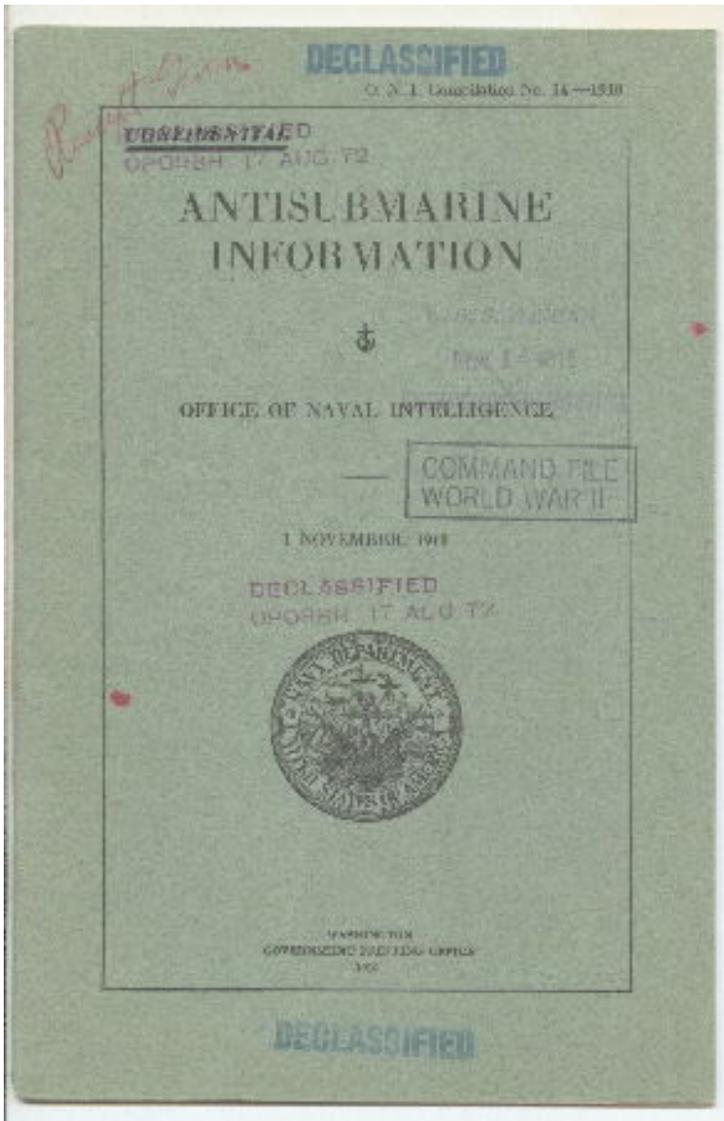


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[Declassified 17 August 1972]

**ANTISUBMARINE
INFORMATION**

OFFICE OF NAVAL INTELLIGENCE

1 NOVEMBER 1918

WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

Image of cover.

NOTE

This compilation is for the information of all commissioned officers.

Every care must be taken to prevent the contents reaching the enemy, and the compilation should be destroyed when no longer needed.

No transfer or quarterly receipts are required.

DISTRIBUTION

In general: Bureaus of the Navy Department; all flag officers; all commanding officers of vessels in the Atlantic Fleet; also stations concerned with submarine or antisubmarine work.

[frontispiece]

Division D-3

OFFICE OF NAVAL INTELLIGENCE
NAVY DEPARTMENT
WASHINGTON, D. C.

Compilation No. 14, 1918 **Antisubmarine Information**

1 NOVEMBER, 1918

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SUBMARINE U 157.
 (CONVERTED MERCANTILE CLASS.)
 (With two 5.9" guns.)

(6)

Three images of: **SUBMARINE U 157**
(CONVERTED MERCANTILE CLASS.)
(With two 5.9" guns.)

[6]

LOSS OF U. B. 110.

Source: British Admiralty. 19 July, 1918.

10406 L. U-4-A.

On 19 July, at 3.30 p. m. (German time), when about 3 miles south of Hartlepool and a little outside the war channel, a south-going convoy, consisting of 29 steamers, was sighted. The commanding officer wished to attack a big vessel in the van of the convoy, but the large number of escorts prevented him from getting into a position for attack, and he therefore turned his attention to a 3,000-ton ship in the rear of the convoy. He believes that, while carrying out this attack, U. B. *110* was sighted by aircraft, which signaled the submarine's presence to the accompanying vessels, for suddenly a motor launch (M. L. 263) was sighted, heading straight for the submarine. The commanding officer gave the order, "Quick to 17 meters (55 feet)," but before the boat had dived to a sufficient depth a depth charge exploded under the bows, forcing her up and jamming the forward hydroplanes to "rise." Another depth charge exploded near the stern at about the same time. Some of the survivors stated that the port main motor short-circuited and that No. 2 fuel tank starboard was damaged as a result of one of these explosions.

The crew was rushed forward in order to force the bows down; but about this time U. B. *110* was rammed by a destroyer, which struck her conning tower on the port side, giving the boat a list to starboard. Immediately afterwards another depth charge seems to have exploded right underneath the submarine, forcing her to the surface. All efforts to dive the boat were unavailing. Finally the commanding officer gave orders to blow the tanks and then to abandon ship. Meanwhile the destroyers had opened fire. It was stated that the conning tower of U. B. *110* was hit three times, one shell passing right through it without exploding. The clips of the conning-tower hatch, which had jammed on account of excessive air pressure in the boat, were finally forced open, and the crew tried to escape through this and the forward hatch. The combined effect of the gun fire and the heavy list of the boat seems to have led to a panic. The crew tried to force their way through the hatches in a body, and it was probably owing to this that a large number failed to escape.

Shortly after U. B. *110* came to the surface a destroyer again rammed her with such force that she capsized and sank.

DETAILS OF U. B. 110.

Source: British Admiralty. 19 July, 1918.

10406 L. U-4-A.

Submerged endurance.--U. B. 110 was tested for a depth of 50 meters (164 feet) of water, this pressure being maintained for some

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time, after which it was increased to 60 meters (197 feet) for a short period. On service the boat had not dived to more than 40 meters (131 feet). An informant stated that on one occasion while he was serving in the North Sea in U. B. 57 the boat dived involuntarily to 110 meters (360 feet) without incurring any damage beyond a few small leaks.

The first completed boat of the U. B. 48-140 class successfully carried out a submerged endurance trial of 72 hours at dead slow speed, about 1.5 knots, and this endurance was specified for all boats of the class. It was stated that the first boat of each new class of German submarines carries out a similar trial. The strain imposed on the crew, in spite of the use of oxygen, was very severe.

Speed.--Utmost speed with the Diesel engines at 460 revolutions per minute was 13.5 knots.

Utmost speed for one hour with the Diesel engines backed up by the motors was 14.2 knots, corresponding to 485 revolutions per minute.

Silent running.--Trials in Kiel Bay lasting one day proved the submerged silent running speed of U. B. 110 to be 150 revolutions per minute with the starboard propeller and 110 revolutions per minute with the port propeller, corresponding to 2.8 knots.

At this speed, when hunted, both hydroplanes and steering gear were clutched into "hand." At high submerged speeds the hydroplanes and steering gear were left in "power," because the main motors made more noise than any auxiliary motor in the boat.

When running "silently," trimming was done with air, while under normal conditions the trimming pump or main ballast pump was employed for this purpose.

Bottoming.--During his cruise in U. B. 110 the commanding officer never rested on the bottom, and it was asserted that, though smaller submarines sometimes lay on the bottom during the day, this practice is not general and many officers are strongly averse to it.

The usual length of cruise for submarines operating off the east coast is 16 to 18 days; those proceeding to the Bay of Biscay remain out about 20 to 22 days.

COLLISION OF U. B. 57.

Source: British Admiralty. August, 1918.

10406 L. U-4-A.

During the cruise of this submarine but one steamer was attacked. After the torpedo was fired so many depth charges were dropped that it would have been impossible to distinguish the explosion of the torpedo after a hit was made from those of the depth charges.

After having alternately lain on the bottom and proceeded submerged for about two hours the commanding officer gave orders to come to the surface. She came up right under a destroyer, which was stopped at the time. The impact bent the main periscope badly. The destroyer at once went ahead and dropped some depth charges, which bent the steering rudder of the submarine. As a result of this attack U. B. 57 had to break off her cruise and return to Flanders.

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U. 139-150 CONSTRUCTION.

Source: British Admiralty. August, 1918.

10506 L. U-4-A.

Hull.--The pressure hull is considerably stronger than that of the ordinary "U" boats, a steel of higher tensile strength being used in the construction. This increase of strength is not believed to have added very much to the thickness and weight of the pressure hull.

The new pressure dock specially built at Stettin for these vessels is nearing completion. When it is available they will be tested to a depth of 100 meters (328 feet) of water, but will be able to dive to a still greater depth in case of emergency.

For the whole length of the pressure hull, the top of the outer hull is made of nickel steel of about 1 inch thickness, which is carried down to a short distance below the water line on each side, where it tapers to one-half-inch. This armour is intended to protect the air bottles, venting pipes, and other fittings in the superstructure from damage by gunfire, and also to reduce the effect of depth charges when submerged.

No sliding conning towers are being fitted, nor are the conning towers armored.

Evaporators.--Electrical evaporators made by Pape & Henneberg, Magdeburg, are being fitted to make fresh water. Hot circulating water from the Diesel engines, heated to 80° C. (176° F.) by the exhaust, is used as feed water, and the distilled fresh water is passed under pressure through carbon filters.

Hydroplanes.--It was stated that these vessels are being provided with a new type of forward hydroplane, fitted with housing gear, which, from one informant's description appears to be similar to that fitted in British "K" boats. Another informant, however, stated that the forward hydroplanes were designed to hinge downward into a vertical position by means of a special motor and gearing. This resulted from the hydroplanes being larger and fitted higher than in ordinary "U" boats, and from the increased tendency to damage in a seaway. Another reason given for this modification was that the danger of damage from depth charges would be considerably lessened when the forward hydroplanes were hinged back, the after hydroplanes being sufficient for depth keeping. The forward hydroplane guards are just visible above the water when the vessels are in their normal surface trim.

OPERATIONS OF U. B. 124.

Source: British Admiralty. August, 1918.

10406 M. U-4-A.

After acceptance trials the U. B. *124* started out on her first cruise. On 7 July, 1918, she encountered two hostile destroyers while still in convoy. At 2.30 a. m. it seems that one of the vessels struck a mine. The commander of the German forces immediately gave orders for the convoy to return to Heligoland.

[9]

On the next and final cruise, the U. B. *124* sighted a British submarine through the mist off the Skaw, but was not attacked. On the following day, another British submarine fired a torpedo at her, which missed its target. A few days later the submarine encountered a kite balloon towed by a patrol, which she succeeded in avoiding. On the same day she encountered another kite balloon towed by a British battleship, said to be of the Queen Elizabeth class, which was carrying out gunnery practice. Combat was avoided by the submarine.

On 17 July another submarine was sighted and challenged by radio. She proved to be the *U-92* homeward bound with the after part of her conning tower fair water damaged and the after gun lying on the deck beside its pedestal. The *U-92* had been rammed, off the coast of Ireland, but was still able to dive.

U. B. *124* arrived off the northwest coast of Ireland in the fore-noon of Saturday, 20 July. At 6.30 a. m. a large merchant vessel was sighted to the north, about 5 to 6 miles off. Reference to his silhouette book convinced the commanding officer that this was the ex-German S. S. *Vaterland*. Her speed was estimated at 18 knots and her course as about southwest. U. B. *124* proceeded to get into position for attack, accordingly. On the nearer approach of the merchant vessel, however, it was seen that she was in tow of tugs and escorted by several destroyers; that her speed was only 3 to 4 knots, and that she was proceeding almost due south.

About this time several explosions were heard in the vicinity, and, as no surface craft were anywhere near the submarine, it was assumed that a seaplane had spotted the submarine and had dropped bombs.

When the *Justicia* was bearing about west-northwest, U. B. *124* approached on the course south 70 degrees west, so as to make the track angle rather less than 90 degrees. She succeeded in passing through the cordon of escorting destroyers, though obliged once or twice to dive below periscope draft.

At about 11.10 a. m. she fired her first torpedo at a range of 656 yards (600 meters) from the port lower bow tube, obtaining a hit forward. A second torpedo from the starboard lower bow tube followed almost immediately, and was observed to hit aft.

The commanding officer then attempted to dive deep and proceed away at full speed. Owing, however, to a delay in compensating for the two torpedoes fired, the boat lost her trim and her bows broke surface. Orders were given to flood the regulator tanks, and the crew were sent forward to restore the trim. By this time, however, the forward torpedo-compensating tanks had been flooded. The boat now took up a sharp angle down by the bow and made an involuntary dive. She had reached a depth of 131 feet (40 meters) when dept charges exploded near her. In the agitation caused by the explosions the inexperienced second in command forgot to stop flooding the regulator tanks, with the result that when the trim was restored the boat continued to sink, and finally came to rest on the bottom at a depth of 282 feet (86 meters). The floods of the regulator tanks were

found still open when the submarine reached the bottom. This was about five to six minutes after the torpedoes had been fired.

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Between 11.30 a. m. and about 1 p. m. a large number of depth charges--at least 50--were dropped near the submarine, and at 2 p. m. about 5 more were heard to explode in the immediate vicinity. No visible damage was caused, except that the electric lights were loosened in their sockets. In view of these attacks, the commanding officer thought it wiser to remain on the bottom.

At about 7 p. m. orders were given to blow all tanks and rise to the surface. The boat lost trim almost immediately and took up an inclination of about 50 degrees down by the stern. Acid ran out of the batteries and bilge water entered the battery wells, causing gas to generate. It is believed that the loss of trim was caused by one of the after tanks or its blow having sprung a leak, the result either of the explosion of depth charges or of the excessive pressure at the depth reached by U. B. *124*. The bows broke surface at a very steep angle, but the submarine then quickly regained her trim and made away with both Diesel engines, which were still in good working order.

Three destroyers were then observed approaching from about 5 miles off. They opened fired about 10 minutes later. It has been maintained that U. B. *124* was not hit by gunfire.

The crew of the submarine was ordered on deck and instructions were given to the engineer officer to sink the boat. With the exception of the sublieutenant and the engineer officer, who were on the bridge and evidently did not expect the submarine to sink immediately, all the crew jumped overboard in time to save themselves. A few seconds later U. B. *124* suddenly sank and one of the demolition charges on board her was heard to explode.

The destroyers approached, but, after circling round, went off in search of a periscope which had been sighted. After being in the water for 20 or 30 minutes, the crew of the submarine were rescued and taken on board H. M. S. *Marne*.

The commanding officer of U. B. *124* was not lying in wait when the *Justicia* was sighted and the meeting was a surprise. Nevertheless, the impression was gained that several other submarines had been ordered to concentrate in the area and that the U. B. *124* was aware of this.

LOSS OF U. B. 84.

Source: Fairly reliable.

10406 M. U-4-A.

U. B. *84* was rammed in Eckernforde Bay on December 6, 1917, by the torpedo target ship *Solingen*, which passed over her, damaging her conning tower and bow compartment. The submarine sank immediately, but, by blowing all tanks, she was brought to the surface and remained there one and a half to two minutes before sinking to the bottom. All the crew came up on deck, with the exception of the engine-room watch of seven men, who were unable to escape, as the water-tight door between engine room and living quarters could not be opened. These men went down again with the boat. They responded to the tappings of divers for 30 hours, but it was impossible to rescue them.

[11]

The submarine was not raised by the submarine salvage ship *Vulkan* until nine weeks later. She is now being repaired at Kiel.

GERMAN SUBMARINE TACTICS.

Source: Extracts of British Admiralty aviation publication. April, 1918.

10744. U-4-A.

Balancing submerged.--A German submarine never floats, i.e., never stops his motors under water (experiments show that this can not be done for more than from five to seven minutes) unless he finds he is chased by hydrophone flotillas, etc., and he then re-starts his motors immediately on hearing the watching craft under way. The matter is best impressed on officers when they understand that the ballasting of a submarine is much more difficult than that of an airship, and in one extreme case, through different currents and therefore density, changes resulted in the boat's buoyancy altering 25 tons. There is a remote chance, therefore, that a submarine commander, being chased and believing that he had sufficient negative buoyancy, or encountering different density through tide, might momentarily appear on the surface by mistake on switching off his motors.

Visibility.--The hunt constantly resembles an ordinary sport, such as fishing. Just as one has to change one's flies for different rivers and times of year, so one has to alter one's methods and look for and adopt different plans of operation and schemes of detection for different areas. For instance, in clear waters, such as the Mediterranean and the Baltic, submarines can be seen at 60 to 80 foot depths; in the western approaches to the Channel one has been seen at 30 feet; while in the muddy waters up Channel and off Harwich it is impossible to see a submarine under the surface even with periscope well out. In the Queenstown area captains of the submarines report that the manner in which sea gulls follow their periscopes in the Atlantic is very noticeable--far more so than in the North Sea, where it seldom occurs. This information is very valuable for our patrols in locating submarines, as one might neglect to examine a spot around which sea gulls were congregating, or if one happened to notice a momentary wash of a periscope it might be mistaken for the usual shoals of fish with sea gulls overhead which is constantly seen. It is interesting to note that one of our airships on the east coast reported that she had bombed a periscope which sea gulls were following.

Lying on the bottom.--In some seas lying on the bottom is impossible, and even with considerable negative buoyancy the vessels roll and bump at 20 to 30 fathoms, bumping vertically 20 to 30 feet. This is likely to open up seams and perhaps cause oil leakage.

The submarine point of view.--The point of view held by submarine officers is not widely known in the airship service, and it would seem rather important to know what they think and feel. The reason a submarine commander respects aircraft is because his position is given away if he is seen and the purpose of his patrol is interfered with. Naturally surface craft are at once brought on the scene, and later, if airships work with very fast coastal motor boats

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fitted with hydrophones, the submarine's chances would be less, as he has not much to fear even from aircraft of

the fastest type if he keeps a proper lookout. Pilots must always realize this and try to catch him unawares. The German submarine commander's object is to conceal his position, which, if known, means his being harried, with the loss of his chance to attack a convoy, whose course is altered. Cases will be certain to occur later where, of two submarines in conjunction, one will show itself, so that the other may have greater freedom of action elsewhere. Apropos of submarines not wishing to be seen and relative to the efficiency of aircraft in a certain area our submarine antisubmarine patrol reports mournfully:

It is now very seldom that a German submarine is seen on the surface, and it is obvious that the activities of aircraft and our submarines have compelled hostile submarines to take greater precautions and to remain constantly submerged during daylight hours.

This is the experience of all patrol areas nowadays, and it is of note that practically all the sinkings of merchant vessels take place at night.

Perhaps the best way to get a realistic idea of what an enemy submarine commander does will be to imagine him as he leaves his base--say Bruges. There are two routes at present to his main hunting grounds, and we will consider the southerly--via the Straits of Dover. He has a nerve-racking time. First of all having to pass through our antisubmarine barrage and mine fields, aircraft, submarines, and all manner of surface craft and devices that are used to prevent his possible passage, which is usually made at night. When he gets through this he has run his batteries down considerably, and therefore has to risk running on the surface as much as possible to recharge. This is an additional danger and is the chance for aircraft, as it is probably daylight at this stage of the proceedings. Each attack, even if unsuccessful, has some effect on the submarine's crew, and by the time the vessel gets to the open sea and reaches its patrol area their judgment and efficiency may be considerably affected. A case is given later illustrating this point of view from an actual attack on a submarine. Patrolling up and down waiting for a target a submarine may often get into position for torpedoing, only to be put off by the vessel altering course, etc., at the psychological moment. Submarines do not worry about surface craft and often approach them quite closely on the surface or, diving, with their periscope. Our own submarine commanders have crept so close to German vessels that they could see the faces of the men cleaning the guns quite distinctly. Merchant skippers who have been prisoners in German submarines confirm this, but state that when aircraft of any description is seen there is an immediate panic on board and all possible speed is made to submerge.

Considering the actual attack, if the victim is unaccompanied the submarine usually keeps his periscope up after the attack to get the name of the vessel, etc. With other surface craft about, he is more wary, and dives at once, but he is not at all afraid of getting in between an escort and convoy. A German submarine has actually re-torpedoed an escorted cruiser that was surrounded by destroyers. In the latter case the submarine was finally sunk, but in other similar cases daring submarine commanders have added the escort as well

[13]

to their bag. If aircraft arrive, the submarine will dive at once to 60 to 100 feet, and proceed slowly away at, say, 1 1/2 to 2 knots. If surface craft as well--with hydrophones--are being used, he will intermittently stop his engines (but only for a few minutes), lying still when everything is quiet, and starting up again on hearing engines being run. It is rarely that a submarine proceeds under water (9 knots) after attack.

The general practice of the submarine commander is to come to the surface, say, a half to an hour after he has been seen, has attacked, or has been attacked--either to satisfy his curiosity or to see whether he can proceed.

The sound and safe thing to do is to remain underneath for a much longer period, but this rarely happens, and again this is where aircraft gets a chance it would not otherwise have. After he has his look subsequently to the attack, if there is danger the submarine goes down again, coming up an hour afterwards, apparently repeating this with increased periods under water (depending on the personal equation) till the coast is clear. Naturally he is keen to get on with his work, but it appears very hazardous to come up and risk finding destroyers or aircraft right on top of him, and be shaken to pieces--in some cases sunk--when a little patience would have rendered him immune. At the risk of being redundant, it is emphasized that a very useful period to arrive on the scene is shortly after the torpedoing. When the submarine is discovered his position is not enviable. Actual data from the captain of the submarine giving a recent continued attack is appended, and the psychological effect on the crew is given, showing that in this case, where the attack failed, the moral results achieved were considerable, so much so as to stop the submarine's work for some time:

8.37. Dived to avoid attack.

8.40. Loud explosion of depth charge aft. First lieutenant and men lifted off feet and stern vibrated very violently. Another violent explosion.

8.50. Took bottom in 23 fathoms and stopped all motors.

9.05. Loud explosion. Most violent of all. All lights went out. Thought we were hit.

All the explosions were very loud and violent, shaking the boat considerably; the last believed to be sweep explosive, as a wire was heard grating on the hull just before the explosion. The after hydrophone jammed and the compass took on a permanent deviation of 5 degrees. There was no permanent moral effect on the crew, but highly strung individuals were affected for some time. There was a feeling of impotency at being unable to hit back. For two or three days men started when touched.

The captain affirms that one's judgment would most likely be affected for several days after such an occurrence--inducing either over-cautiousness or rashness. In this case it is evident that had the depth charge been of the type now being used the submarine would have been destroyed.

Effective depth-charge radius.--Experiments have recently been carried out by H. M. S. *Vernon* to determine the amount of damage caused to a British submarine (*D-1*) by the explosion of 300 pounds of 40/60 amatol detonated at various depths below the fore end of the keel. These experiments show that if the distance between the keel and the charge be 50 feet or less, a submarine of this type will be rendered useless. This corresponds to the effect of a 500-pound bomb detonated at about 52 feet, or a 230-pound bomb at, say, 42 feet. If

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the dimensions of a submarine under attack were 22 feet diameter and 220 feet length, this would give the following effective target areas:

Bomb.	Horizontal dimensions of target.
500 pounds	126 by 324 feet
230 pounds	106 by 304 feet

It must be remembered, however, that with the introduction of submarines of stronger type the destructive radii will be diminished.

Distribution of submarine information.--It is all important that every worker in the antisubmarine warfare should realize that developments are taking place every day, and that he should therefore go out of his way to learn the latest information that might be useful to him in his area. Most people are too occupied in their own work, and as there is not much time for the "spoon-feeding" type of instruction in war time, very important information is often missed through being locked up until the period when it might have been extremely valuable has passed.

As a small illustration of this constant change and progression, German mines have usually been painted black or dark green and black; but very recent submarine patrols now report mines painted green mottled with brown, to blend, presumably, with the muddy waters off our coasts. Similarly, submarines painted gray and black are now being painted green and brown, and a few days ago a very large one of this description was chased by one of our submarine's off the German coast.

Comparison of British and German submarine mines.--In our submarines the complete mine is carried in a vertical chamber and rests on a pad at the bottom, being also held in position by a pin penetrating into its side near the top of the chamber. The mine is carried upside down, and in dropping, the pad is first of all swung clear, the final act being to withdraw the pin. This releases the mine, which falls out with a loud clatter.

Incidentally, this noise is quite distinctive and can be heard for some distance by surface craft, but more especially by submarines and hydrophone flotillas. Mining operations are often given away by this means when no ocular evidence of the submarine exists. Hydrophones are being rapidly developed, and with some types, flotillas can now detect at a distance of 6 miles a submarine proceeding submerged at 2 knots.

German mines are, however, dropped base downward (and with the air-ejected mines, the sinker end is shot out first). On dropping, the mine and sinker goes to the bottom. After a period of 10 to 20 minutes a soluble plug dissolves and releases the mine, which rises by its own buoyancy plus the inertia of the compressed springs to start it off. The hydrostatic gear is held unlocked until the mine leaves the sinker, when it comes into play, and on the mine reaching its set depth, grips and holds the mooring rope, i.e., if the mine field is to be 20 fathoms, the hydrostatic gear operates when 20 fathoms of rope have unwound. Once it is thus operated, it does not come into action again and can not subsequently release the wire. The safety gear is only operative so long as the soluble plug (or pin) is in place. When this plug is out the mine is active.

[15]

CARBONIT MINE.

SHOWING SINKER ON BOTTOM AND MINE RISING TO ITS SET DEPTH.

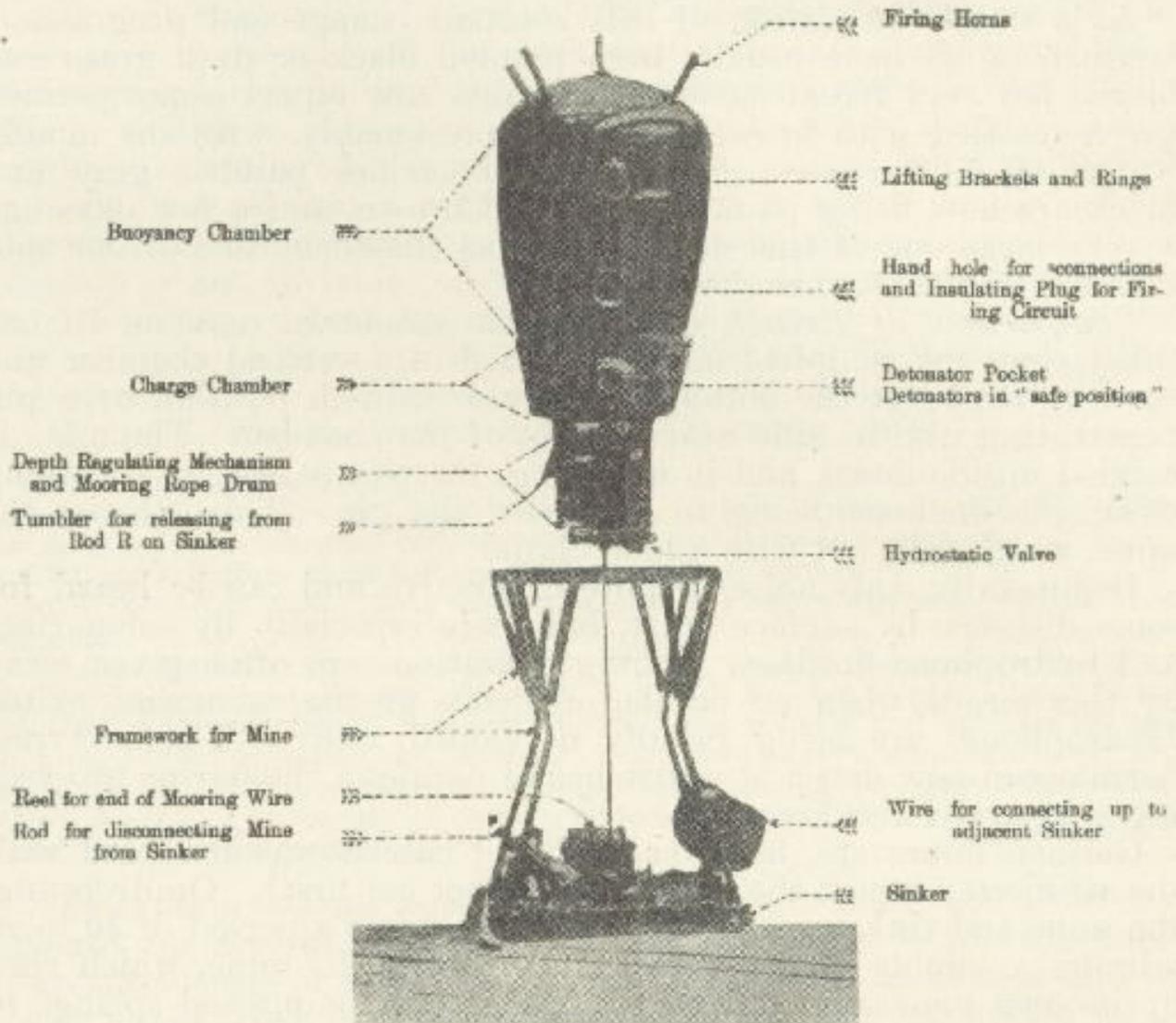


Image of **CARBONIT MINE**. Showing sinker on bottom and mine rising to its set depth.

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AUSTRIAN SUBMARINES.

Source: Commander American naval forces in European waters. 27 September, 1918.

5357 A. F-6-D.

Reliable information indicates that there exist several gaps in the series of numbers assigned to the Austrian submarines; from the actual state of the information it is concluded that Austria in April, 1918, possessed 30 submarines, distinguished by the following numbers: *U-1, U-2, U-4, U-5, U-7, U-8, U-9, U-10, U-11, U-13, U-14, U-15, U-17, U-18, U-19, U-20, U-21, U-22, U-24, U-25, U-26, U-27, U-28, U-29, U-30 (new U-30), U-31, U-40, U-41, U-48, U-49*. To which must most certainly be added the Italian *ex-Pullino*, making a total of 31 (eight of which are adapted for mine laying).

The destruction of the following submarines is certain: *U-3 U-6, U-12, U-16, U-23, U-20*.

Besides the crew proper, every submarine is provided with a nucleus of reserves, which in number practically corresponds to the active crew; so that every unit has two complements of personnel; which take alternate turns in the cruises.

In addition to wireless, Austrian submarines are provided with an acoustic apparatus of German type (probably no more than a perfected edition of the Submarine Signal Co.'s device of bells), which works very well for a radius of about 10 miles.

GERMAN DISTANT-CONTROL BOATS.

Source: British admiralty. September, 1918.

9417 1. U-2-C.

It has been reported that the German admiralty have practically abandoned the use of distantly controlled motor boats on account of the number of accidents caused by the unreliable working of their engines.

FRENCH EXPERIMENTS WITH OIL TRACKS.

Source: French official bulletin. 29 August, 1918.

10729 A. F-6-H.

The French admiralty have experimented with a submarine for the purposes of obtaining data on oil ejected from submerged tubes.

The submarine was fitted with two floats, tracking astern on the same line. They were spaced at 200 meters aft and 280 meters, respectively. These floats served as a basis for measuring distances. The petroleum used was evacuated from a tank of the submarine by means of a pump placed 5 meters below the deck and 24 meters forward of the stern. At average speed and at moderate depths it was computed that an oil track would rise at a

speed of about 6 seconds per meter. At high speed the oil takes about 8 seconds per meter, due probably to the stronger eddies of the propellers.

It is believed that various patrols have allowed enormous errors in their calculations in dropping bombs, due to the inexact knowledge

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of the speed of rising oil. The table of the results of the experiments is as follows:

Depth of submarine calculated from keel.	Depth of orifice emitting oil.	Speed of submarine.	Distances observed of tracks aft.	Distances referred to point of emission of oil.	Number of seconds for rise of oil.	Speed of rise in seconds per meter.
Meters.	Meters.	Knots	Meters.	Meters.		
10	5	4	30	54	27	5.4
20	15	4	150	174	87	5.8
30	25	4	290	314	157	6.3
20	15	7	430	454	130	8.6

FRENCH SUBMARINE ATTACK WITH USE OF HYDRO-PHONES.

Source: French official bulletin. 29 August, 1918.

10729 A. F-6-H.

The French patrol boat *Engageante* in a recent attack on a submarine employed her hydrophones to effective use. The description of the operation may be of value in illustrating the possibilities of pursuing an unsighted submarine and attacking it with genuine chances of success.

The *Engageante* during dull weather and an agitated sea picked up a distinct sound of a submarine on the port bow. The ship turned to the right to permit a better use of her hydrophones by taking the sea aft. Then, after obtaining the bearing of the submarine, she commenced her series of alternate runs and stops. From the plotting of the approximate tracks of the submarine and the patrol boats it was determined that the course of the submarine was crossed five times by the patrol. The divergence of the two courses, in addition, constantly diminished. At the fifth crossing seven depth charges were dropped. The patrol then stopped to listen. Sounds were picked up which resembled the crashing of steel shutters, accompanied by a noise of steam issuing from an immersed tube. The sounds after a few moments ceased entirely. The patrol cruised on various courses without picking up anything further.

It is believed that the chances of having made a very successful attack are good, as the pitch of the submarine's propellers at the point of attack was at a maximum and recognized with certainty as being the propellers of a submarine.

"U-21" ARMOR.

Source: British Admiralty. August, 1918.

10406 M. U-4-A.

There have been reports to the effect that the decks of German submarines have been armored. From recent information it is gathered that the *U-21* has had her deck strengthened by means of extra plating, to enable her to mount her guns with safety. This may possibly explain the reports concerning armored decks, which might

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make a submarine top-heavy. It has been stated that in the acceptance trials of one submarine the upper structure of light armor was so heavy that alterations had to be made.

GERMAN SUBMARINE DIVING QUALITIES WITH INCREASED COMPLEMENT.

Source: German. August, 1918.

It has been stated by the commanding officer of the *U-46* that when 35 extra men were taken on board from the survivors of a torpedoed ship that the diving qualities of the submarine were seriously impaired. Had it not been for the fact that little danger was anticipated from the allied warships it would have been impossible to have taken these survivors on board.

GERMAN CRUISER DESTROYERS (NEW TYPE).

Source: British reports. 27 August, 1918.

94171. U-2-C.

A report dated August, 1918, states that a new type of German cruiser destroyer is being constructed, eight of which are being built at the present time. Some of them are practically ready to be launched. It is believed that these cruiser destroyers are intended to replace the additional vessels of the *Brummer* class, the construction of which was contemplated at one time. Apparently the *Brummer* and *Bremse* have not given satisfaction. It is thought probable that the cruiser destroyers will be of a type approximating the English *Swift* class.

GERMAN DESTROYERS.

Source: British Admiralty. August, 1918.

8751 B. U-1 J.

Nomenclature.--When Germany commenced seriously building torpedo craft in 1883, a system of consecutive numbering in a series from 1 upward was adopted.

In order to encourage a spirit of emulation among the builders, however, each boat carried the initial letter of her building yard before her serial number. These initial letters were "G" for Germania yard, Kiel; "S" for Schichau yard, Elbing; and "V" for Vulcan yard, Stettin. Thus No. 1 became "S. 1," No. 88 became "G. 88," and so on. Carefully managed press notices of such vessels as had distinguished themselves in the matter of speed or sea-

worthiness soon rendered the plan a complete success.

Total numbers.--In August, 1918, Germany possessed, completed, about 190 destroyers and 150 torpedo boats of all types.

Armament.--Up to the outbreak of war all German torpedo craft were designed as torpedo boats proper and not as destroyers, and hence carried a strong torpedo armament with a relatively weak gun armament. The lessons of the war, however; and particularly the

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battle of Jutland, have led to the abandonment of this system and the introduction of a considerably heavier gun armament.

Fire control.--Fire is controlled by means of electric transmitter, telephone, or flexible voice piping.

An electric receiving apparatus (Geber) is fixed above each gun in front of the breech. It shows (a) range, to the nearest 100 meters; (b) deflection, in red figures for port, green figures for starboard; (c) bearing in degrees, so that the gun may be laid on a particular bearing (a graduated bearing ring being fitted on the pedestal of the gun); (d) orders for firing. The last named are as follows: Rapid fire (Schnellfeuer), independent (Selbständig), local control (Geschützweise), and cease firing (Batterie halt).

Fire gongs are also fitted.

Salvo firing is always used as long as the control remains intact, and salvo firing in half flotillas appears to be practiced considerably.

Torpedo tubes and torpedoes.--All destroyers prior to G. 174 (1909-10 program) carry three 17.7-inch revolving tubes mounted in the center line, so that all three will bear on either broadside. Five torpedoes are carried, three in the tubes and two spare.

All destroyers from G. 174 (old series) to S. 24 (new series), inclusive, carry four 19.7-inch tubes. The two foremost tubes are mounted one on either side, directly abaft the forecastle, with an arc of training of about 45° from nearly right ahead to about 40° before the beam. The other two are mounted in the center line for all-around training. This disposition permits of the use of three tube on either beam. Five torpedoes are carried--four in the tubes and one in a water-tight holder on deck.

All destroyers from V. 25 onward originally carried six 19.7-inch torpedo tubes, viz, one on either side, directly abaft the forecastle (as in G. 171-S. 24), the other four mounted in pairs on the center line; the two tubes of each pair diverge at an angle of about 12°. Seven torpedoes were carried, six in the tubes and one spare. In a number of these boats, however, from G. 37 onward, the two foremost tubes have now been entirely removed, this reduction of armament presumably having been found necessary in order to balance the considerable increase in weight due to substituting three 4.1-inch guns for the three 22-pounders, for which the boats were all (or nearly all) designed.

Complement.--Recent destroyers carry 4 or 5 officers, viz., 3 executive officers, 1 engineer, and sometimes a surgeon; about 4 warrant officers, about 45 deck ratings, and 45 engine room and other ratings; total, 98 to 100 men.

Depth charges.--Destroyers and some of the torpedo boats operating in the North Sea usually carry from two to six cylindrical depth charges, for which a launching trough is fitted on either quarter. These depth charges are about 3 feet in length and 16 inches in diameter, and are made in two parts, comprising a buoy and a charge case, which are dropped together. The charge case, which contains about 56 pounds of explosive, is released from the buoy after a certain number of seconds, according to the adjustment of an indicator on the buoy; the depth at which the charge explodes is adjusted by a separate indicator on the charge case. These indicators are set by

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orders from the bridge and the depth charges are dropped by hand, two sets of hand-release gear being fitted at the stern of the boat.

Explosive kites.--German torpedo craft are now supplied with an antisubmarine explosive kite, about 4 feet in length and 2 feet across, which can be towed at any speed between 6 and 21 knots. It has some form of inertia pistol, and is towed by means of an armored electric cable which is carried aft in the boat on a drum of special construction; the drum contains a dry battery and is fitted with switches, pilot lamp, etc. The kite is used when searching for a submarine which has been reported or sighted in the neighborhood and has dived. It is towed from the mine-sweeping fair-lead aft, where fitted, otherwise from a hinged derrick at the stern of the boat. Three or four of these kites are usually carried.

Masts (distinctive marks).--The destroyers of a flotilla generally all carry a shaped frame or frames with the center cut out (triangle, circle, diamond, or half moon) on the foremast as flotilla sign, and a second shape of varying description on the mainmast as individual sign. In some cases the flotilla is distinguished by the absence of the foremast sign; in June, 1917, the first and second flotillas were thus distinguished. Leaders of flotillas generally carry the flotilla sign only (on the foremast) and no individual sign.

All destroyers usually carry, in addition, two conspicuous horizontal hoops, as described below under "[Recognition signals.](#)"

Mine laying.--Destroyers carry mines only when they are detailed for that particular purpose, and whilst carrying them are considered to be precluded from undertaking other offensive operations, and are usually provided with an escort.

When detailed for mining, each destroyer carries 12 mines, 6 on either side amidships, lashed as convenient. There are no special fittings for them, except in a few of the older boats. Rollers are fitted on the underside of the sinkers to facilitate moving the mines about the deck. The mines are laid at a speed of about 15 knots.

They are simply pushed overboard, alternately from the starboard and the port sides.

Mine sweeping.--A considerable number of destroyers, including some of the most recent classes, are fitted for mine sweeping. A large double fair-lead is fitted aft. Mine sweeping is carried out by half flotillas in line abreast, the two ends of each sweep being towed by adjacent destroyers. The destroyers steam about 164 yards apart.

All torpedo boats, except those few which are used as dispatch boats and tenders, are fitted for mine sweeping

and in war time are very largely employed on mine-sweeping duties. In a number of these boats the torpedo tubes have been replaced by winches.

Range finders.--In the newer destroyers a 1-meter (3 1/4 feet) range finder is mounted on the searchlight platform above the bridge; some recent destroyers are reported to have a second instrument mounted aft. A specially trained able-seaman range taker is carried in each destroyer. It is said to be very seldom possible to take ranges in action, owing to the excessive vibration.

Torpedo boats of the "A" class are also reported to carry a 1-meter (3 1/4 feet) range finder.

Recognition signals.--For recognition signals by day German torpedo craft hoist a combination of two cones or balls or flash a letter

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on the searchlight. At night they generally use systems of colored lanterns, three of which are fitted on the foremast as follows:

1. Night signaling apparatus, which consists of three (double) lanterns arranged vertically; the upper half of each lantern is fitted with white glass, the lower half with red glass, and only one half is switched on at a time.
2. Two conspicuous horizontal hoops, each carrying a number of electric lamps, which may be red, green, or white, but are all of one color in one hoop.
3. Four small lanterns on a fixed yard on the fore side of the fore-mast, which are also reported to be red, green, or white. These are probably used for flashing a recognition signal.

Smoke-producing apparatus.--All modern destroyers carry, aft on either quarter, a metal cylinder about 2 feet in length mounted on a sloping platform. These two cylinders, which contain some chemical composition, are in connection with the compressed-air service and are used for developing a smoke screen. The apparatus is controlled from the fore bridge or after wheelhouse. The smoke produced is grayish-white in color.

The boilers are also utilized to produce a smoke screen when required.

Speed (cruising).--Before the war the cruising speed of destroyers was fixed as follows: (a) For the boats from T. 90 to T. 136, inclusive, 14 knots; (b) for the boats from T. 137 onward, 17 knots.

In turbine boats with two shafts for speeds of 12 knots and under one shaft only was to be used, if possible, the other being allowed to run idle.

Wireless telegraphy.--The wireless room, which is situated directly abaft the fore channel, is insulated against heat and sound.

Rudders.--A bow rudder is fitted which can be raised into a recess in the hull when boat is to be towed.

TORPEDO FIRING IN SUBMARINE SCHOOL AT KIEL.

Source: German. August, 1918.

10406. U-4-A.

The course for commanding officers at the submarine school, Kiel, includes a test in attacking a convoy with torpedoes fitted with collision heads. The candidate is required to make a successful torpedo attack without being sighted. The operation is made as realistic as possible, the attack being carried out against five or six camouflaged merchant vessels escorted by torpedo boats and trawlers. Should the periscope be sighted, marks are deducted and a flag signal is hoisted, indicating that the submarine must carry out her attack again.

It has been claimed that some of the permanent staff of the submarine school can detect a periscope at great distances--sometimes as far as 1,000 yards with the naked eye.

There is an instructional officer on board the submarine during these tests.

The torpedo-target ships, at which torpedo-firing tests are carried out, are camouflaged in the styles adopted by British merchant ves-

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sels, in order that submarine officers may get accustomed to the appearance of camouflaged ships in the periscope.

At least 30 to 40 torpedoes are fired by each candidate in the commanding officer's course, and a high standard of efficiency is demanded. Failure to qualify in this course entails the return of the candidate to the general service.

In regard to the British service it has been remarked that there had lately been an improvement in the torpedo firing of British submarines, which previously was not considered good. The commanding officer of a U-boat has stated that during his career in submarines he had had six torpedoes fired at him without success by British boats.

GERMAN SUBMARINE CABLE CUTTER.

Source: British admiralty. August, 1918.

10406 L. U-4-A.

It has been stated that the converted mercantile submarines of the *Deutschland* class are being fitted with mechanical cable cutters that consist of a heavy shaft, a revolving spur, and two prongs or arms that take up the position of the flukes of a patent anchor. The spur which is a very strong circular-toothed cutter, extends below the arms and its cutting edges pass between the shank and the arm. When the cutter is dragged along the sea bed the teeth also engage in the bottom, causing the cutter to rotate. If a cable is picked up, it is forced into the cutting knives by the position of the arms or prongs. It is claimed that this appliance will cut cables up to 6.3 inches.

GERMAN SUBMARINE USE OF SHORE FIRES AS RANGE LIGHTS.

Source: Report of sub chaser No. 337. 23 September, 1918.

On the night of August 17, 1918, two distinct fires were observed in the mountains of Albania that were in such a position as to form an excellent range for German submarines entering the Adriatic. Due to the logical position of these lights it was suspected by the commanding officer of the sub chaser that they were placed in this position for the purpose mentioned. While the Germans maintained communication with their forces ashore in this region, it seems this ruse might actually have been tried.

GERMAN SUBMARINE IDENTIFICATION SIGNALS.

Source: British. 27 August, 1918.

9417 1. U-2-C.

It has been reported that on or about July 29 two German submarines were observed exchanging identification signals, as follows: First each one sent up a smoke bomb, which spread into three parts in the air. These were followed by second ones, which spread into two parts.

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GERMAN SUBMARINE SMOKE TACTICS.

Source: German. August, 1918.

10406. U-4-A.

When columns of smoke are sighted by German submarines their bearing is immediately taken. The submarine continues on the surface at slow speed, taking a fresh bearing of the approaching vessels every 10 to 15 minutes, until the speed of the convoy and its approximate course can be judged.

If the convoy is zigzagging, each alteration of course is carefully noted during a period of at least an hour, and sometimes even for two hours, until the mean course of the convoy can be definitely ascertained.

The submarine then proceeds to close on a course differing by about 45° from the estimated mean course of the convoy, and endeavors to reach a point about 1 mile ahead of the convoy on this mean course. She submerges as soon as there is danger of being sighted, i.e., with average visibility, when the funnels can be distinctly made out above the horizon.

On reaching the required position the submarine turns and proceeds at low speed toward the convoy in a reverse direction to its mean course. She is thus in a favorable position for attack, whether the convoy continues on the same leg or the zigzag or shifts to the opposite leg.

The leading wing ship of the convoy is generally used by the submarine as an "observation ship" or mark for getting into position for attack. The actual attack is more usually delivered against the second or a later ship in the line.

In ships of the dummy convoy, on which attacks are carried out by officers qualifying in the submarine school, in addition to the ordinary lookouts a special petty officer provided with binoculars kept a lookout only in the direction of the mean course of the convoy. It is believed that the attack from this position has been a very

favorite one, and that aircraft or a destroyer, scouting ahead along the direction of the main course, would in many cases greatly hamper an attacking submarine.

As regards the further attack, the submarine may pass down between two columns of the convoy, keeping at periscope draft. She may then turn roughly at right angles to the course of the convoy and endeavor to fire a bow shot at a vessel in one column and then a stern shot at a ship in the other column. If, however, there is not sufficient room to maneuver in this manner and the convoy is on a steady course at the time, she may remain on an opposite course and fire two bow shots, each angled for 90°, at ships on either side of her, i.e., one in each of the columns.

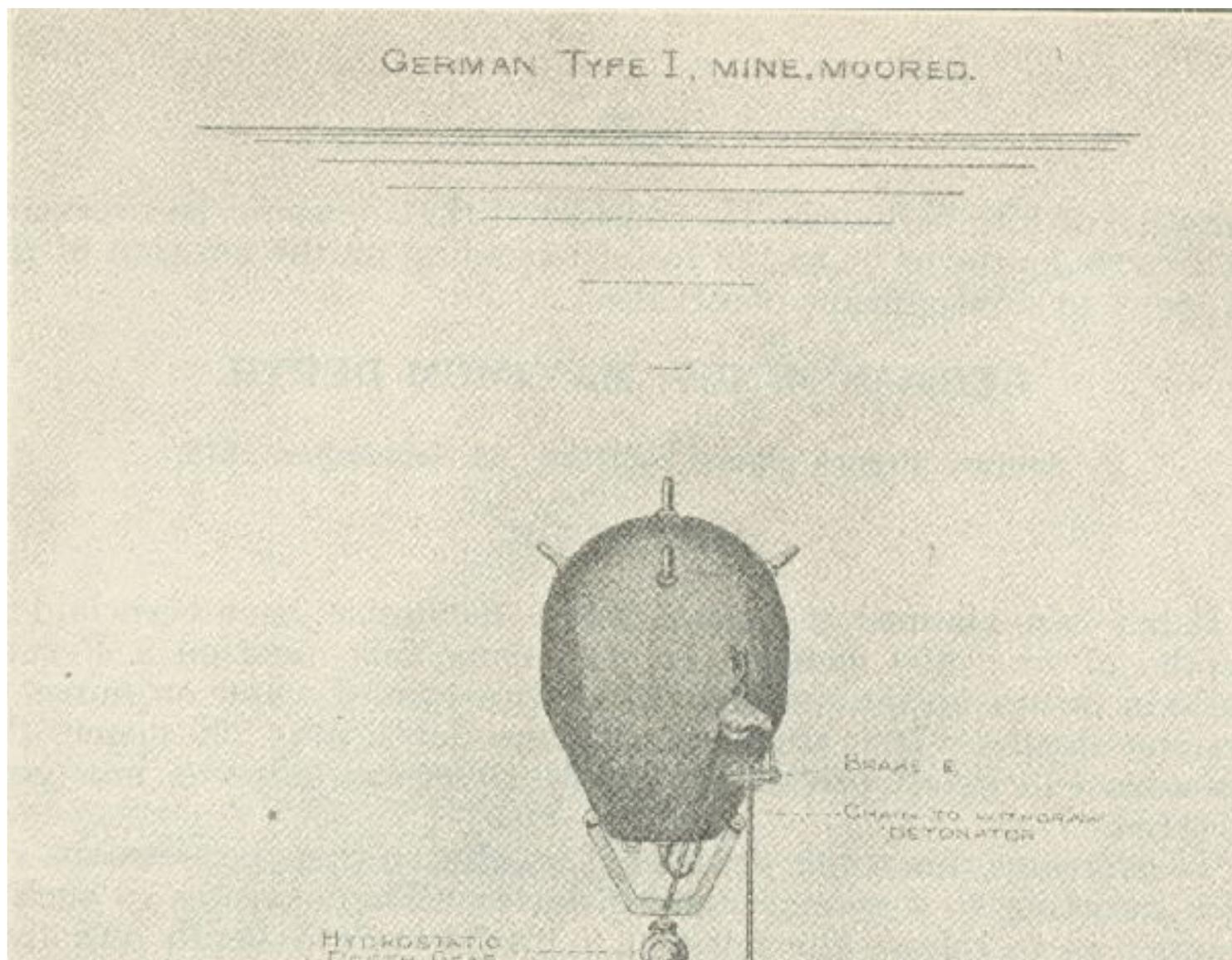
GERMAN SUBMARINE KITE BALLOON TACTICS.

August, 1918.

10406 M. U-4-A.

From the statements of the commanding officer of a "U. B." boat it appears that submarines are considerably inconvenienced by the

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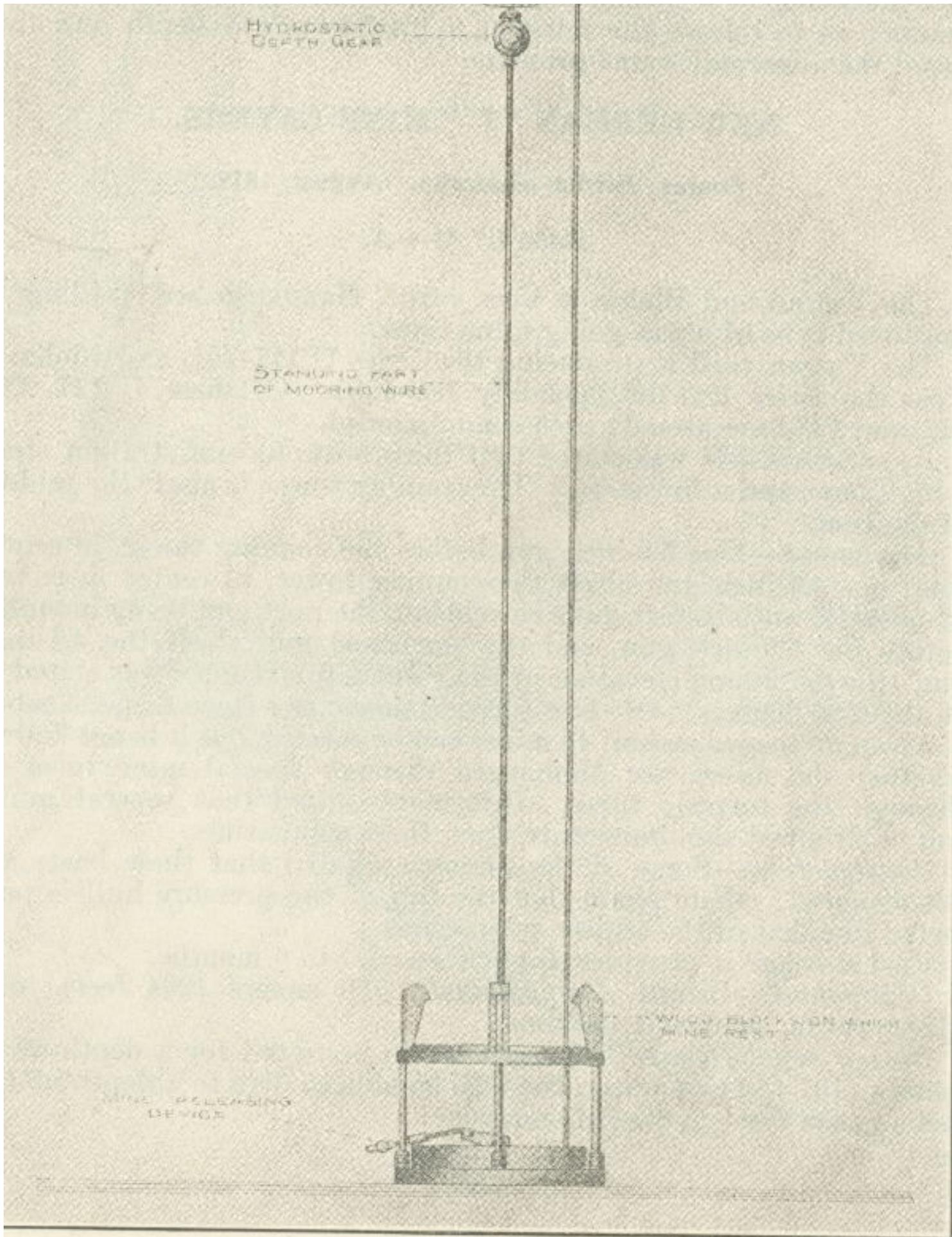


Image of **German Type I Mine**, moored.

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presence of kite balloons. He considered that it would be necessary to dive to depths of 66 to 132 feet (depending on the position of the balloon) to surely escape observation.

GERMAN MINES: MAXIMUM DEPTH.

Source: French official bulletin. 26 September, 1918.

10734. F-6-H.

It has been claimed at various times that mines have been laid in depths of over 200 meters. In discussing this question a French bulletin brings up the question of the pressure of water on mines at extreme depths. It is stated that at any depth over 200 meters the pressure will in all probability crush a German mine as now constructed.

To overcome this water pressure it is believed that the Germans are now resorting to a special sinking device. This operates in such a manner as to release the mine at a predetermined depth and thus avoid the abnormal water pressure.

NEW GERMAN "U" MINE LAYERS.

Source: British admiralty. August, 1918.

10406 L. U-4-A.

The Vulcan and Blohm & Voss yards, Hamburg, are building an improved type of ocean-going mine layer.

The Vulcan yard is producing the series U 117-121, and Blohm & Voss the series 122-126 (possibly 122-128). Of these U 117, 118, 122, and 123 have already been commissioned.

Appearance.--It was stated that these boats have a straight stem, a high bow, and a low stern. The conning tower is abaft the middle of the boat.

Armament.--One 5.9-inch gun before the conning tower, in center line; one 4.1-inch gun abaft the conning tower, in center line; two 22-pounder antiaircraft guns en echelon, the port gun being mounted before the 5.9-inch gun, and the starboard gun abaft the 4.1-inch gun (the maximum elevation of these antiaircraft guns was stated to be about 85 degrees); two bow torpedo tubes; two stern torpedo tubes.

About 22 torpedoes and 45 mines can be carried, but it is not known whether the mines are discharged through special mine tubes or through the torpedo tubes. Informant stated that several mines can be dropped simultaneously from these submarines.

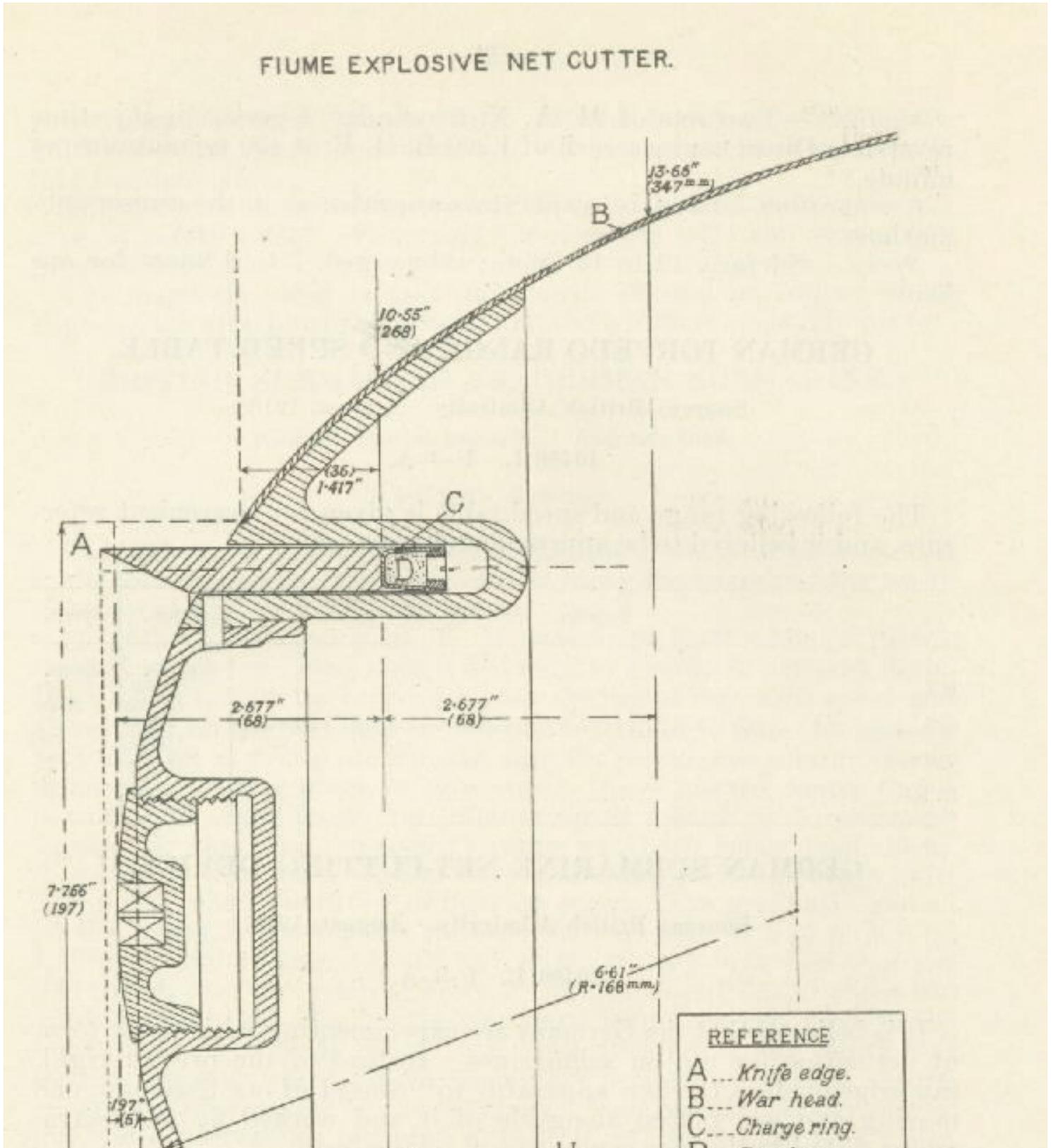
Construction.--Some of the prisoners stated that these boats are not armored; others again that the top of the pressure hull is protected like that of the cruiser submarines.

Fuel stowage is provided for cruises of 5 to 6 months.

Dimensions.--Length (approximate), 90 meters (294 feet); displacement on surface, 1,450 tons.

Diving capabilities.--The boats are to be tested for a depth of 60 meters (197 feet) of water, but will be able to dive to a depth of 100 meters (328 feet) in case of emergency.

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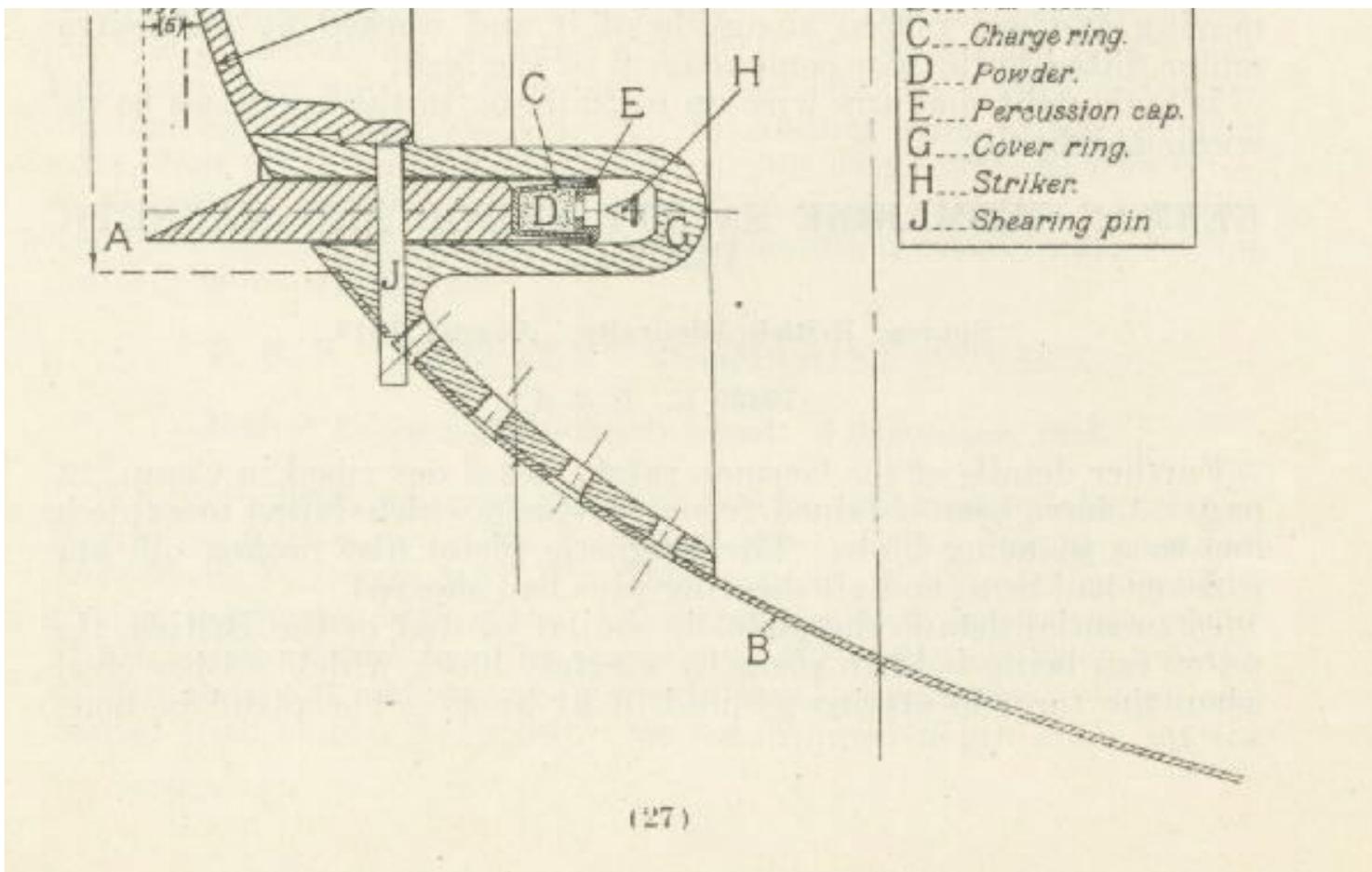


Image of "fiume explosive net cutter."

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Engines.--Two sets of M. A. N. 6-cylinder, 4-cycle, air-injection, reversible Diesel engines, each of 1,200 B. H. P. at 450 revolutions per minute.

Evaporators.--Electric evaporators are fitted as in the cruiser submarines.

Speed.--Surface, 12 to 13 knots; submerged, 7 to 8 knots for one hour.

GERMAN TORPEDO RANGE AND SPEED TABLE.

Source: British Admiralty. August, 1918.

10406 L. U-4-A.

The following range and speed table is given for convenient reference, and is believed to be approximately correct:

Torpedo.	Range.	Speed.
	Yards.	Knots.

H/8	8,750	40
	19,685	27-28
G/7	5,800	35
	11,250	28 1/2
G/6 A. V	2,200	40
	5,500	27
K. III	1,300	32

GERMAN SUBMARINE NET-CUTTING DEVICE.

Source: British Admiralty. August, 1918.

10406 L. U-4-A.

It is believed that the Germans are experimenting with a new form of net cutter for use on submarines. Instead of the present rigid, saw-edged cutter, the new apparatus will consist of one fixed saw, one moving and one placed alongside of it and worked by an electric motor fitted in the bow compartment of the boat.

It is thought that any wire up to 20 m. m. in thickness can be cut without difficulty.

GERMAN SUBMARINE SAFETY PISTOL AND MAGNETIC PISTOL.

Source: British Admiralty. August, 1918.

10406 L. U-4-A.

Further details of the German safety pistol described in Comp. 12, page 63, have been obtained from a torpedo which failed to explode due to a glancing blow. The magnetic pistol had broken off, one whisker had bent, and all shearing pins had sheared.

In essential details the pistol is similar to that of the British, the water fan being held in place by a safety block which washes clear when the torpedo attains a speed of 21 knots. The pistol becomes

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fully dangerous at 220 yards, which distance is considered the minimum attacking range for submarines. On impact the striker is driven into the detonator.

The German magnetic pistol can be attached and used with this type of safety pistol. Four pairs of shearing pins and two safety pins are fitted.

The magnetic pistol is said to be quite efficient on impact at an angle, as the attachment rods bend and the whiskers come into play.

BRITISH SUBMARINE VS. GERMAN SUBMARINE.

Source: British report. 1 August, 1918.

9451 N. F-6-G.

The following report of H. M. submarine *E-35* is of interest, due to the tactics used by this submarine in using the trough of the sea in creeping up on the enemy unobserved.

On 11th of May, at 4 p. m., H. M. submarine *E-35* while on patrol, sighted a long low-lying object, distant 2 to 3 miles in her port beam. She altered her course to investigate. Owing to increased speed and a heavy sea on the port quarter, she had to dive to 40 feet. On coming up to 26 feet at 4.18 p. m., she saw that the object was a large enemy submarine heading north at slow speed. *E-35* altered course to cut her off, and dived to 40 feet, coming up at 4.42 p. m. to periscope depth. By this time the enemy's range was 1,800 yards dead ahead. *E-35* followed in the trough of the sea, keeping periscope depth until 5.20 p. m., when she dived to increase speed. She gradually gained on the enemy, observing her through the periscope at 5.35 p. m. and 5.53 p. m. and at intervals till 6.17 p. m., when it was seen that she had turned and was heading down *E-35*'s starboard side at about 250 yards range. At 6.16 p. m. the starboard beam tube was fired, in the hope that the torpedo would hit while picking up its depth. It missed, however, and on *E-35* raising her periscope at 6.22 p. m., the enemy was bearing 45° on the port bow. *E-35* maintained her course, gradually overtaking her, and at 6.25 p. m., fired both bow tubes. Both torpedoes hit. All that could be seen after the results of the explosions cleared away was a quickly expanding patch of comparative calm, floating on which were survivors and wreckage. At 6.28 p. m. *E-35* came to the surface to pick up the former. Another submarine was then sighted 2 1/2 miles away. She, therefore, dived to attack, but nothing more transpired.

U. S. S. "CHESTER" SUBMARINE ATTACK.

Source: Commanding officer's report. 5 September, 1918.

Weather: Dark, no moon, passing clouds, with rain squalls. Time: Beginning 1.04 a. m. G. M. T., 5 September, 1918. Initial position Lat. 49-12 N. Long., 5-37 W. Ship's speed, 18 knots; zigzag "A"; towing paravanes both sides. Officer of the deck sighted submarine awash, close aboard, heading slightly on the starboard bow. *Chester* immediately put rudder hard right to ram. Submarine avoided and turned with rudder hard left. *Chester* dropped depth bomb set for

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150 feet; then sighting submarine hard on port bow, *Chester* shifted rudder hard left and dropped second and third depth bombs set for 150 feet. The submarine then appeared to fire a torpedo from very short range, which passed down the port side of the ship, merging with the paravane wake. Submarine submerged quickly. *Chester* passed over submarine wake and dropped fourth depth bomb set at 150 feet close to the submarine. Men on general quarters stations aft report that when this depth bomb was dropped the phosphorescence caused by the submarine submerging was plainly visible and very close aboard, moving slowly. With the disappearance of the submarine wake the *Chester* took up her course. Upon subsequent examination it was found that the port paravane had been damaged, apparently from a very heavy blow.

Commanding officer of the United States naval force operating in European waters put the following endorsement upon the report:

1. It is unknown whether the submarine in question was slightly injured or not by striking the paravane of the *Chester*, as it continued to operate, though in a different area.
2. It is not probable that any injuries were sustained from the depth charges released, as they were set for 150 feet, while the submarine was practically on the surface.

GERMAN SUBMARINE ENCOUNTER WITH H. M. S. "MEDEA."

Source: British report. 1 August, 1918.

9451 N. F-6-G.

On 6 July H. M. S. *Medea* sighted a submarine on the port beam distant 1,500 yards and silhouetted against the afterglow. Apparently the submarine did not see the *Medea*, whose background was a fog bank, until she was but 1,000 yards away. She started to dive, so fire was opened from the forecastle gun. The submarine disappeared when about 600 yards distant. Depth charge attacks were carried out, and three men were reported to have been seen in the water. After the fifth charge had been dropped much oil came to the surface. Nothing further was observed.

GERMAN SUBMARINE SUNK BY H. M. S. "GARRY."

Source: British Admiralty. 15 August, 1918.

9451 N. F-6-G.

On July 19 a ship in convoy notified the H. M. S. *Garry* that a submarine was sighted. The *Garry* immediately proceeded full speed toward the spot and dropped two depth charges. Shortly after the bow of the submarine broke surface about four points to port and about 300 yards away. *Garry* put her rudder hard-a-port, proceeded full speed for the enemy, and opened fire, with each round hitting. The submarine was rammed at right angles, *Garry* passing directly over her. Half a minute later she again broke surface. *Garry* swung around--the forward 12-pounder and port

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waist gun meanwhile firing and hitting--and rammed her again, tearing up her upper works. Thereupon she heeled over and sank. *Garry* sustained considerable damage, but by effective shoring up of decks and bulkheads made harbor.

GERMAN SUBMARINE EXPLOSION.

Source: British commander in chief, Mediterranean. 27 September, 1918.

9884 E. U-1-J.

A squadron of French destroyers attacked an enemy submarine after she had sunk the S. S. *Belbank* off Marseille on 7th September. Twenty depth charges were dropped, 19 of which exploded, causing bubbles of oil about 2 meters in diameter to rise to the surface. Ten minutes later a violent underwater explosion threw the

entire personnel of one chaser into the water, damaging the chaser herself so badly that she had to be towed home. Though nothing came to the surface it appears very possible that the submarine may have been destroyed, as no further activity of this submarine has been reported since this date. She was presumably the U. C. 67.

GERMAN OFFICER LECTURES TO ENLISTED PERSONNEL.

Source: British Admiralty. 15 August, 1918.

9417 I. U-2-C, page 9.

Throughout the entire war it seems that the Germans have made a thorough practice of addresses and short talks by the officers for the benefit of the enlisted men. Such topics have been dwelt upon as the "Success of the submarine war," "The wrecking of London by aircraft," and "The glorious virtues of the German Army." The objects of these talks are several.

- (a) They furnish means of carrying on propaganda to stimulate the morale of the men and arouse interest.
- (b) They provide amusement for the men in emergency and during periods of forced inactivity.
- (c) They keep the officers in closer touch with the men:
- (d) They provide opportunity to better the general education of the men and instruct them in the new developments and devices of the war.

FLOATING FUEL OIL: DANGER OF IGNITION.

Source: Admiralty weekly orders. 5 September, 1918.

The British Admiralty has called the attention of officers to the danger caused by throwing hot rivets or ashes overboard by a ship under repair. Such action recently caused a fire at a British naval base on account of oil fuel floating below and being ignited by the hot material. The results of such carelessness might be very serious, and steps should be taken to avoid it.

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DATA FOR DEPTH-CHARGE DROPPING.

Source: British admiralty. September, 1918.

10261 B. U-3-C.

TABLE A.-Distance (in yards) that submarine is ahead of (1) oil, (2) air, bubbles of wake.														
Depth of sub-marine in fathoms	Depth of sub-marine in feet.		Submarine's speed (or tide) in knots.											
			.5	9	8	7	6	5	4	3	2.5	2	1.5	1
10	60	Oil	28	56	84	112	140	168	224	280	336	392	448	504
		Air	11	22	33	44	55	66	88	110	132	154	176	198

15	90	Oil	42	84	126	168	210	252	336	420	504	588	672	756
		Air	17	33	50	66	83	99	132	165	198	231	264	297
20	120	Oil	56	112	168	224	280	336	448	560	672	784	896	1,008
		Air	22	44	66	88	110	132	176	220	264	308	352	396
25	150	Oil	70	140	210	280	350	420	560	700	840	980	1,120	1,260
		Air	28	55	83	110	138	165	220	275	330	385	440	495
30	180	Oil	84	168	252	336	420	504	672	840	1,008	1,176	1,344	1,712
		Air	33	66	99	132	165	198	264	330	396	462	528	594
35	210	Oil	98	196	294	392	490	588	784	980	1,176	1,372	1,568	1,764
		Air	39	77	116	164	193	231	308	385	462	539	616	693
40	240	Oil	112	224	336	448	560	672	896	1,120	1,344	1,568	1,792	2,016
		Air	44	88	132	176	220	264	352	440	528	616	704	792
45	270	Oil	126	252	378	504	630	756	1,008	1,260	1,512	1,764	2,016	2,268
		Air	50	99	149	198	248	297	396	495	594	693	792	891
50	300	Oil	140	280	420	560	700	840	1,120	1,400	1,680	1,960	2,240	2,520
		Air	55	110	165	220	275	330	440	550	660	770	880	990
55	330	Oil	154	308	462	616	770	924	1,232	1,540	1,848	2,156	2,464	2,572
		Air	61	121	182	242	305	363	484	605	726	847	958	1,089
60	360	Oil	168	336	504	672	840	1,008	1,344	1,680	2,016	2,352	2,688	3,024
		Air	66	132	198	264	330	396	528	660	792	924	1,056	1,188

Estimate the enemy's depth and speed (or tide) and ascertain from the table the distance (in yards) the submarine is away from the oil or air bubbles of his wake.

In the case of air bubbles the size of a small melon, halve the distance given in air table.

In the case of air bubbles the size of a large orange, reduce by one-quarter the distance given in air table

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TABLE B.--Speed of destroyer, 20 knots (distance in yards).

Time.	Submarine's speed, in knots.								
	1	2	3	4	5	6	7	8	9
m. s.									
10	107	102	96	90	85	79	73	68	62
20	214	203	192	180	170	157	145	134	123

	30	321	304	287	270	253	236	219	202	185
	40	428	405	382	360	338	315	292	270	248
	50	535	506	477	450	422	394	366	338	310
1	00	641	607	573	540	506	472	438	404	370
	10	749	709	669	630	591	551	510	470	430
	20	855	810	765	720	675	630	585	540	495
	30	962	911	861	810	759	709	659	609	559
	40	1,069	1,012	957	900	845	787	731	675	619
	50	1,176	1,114	1,053	990	928	866	804	742	680
2	00	1,282	1,215	1,149	1,080	1,012	945	877	800	741
	10	1,390	1,316	1,245	1,170	1,097	1,024	951	878	805
	20	1,496	1,417	1,339	1,260	1,181	1,102	1,023	944	865
	30	1,604	1,519	1,435	1,350	1,266	1,181	1,096	1,011	926
	40	1,710	1,620	1,530	1,440	1,349	1,259	1,169	1,079	989
	50	1,817	1,721	1,625	1,530	1,454	1,338	1,242	1,146	1,050
3	00	1,924	1,822	1,720	1,620	1,518	1,416	1,314	1,212	1,110
	10	2,031	1,924	1,817	1,710	1,603	1,496	1,289	1,182	1,075
	20	2,138	2,024	1,912	1,800	1,687	1,574	1,461	1,348	1,235
	30	2,245	2,126	2,009	1,890	1,771	1,652	1,533	1,414	1,295
	40	2,351	2,227	2,104	1,980	1,855	1,731	1,607	1,483	1,359
	50	2,459	2,328	2,200	2,070	1,940	1,810	1,680	1,550	1,420
4	00	2,565	2,429	2,295	2,160	2,024	1,888	1,752	1,616	1,480
	10	2,672	2,531	2,391	2,250	2,109	1,968	1,827	1,686	1,545
	20	2,779	2,632	2,487	2,340	2,193	2,046	1,899	1,752	1,605
	30	2,886	2,734	2,583	2,430	2,278	2,126	1,974	1,822	1,670
	40	2,992	2,834	2,678	2,520	2,362	2,204	2,046	1,888	1,730
	50	3,100	2,936	2,773	2,610	2,446	2,282	2,118	1,954	1,790
5	00	3,206	3,037	2,869	2,700	2,530	2,360	2,190	2,020	1,850
	10	3,313	3,139	2,965	2,790	2,615	2,440	2,265	2,090	1,915
	20	3,420	3,240	3,060	2,880	2,699	2,519	2,339	2,159	1,979
	30	3,527	3,341	3,155	2,970	2,784	2,598	2,412	2,226	2,040
	40	3,634	3,442	3,250	3,060	2,868	2,676	2,484	2,292	2,100
	50	3,741	3,543	3,346	3,150	2,952	2,755	2,568	2,371	2,174
6	00	3,847	3,644	3,442	3,240	3,047	2,844	2,641	2,438	2,235
Difference in speed.		19	18	17	16	15	14	13	12	11

To be used in conjunction with Table A. Enter this table with the submarine's assumed speed and the distance (in yards) obtained from Table A. The left-hand column will then give the time required to over-take the submarine.

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TABLE C.--Distance that can be traveled by submarine (in yards).

Time.		Speed of submarine, in knots.								
		1	2	3	4	5	6	7	8	9
m.	s.									
	10	6	11	17	23	28	34	39	45	51
	20	11	23	34	45	56	68	79	90	101
	30	17	34	51	68	85	101	118	135	152
	40	22	45	68	90	113	131	158	180	203
	50	28	57	85	113	141	169	197	225	254
1	00	34	68	101	135	169	203	237	270	304
	10	39	79	118	158	197	237	276	315	355
	20	45	90	135	180	225	270	315	360	405
	30	51	102	152	203	254	304	355	415	456
	40	56	113	169	225	282	338	394	460	507
	50	62	124	186	248	310	372	434	505	558
2	00	68	135	203	270	338	405	473	540	608
	10	73	147	220	293	366	439	512	585	659
	20	79	158	236	315	394	473	552	630	709
	30	84	169	253	338	422	507	591	675	760
	40	90	180	270	360	451	541	631	720	811
	50	96	192	287	383	479	574	670	763	862
3	00	101	203	304	405	507	608	709	810	912
	10	107	214	321	428	535	642	749	855	963
	20	112	226	338	450	563	676	788	900	1,014
	30	118	237	355	473	592	710	828	945	1,064
	40	124	248	372	495	620	743	867	990	1,115
	50	129	260	389	518	648	777	906	1,035	1,166
4	00	135	270	405	540	676	811	946	1,081	1,216
	10	141	282	422	563	704	845	985	1,126	1,267
	20	146	293	439	585	732	878	1,025	1,171	1,317

	30	152	304	456	608	760	912	1,064	1,216	1,368
	40	158	316	473	630	788	946	1,104	1,261	1,419
	50	163	327	490	653	817	980	1,143	1,306	1,470
5	00	169	338	507	675	845	1,014	1,183	1,351	1,520
	10	175	349	523	698	873	1,047	1,222	1,396	1,571
	20	180	361	540	720	910	1,081	1,261	1,441	1,621
	30	186	372	557	743	929	1,115	1,301	1,486	1,672
	40	191	383	574	765	957	1,149	1,340	1,531	1,723
	50	197	395	591	788	986	1,183	1,380	1,576	1,774
6	00	203	406	608	810	1,013	1,216	1,419	1,621	1,824

This data supersedes notes on pages 11-13, compilation 12, 1918 (15 Sept.).

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LOOKOUT INSTRUCTIONS:

Source: U. S. S. "Nashville." September, 1918.

1. The safety of the ship and the convoy depends, almost entirely, on the efficiency of the lookouts.
2. This should be constantly borne in mind by the officers and petty officers of the watch, and continually impressed on the lookouts.
3. The enemy will be sure to take advantage of the slightest let-up in our vigilance. " Eternal vigilance is the price of safety " at sea more so in these days of an active submarine enemy than ever before.
4. In order that the officer of the deck may act quickly in case of emergency it is vital that he receive prompt and accurate information of all objects sighted.
5. In order to get this information to the officer of the deck the following forms of reporting objects will be used by the lookouts:

First.--The object sighted. Such as "periscope," "submarine," "sail," "porpoise," etc. Avoid the use of such expressions as "object" or "dark object." If, however, you can not distinguish what it is, so report it. The main idea is to give information to the officer of the deck quickly.

Second.--The bearing of the object sighted. This bearing must be given in degrees from zero ahead, around to the right, to 360°. Thus 90° would be reported as "nine, oh"; 125° as "one, two, five"; 310° as "three, one, oh."

Third.--The approximate distance from the ship. For this purpose we will consider the ship as in the center of a circle, of which the horizon is the circumference. An object sighted on the horizon would be reported as "horizon"; an object halfway to the horizon would be reported as "one half "; an object between halfway and the horizon would be "three-quarters"; and one halfway between the ship and "one-half " would be "one-quarter."

An object very close to the ship would be reported as "close aboard."

Examples.-(1), Suppose -a sail is sighted, bearing 35° and on the horizon. Lookout reports, "*Sail; three, five; horizon.*"

(2) Suppose a porpoise is seen, bearing 320° close aboard. Look-out reports, "*Porpoise; three, two, oh; close aboard.*"

(3) Suppose a periscope is seen, bearing 95° about halfway between the ship and the horizon. Lookout reports, "*Periscope; nine, five; one-half.*"

6. These instructions will be carefully explained to all deck divisions and to all petty officers and men of other divisions standing look-out watches.

Note.--In regard to the instruction of lookouts concerning the names of the various objects that might be sighted it would seem that this point is very important. It is believed that very often delay and confusion have resulted from the lack of a thorough knowledge on the part of the lookouts, and particularly in the case of new men, of phraseology such as "close aboard," "horizon;" and "oil slick."

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UNITED STATES DESTROYERS' OPERATING RECORDS.

Source: Summary of operations, Destroyer Flotilla. 26 August, 1918.

10428. U-4-A.

The records given below are taken from the summary of operations of the destroyer flotilla operating in European waters during the period of the three months, April, May, and June.

The record for distance steamed is held by the *Caldwell*, 21,231.6 miles during the period of three months: The *Caldwell* also takes the honors for hours under way and days at sea. During this period the *Caldwell* was under way 1,319.4 hours while 55 days at sea. The *Beale* steamed 20,384.1 miles and takes second place with 1,276.4 hours under way, 53.2 days at sea. The *Allen* is a close third with 19,054.4 miles steamed to her credit, 1,261.7 hours under way, and 52.6 days at sea.

The *Cummings* holds the record for submarines attacked during this period. It participated in eight submarine attacks by depth charges. The *Davis* and the *Allen* come second, each with six submarine attacks by depth charges and one by gun fire.

The *Rowan* escorted nine troop convoys and the *Winslow* eight.

The *McCall* escorted 11 merchant convoys, and the *Davis* and the *Jenkins* each nine.

UNITED STATES DEPTH-CHARGE ALLOWANCES.

Source: Information Bulletin No. 213, United States naval forces, European waters. 26 September, 1918.

Upon the recommendation of a special planning committee, the chief of naval operations has approved the

following depth-charge installations for different types of vessels:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Antisub offensive:								
Destroyers	50	2	2	2	--	Yes	Yes	4
Eagles	24	1	--	2	--	Yes	Yes	
Chasers 110	12	1	--	--	2	No	--	
Yachts	8-12	1	--	1	--	No	--	
Escort vessels:								
Armed cruisers	24	1	--	2	--	No	--	
Cruisers	24	1	--	2	--	No	--	
Gunboats	12-24	1	--	1-2	--	No	--	
Yachts	12-24	1	--	1-2	--	No	--	
Transports	4	--	--	--	1	No	--	
N. O. T. S.	4	--	--	--	1	No	--	
(1) Allowance of depth charges, 300 pounds. (2) Y-guns. (3) Projectors, single barrel. (4) Depth charge tracks, standard heavy.				(5) Depth charge tracks, standard light. (6) Bridge control for depth charge release gear. (7) Bridge firing gear for Y-guns. (8) Allowance for depth charges, 600 pounds.				

Of 56 cases in which enemy submarines were in contact with allied convoys under escort, from October, 1917, to July, 1918, the following analysis is of interest:

- (a) Three possible attacks were averted by escort vessels sighting the submarine, two during daylight and one during moonlight.
- (b) In one case the periscope was sighted and attacked, and in another the wake of the torpedo was sighted and vessels maneuvered to avoid it.

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Of the remaining 51 attacks, in all but one of which one or more torpedoes were fired, the following analysis is made:

- (a) In 37 cases the submarine was inside the screen of escort vessels, or close to a convoy where a gap occurred in the screen.
- (b) In 10 cases the attack was made from outside the escorting screen, and in four cases the position of the submarine was unknown.
- (c) Eighteen attacks were made between the convoy columns; and of these 8 were made against convoys while zigzagging, while 6 of the 18 were made by submarines on the surface at night.
- (d) Of 48 ships hit or sunk, 36 occupied positions as leaders of columns.

- (e) Thirty-five attacks were made from abeam or forward of the beam, and 16 abaft the abeam. An increasing tendency is noted for quarter shots.
- (f) Of 19 attacks during 1917, 16 were from a position abeam or forward of the beam, 2 abaft the beam, and 1 unknown.
- (g) During 1918, of 32 attacks, 19 were abeam or forward of the beam, and 14 abaft the beam.
- (h) Of 51 attacks, in only two cases was the submarine sighted before the torpedo hit. In one of these the periscope was sighted by day, and in the other by night.
- (i) Of the 51 attacks, 41 were by day and 10 by night, and of the latter 3 during moonlight.

On the average, all attacks were delivered close to the ships attacked, the distance averaging from 300 to 500 yards, 27 attacks were made against eastbound convoys and 24 against west bound ones.

RECOGNITION SIGNALS BETWEEN UNITED STATES SUB-CHASERS.

Source: Extracts of war diary, U. S. S. "Leonidas." 22 August, 1918.

The question of recognition signals between chasers and barrage vessels is, like communication with all other ships in the war zone, of vital importance. Frequent occasions arise where the challenge is not answered promptly with the result that friendly vessels may fire on one another with disastrous results. It is vitally important to have soiree system of answering a challenge immediately always on hand. In the case of a vessel not having a storage battery and where some time may elapse before dynamos can be started, a bull's eye or Aldis lights must be kept at hand for prompt use.

HYDROPHONES IN UNITED STATES SUB CHASERS.

Source: Sub chaser "Hunt No. 17." 21 October, 1918.

A demonstration of the use of the "C" tube has been given by a listener named Ross on the *151*. This man picked out and definitely stated that a convoy was approaching on a certain bearing. There was nothing in sight at the time in the direction given. One-half hour later smoke was sighted and two steamers escorted by two destroyers came into view. The convoy must have been picked up at a distance of at least 25 miles.

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COMMUNICATIONS BETWEEN UNITED STATES SUB-CHASERS.

Source: Sub-chaser detachment one. 15 September, 1918.

Radio communication was recently maintained between sub chasers at a distance of over 100 miles. This compares very favorably with the ordinary effective radius which ranges around 50 miles, and when conditions are poor not more than 30 miles.

UNITED STATES SUB CHASER HYDROPHONE TACTICS.

Source: Sub-chaser detachment one. 9 September, 1918.

1. At 4.30 p. m., while on patrol, suspicious sounds were reported by listeners on two boats and an excellent fix obtained at 70° magnetic, distance 1,000 yards. A moment later a large whale broke the surface at this position.

The unit was about to proceed on running hunt when listeners on sub-chaser 86 reported a new suspicious sound bearing 220° magnetic. Further bearings, runs, and fixes ended as follows

2. " Stopped; heard nothing. Returned and rebombed position. Two large whales came to the surface in bombed area, remained about 15 minutes and then dove. Strange tapping sound heard on tube from two sources. It had a regular beat and was perfectly flat and nonmetallic. Assumed drifting hunt in position during night without further contact."
3. The chase was slowed up considerably by interference from destroyers bearing about 45°, which explains the long time between runs.
4. At times during the chase, the whales first picked up at 4.30 were seen in directions different from those of the sound we were tracking. There was no evidence of these particular whales until our depth charges brought them to the surface.
5. The chase is an excellent example of the complications which the difference of opinion among listeners may raise. The listeners on sub-chaser 84 were very sure that the sound heard was that of a damaged submarine or one running very slowly, and they held to this opinion in spite of the fact that they had been fooled by whales less than one hour previous.

The listeners on sub chaser 86 considered the sound to come from whales at all times during the chase and never conceded the presence of a submarine. All of the listeners have heard submarines both in training and in actual contact with the enemy. The sound heard is described as similar to that made by a trawler or other very slow-moving propeller ending in a sort of a wheeze.

6. The attack was made in accordance with doctrine, except that only two depth charges were dropped, this being done in view of the differences in opinion among listeners and with the idea of discovering what was making the sound. Had there been a submarine present there is every reason to believe that we would have regained sound contact. It is, therefore concluded that the sound was made by the whales.

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Conclusions.--(a) That the sound made by whales is very similar to that made by a submarine, and that care must be taken by commanding officers and listeners not to mistake the sound made by whales for a submarine.

(b) That complications arise when a good fix is obtained, when nothing is in sight, and there is no evidence of either submarine or fish. When this occurs there are three probable ways of treating the matter:

- (1) Assume that the sound is a submarine. It will then be necessary to chase and attack according to doctrine, and this will require the expenditure of a large number of depth charges and may result in wastage. If this assumption is to be made, all boats must be supplied with many more depth charges.
- (2) Act upon the opinion of the listeners regarding the source of the sound. This would give rise to complications, owing to differences of opinion which might occur from the similarity of sounds. It is not thought that the listeners at the present time have sufficient experience with submarines to give an opinion sufficiently reliable to risk losing the enemy if he really is there.
- (3) To assume neither one thing or the other and to drop a light barrage on the assumption that if the sound is

made by a submarine either oil will be brought to the surface or sound contact regained after the attack. Then if the sound is not made by a submarine the fish may be brought to the surface.

This was the assumption made in the attack in question.

(c) That when only two boats are operating in a unit, the unit leader ought to lay courses to straddle the probable position of the sound both during the chase and the attack. It will be noted from a study of this particular chase that the flag boat followed a direct course to the probable position as if there had been three boats in the unit, and that better results would have been obtained if courses had been laid so as to straddle the position.

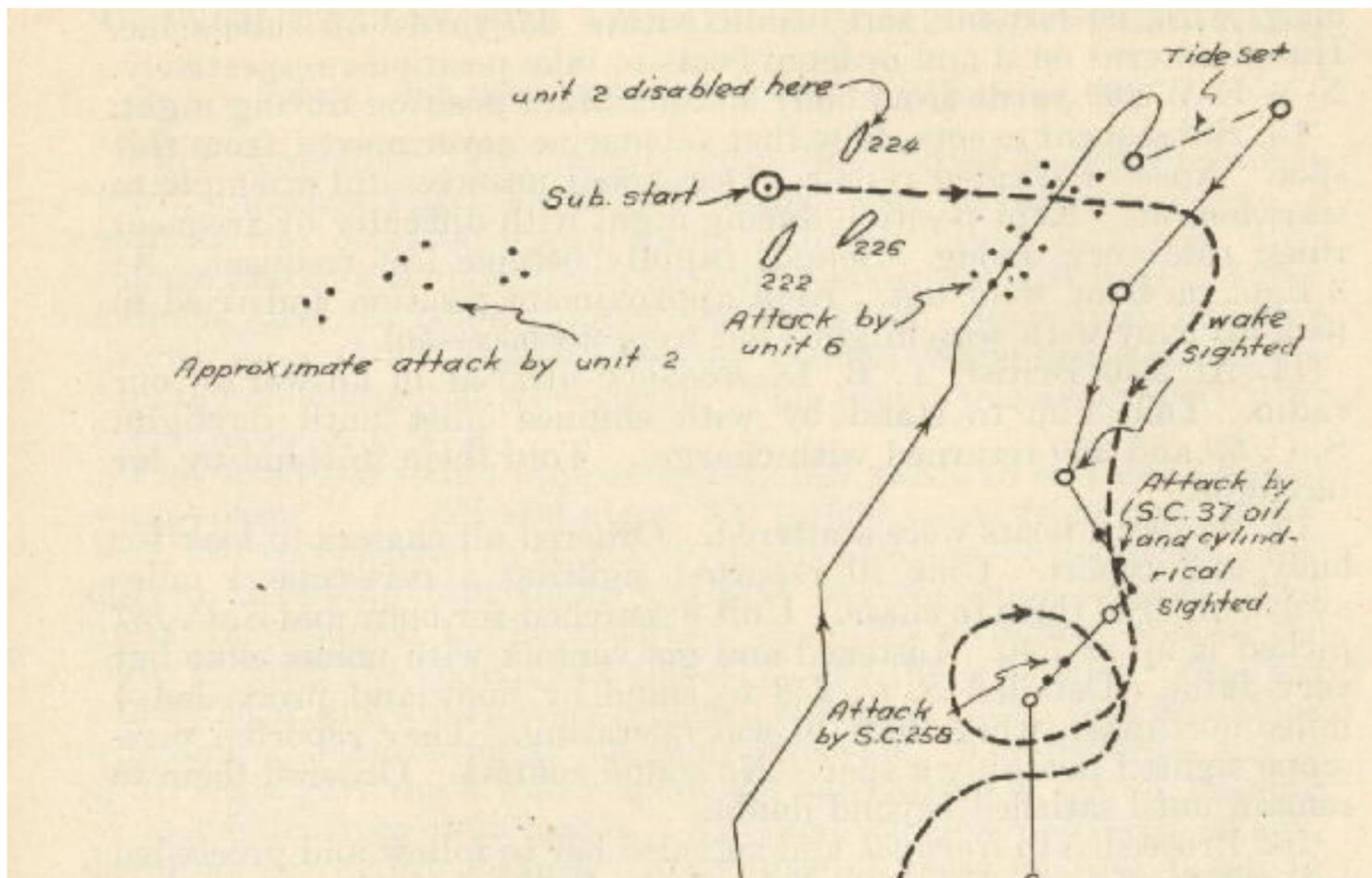
REPORT OF ENGAGEMENT OF HUNT NO. 13, SUB CHASER DETACHMENT ONE.

Source: Commander Unit 6. 6 September, 1918.

1. On the morning of September 6, units 6, 2, and 10 were proceeding on course 220 in line-abreast formation, using schedule " B " running hunt.
 2. At 11.30, steamer 2 miles ahead began acting queerly, steering a erratic course, finally reversing 180 degrees and heading for land. All units stopped to listen. Listeners in center unit 2 and left wing unit 6 heard suspicious sound. Unit 2 carrying designated hunt commander was ordered to attack. On carrying out attack flagship of unit 2 was damaged by depth charge and could not get under way. Meanwhile unit 6 kept in contact with submarine; requested unit 2 to get clear, reporting cuts very close to where they were laying. At this point Lieut. Johnson turned over command of hunt to me, reporting unit 2 for base.
 3. Unit 6 ran various short courses nearer submarine, meanwhile group was maneuvered into line-abreast formation, attacking dis-
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- tance. Ordered unit 10, which was approaching from the northeast, to stop about three-quarters of a mile away in order to cause no sound interference.
4. At 1.25 o'clock unit 6 fixed submarine directly ahead distance 100 yards. Immediately carried out barrage three-boat attack, course 55 magnetic, each boat letting go three stern charges and Y-gun. Pattern laid symmetrically, thoroughly covering any possible maneuver of the submarine. Stopped and listened; no hearing for about 20 minutes, then got contact. Distinct sound of submarine starting, making noise as if shafts were badly bent, also giving out squeaking sound. Submarine sounded as if having great difficulty in keeping propeller going. She stopped frequently. Followed submarine.
 5. At 2.30 saw pronounced wake appear. Bearings corresponded. Immediately ordered boats to keep clear and made single boat attack up wake with flagship S. C. 137. Dropped three charges out at end of wake and two ahead. Must have been on top of submarine; charges all set at 100 feet. Oil appeared in small quantities. Examined by engineer force of S. C. 41 while S. C. 137 was rounding to from attack. They pronounced it crude oil. Heard submarine hammering, squeaking, straining, running intermittently, apparently with great difficulty and for short periods.
 6. The second depth charge of this attack threw into the air a cylindrical black object 50 to 60 feet; about the size of a depth charge. Seen by commanding officer and others on S. C. 41 and several men on S. C. 137.

7. Wake again appeared 200 yards away. Ordered S. C. 258 to attack. No further result. Wake continued up sun's rays. Followed closely; ordered unit 10 to follow unit 6 and be prepared to attack. Unit 6 all out of depth charges except three on S. C. 41.
8. At 3.23 had wake under 137; gave unit 10 fix based on direction and speed of wake and ordered them to attack. Unit 6 full speed to get clear. Attack carried out. Submarine had been gradually making shorter turns for some time. Appeared as though rudder damaged in first single boat attack by S. C. 137.
9. From this point on believe submarine bottomed and was never able to move except perhaps to start and scrape along bottom short distance. Noises indicated this.
10. During next listening stop all boats drifted from point of first attack. Sent S. C. 41 and 258 toward fix 400 yards ahead where submarine was heard trying to start. S. C. 41 upon arrival at spot positively heard electric motors start 50 yards on starboard beam and pass under him. Wake also started and passed under. Submarine made about 75 yards and then stopped. Ordered S. C. 41 to attack with remaining charges. Did not explode, setting too deep, 150 instead of 100 feet as prescribed. Immediately ordered S. C. 99 to attack. Attack carried out.
11. Got fix again and ordered S. C. 260 to attack. She did so at fix given.
12. At 6.15 sent S. C. 99 and S. C. 260 in for charges. Sent radio to base for destroyer. Kept S. C. 322 with unit 6, saving her charges for emergency, and prepared to keep in contact with submarine until charges arrived or until she came to the surface. Dropped water

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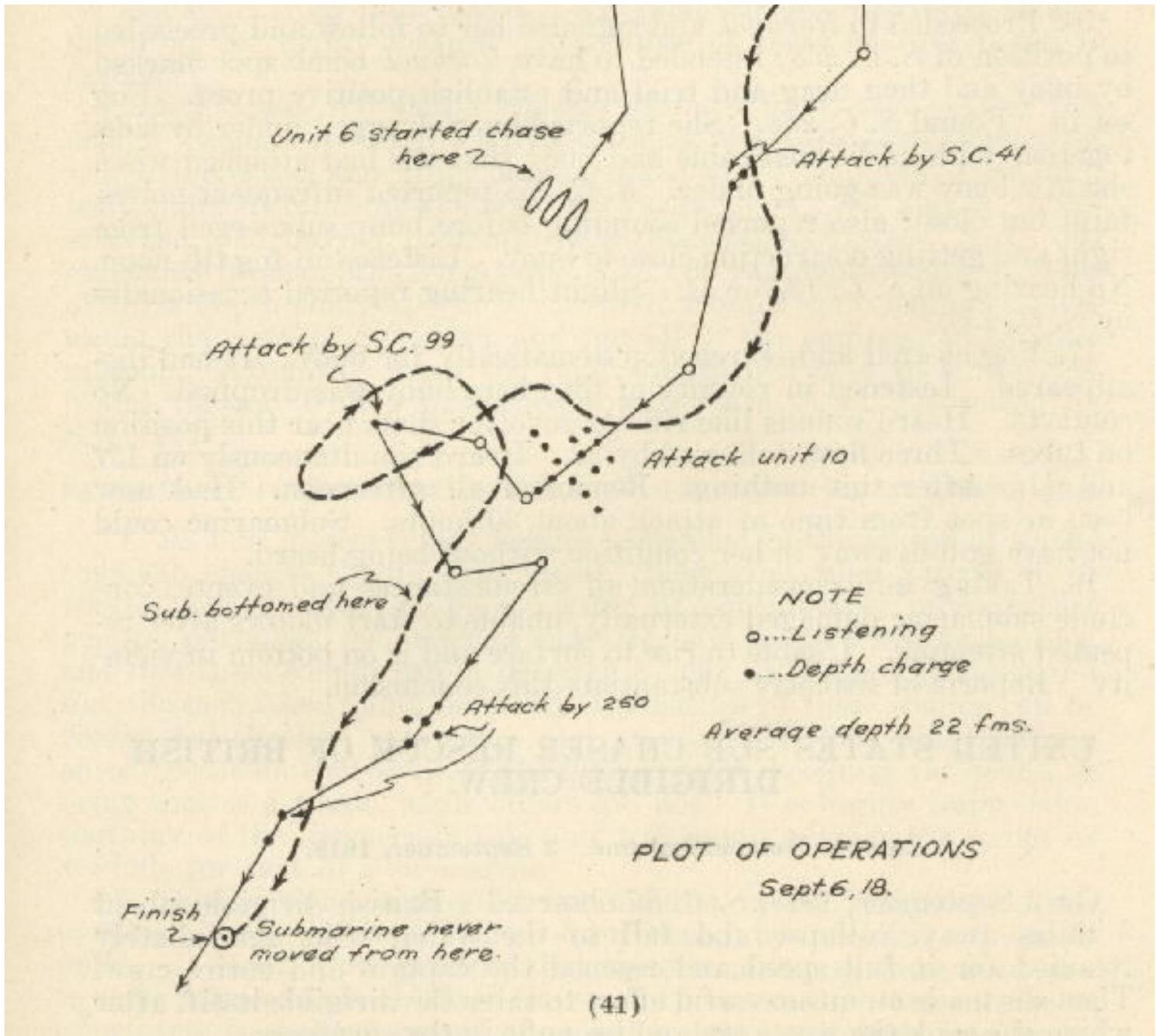


Image of chart: Plot of Operations, Sept. 6, [19]18.

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buoy with 50-fathom wire cable within 25 yards of submarine. Hung lanterns on it and ordered boats to take positions, respectively, N-S-E-W 200 yards from buoy and maintain position during night.

13. Subsequent events show that submarine never moved from this spot. Noises indicated repair. Occasional unsuccessful attempts to start motors. Kept position during night with difficulty by frequent runs; tide very strong. Sounds rapidly become less frequent. At 3 light on buoy went out. Kept approximate position and tried to pick up buoy with searchlights, but were unsuccessful.

14. At 3.50 British T. B. D. *Roebuck* arrived in answer to our radio. Told him to stand by with engines quiet until daylight. S. C. 99 and 260 returned with charges. Told them to stand by for daylight.

15. At dawn boats were scattered. Ordered all chasers to look for buoy and report. Unit 10 reported sighting a periscope 4 miles sway; ordered them to chase. Unit 6 searched for buoy and S. C. 137 picked it up at 7.40. Listened and got contact with noises close but very faint. Detailed S. C. 258 to stand by buoy and proceeded 4 miles northwest, where unit 10 was operating. The reported periscope sighted probably a spar. No sound contact. Ordered them to remain until satisfied beyond doubt.

16. Proceeded to *Roebuck* and signaled her to follow and proceeded to position of S. C. 258; intended to have *Roebuck* bomb spot marked by buoy and then drag and trial and establish positive proof. Fog set in. Found S. C. 258. She reported buoy dragged under by tide, together with additional cable and buoy that she had attached when she saw buoy was going under. S. C. 258 reported infrequent noises, faint but close; also reported sounding before buoy submerged from sight and getting obstruction close to buoy. Listened in fog till noon. No hearing on S. C. 137 or 41. Slight hearing reported occasionally by S. C. 258.

17. Fog cleared and searched systematically for buoy. It had disappeared. Listened in vicinity of fix where buoy was dropped. No contacts. Heard sounds like rifle or revolver shots near this position on tubes. Three first, followed by 22. Heard simultaneously on 137 and 41. After this nothing. Remained all afternoon. Had now been at spot from time of attack about 30 hours. Submarine could not have gotten away in her condition without being heard.

18. Taking into consideration all circumstances and events. Conclude submarine damaged externally, unable to start motors after repeated attempts. Unable to rise to surface and is on bottom in vicinity. Reports of listeners substantiate this conclusion.

UNITED STATES SUB CHASER RESCUE OF BRITISH DIRIGIBLE CREW.

Source: Detachment one. 3 September, 1918.

On 3 September, 1918, S. C. 85 observed a British dirigible; about 3 miles away, collapse and fall to the water. She immediately steamed for it full speed and rescued the captain and entire crew: Then she made an unsuccessful effort to salve the dirigible itself, after which she sank the wreckage and brought in the survivors.

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UNITED STATES SUB CHASER ATTACK ON SUBMARINE.

Source: Sub-chaser detachment one. 9 September, 1917.

On 6 September, 1918, units being in line abreast heading to south-ward, distance apart about 800 yards, with medium visibility, a steamer was observed ahead which suddenly began to zigzag, then change her course about 180°, heading back in toward land. A few minutes later all boats stopped for listening. Soon after stopping listener on S. C. 226 reported hearing a sound resembling a submarine running submerged at slow speed. This sound was also reported by wing chaser S. C. 224.

Plot fixed the sound approximately 300 yards to end eastward of wing chaser S. C. 224 and about 700 to 800 yards from unit leader. S. C. 224 was ordered to attack 300 yards away on 71 magnetic. She obeyed, dropping

four depth charges. At the same time front of units was changed to the eastward, S. C. 224 swinging over to the right to form the right flank and S. C. 351 the left flank. Stopped and listened, and all listeners reported a strange sound that resembled wheezing and knocking at irregular intervals. The fix from angles of all boats gave the distance about 400 yards from S. C. 226, bearing 83 magnetic from unit leader. All three chasers delivered attack, dropping lee depth charges. A number of these charges failed to explode.

United States sub chaser engines disabled by Y-gun.--After this attack listeners reported hearing a sound like a disabled submarine, which increased knocking, bearing fixed at 70 magnetic from unit leader and distance away about 200 yards. S. C. 351 and S. C. 226 attacked, 224 having no more depth charges on board. S. C. 351 expended three depth charges and S. C. 226 two depth charges. One of these depth charges, which was fired from Y-gun, exploded close under the stern of S. C. 226, and put all of her engines out of commission. After this event the hunt was turned over to Units Nos. 6 and 10, and Unit 2 proceeded toward base, S. C. 226 towed by S. C. 251.

EXTRACTS OF COMMENT BY COMMANDER SUB CHASER DETACHMENT ONE.

"1. At first glance it may be seen somewhat in the nature of a joke that sub chasers should drop depth charges on what proved to be whales, but it seems to be a matter of considerable interest that whales, porpoises, etc., make a characteristic sound when swimming, and that these sounds can be detected by our listening apparatus and the source tracked; and, doubtless, the nature of these sounds can be recognized through experience and training. It has been observed on one occasion that some of the listeners did recognize the sound as being that of a whale, while others did not. It is highly improbable that any of the listeners in this unit will again mistake the sound of a whale for that of a submarine.

"2. Several times in the last few months, in the Eddystone Ares, peculiar knocking sounds have been heard by various sub-chaser units. It seems quite possible that these sounds may have been due to some form of animal life in the sea. In any case, it seems the part of wisdom to make a record of as much data as possible that bears upon the sound detection of submarines."

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UNITED STATES HYDROPHONE ANALYSIS OF SUBMARINE SOUNDS.

Source: Hydrophone training officer, sub-chaser detachment one. 9 September, 1918.

Submarine chasers Nos. 224, 226, and 331 during a recent hunt were able, not only to maintain contact with the German submarine but analyze the different components of the sounds received, both before and after the depth-charge attack.

The general sound was put into graphic form and then broken up into curves of the component sounds.

The first component was estimated as a sharp noise, increasing and decreasing in intensity and frequency, with a high overtone noticeable. This sound was taken as indicating a faulty bearing.

The second component gave a low tone of constant intensity and pitch. A slight rhythm was perceptible. This sound indicated an electric motor.

The third component was estimated as a rapid succession of sounds increasing in pitch and in intensity. The

number of impulses heard was approximately 220. The sound might have been a pump or possibly a loose propeller blade.

After the attack was made the sounds received were intensified. The pitch was higher. It seemed as though the submarine was experiencing great difficulty in turning over its shafts. The sound was almost deafening.

One component that resembled impulse sounds heard before the attack, could be recognized with a change that may have been a propeller shaft out of line.

Still another component indicated a loud, deep thud.

The last and fourth component of the sound resembled metal concussions at close to one-second intervals.

The total reception was so loud that the approach of six chasers at full speed was not sufficient to draw the noise.

NOTE.--While the above remarks are of necessity theoretical, they indicate possibilities in the future development of hydrophones in submerged tactics.

THE SHELLING AND DESTRUCTION OF THE U. S. S. "TICONDEROGA."

The following is a brief résumé of the shelling and destruction of the U. S. S. *Ticonderoga* as obtained from statements of Ensign Gustav A. Ringleman, U. S. N. R. F., and Ensign C. J. Sanghove, U. S. N. R. F., survivors of the U. S. S. *Ticonderoga*:

G. A. B., Section C. 22 September, 1918.

According to the afore-mentioned survivors, the U. S. S. *Ticonderoga* left New York for France on September 22, 1918, with a general cargo consisting of railroad materials, automobiles, etc. There were also aboard about 125 soldiers in addition to the regular naval crew, making the total number aboard approximately 250 men.

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According to Ensign Ringleman, on the morning of September 30, 1918, about 2 a. m. (the date of the attack), he had lost sight of the convoy, and, according to calculations, at the time of the attack the *Ticonderoga* was from 12 to 14 miles astern of the convoy.

About 5.30 a. m. on the same morning, when in latitude 43° 05' N., longitude 38° W., Ringleman states he was on the bridge with the commanding officer, the navigating officer, and the junior officer of the watch, when he sighted an enemy submarine about 200 yards off the port bow, running on the surface. There was a fairly high sea running at the time, and the visibility was quite low, it being impossible to see more than 300 or 400 yards.

At the time the submarine was sighted the gun covers were on the forward and after guns owing to inclement and dirty weather.

The submarine at the time she was sighted was on a course at about right angles to that of the *Ticonderoga*, which was approximately east true.

When the submarine was sighted the general alarm was sounded and the forward gun was ordered to open fire on the submarine. At the same time the *Ticonderoga's* helm was ordered put full right and an attempt was made to ram the submarine. The attempt was almost successful, the *Ticonderoga* missing the submarine by about 25 to 30 feet.

Immediately thereafter and before the gun covers could be removed from the guns, the submarine fired on the *Ticonderoga*, the first shot striking the wheelhouse, putting the steering gear out of commission, severely injuring the commanding officer, killing the man at the wheel, carrying away the wheelhouse, and setting fire to the superstructure amidships.

After that the submarine steamed down to the starboard side of the *Ticonderoga* and fired several more shots at the 3-inch gun's crew at point-blank range of about 200 yards, killing the gun's crew and putting the gun out of commission.

The submarine then steamed off the starboard quarter of the *Ticonderoga*, gradually opening up a distance to about 8,000 yards, and shelling the ship in the meantime.

The *Ticonderoga* finally succeeded in bringing her after gun into action and started shelling the submarine, the first shot being fired at a range of about 4,000 yards.

By this time many of the soldiers and crew of the *Ticonderoga* had either been killed or injured by shell and shrapnel. The lifeboats, which were hanging on the davits, were shelled and full of holes, and others were carried away by shell and shrapnel fire.

About this time orders were passed to abandon ship, and attempts were made to clear away several of the lifeboats, but this was impossible to accomplish owing to the falls having been carried away and the running gear having been put out of commission by shell fire. Those boats which did succeed in clearing the side of the ship, with the exception of one, were swamped upon reaching the water because of injuries received during the action.

The occupants of those boats, both Naval and Army personnel, were as a result thrown into the water, and, according to Ensign Ringleman, were lost. The number which were lost is unknown to Ringleman.

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About this time the commanding officer, who had been severely wounded, abandoned the ship, together with about 18 or 19 soldiers, Ringleman and the after gun's crew remaining aboard to work the after gun, and Sanghove and several others also remaining aboard, assisting in working and fighting the ship.

According to Ensign Ringleman, he continued firing the after 6-inch gun until all but three of the members of the gun's crew were killed and the gun was put out of commission.

In the meantime Sanghove, at the request of the wounded on deck, who were clamoring for water, had gone below to start the fresh-water pump. While he was below, the submarine, after silencing the ship's gun, steamed within close proximity and fired a torpedo, which struck the ship in the vicinity of the engine room on the starboard side, pinning Sanghove between the companion ladder and bulkhead. He succeeded in extricating himself, made his way on deck, when orders were given by Ringleman to abandon ship.

Ringleman states that Sanghove, one or two others, and himself, before leaving the ship, secured five of the least

wounded of the crew of the *Ticonderoga*, placed them aboard the life raft (lashed them to same), and as the stern of the *Ticonderoga* was sliding into the water they succeeded in launching the raft. They were about 20 to 30 feet from the *Ticonderoga* when she went down.

Ringleman stated that while on the raft the submarine came along-side and took off the first assistant engineer, Lieut. Fulcher, and one of the officers aboard the submarine inquired if there were any other officers aboard the raft. Ensign Ringleman and Sanghove, not being in uniform, were not recognized as officers and were permitted to remain aboard the raft.

Ringleman was interrogated as follows by an officer aboard the submarine:

Question. Where is the captain?

Answer. He is dead.

Question. Where is the gunner?

Answer. I do not know.

Question. Why did you continue firing at us?

Answer. I told him I did not know.

Question. Where are you from and where are you bound?

Answer. I told him I did not know about those things, as only the officers knew.

Ensign Ringleman stated that while alongside the submarine he advised the German commanding officer that the men aboard the raft and in the lifeboat had been wounded and were badly in need of medical attention, and he there and then requested of the submarine commander that medical attention be given to the wounded. This request was flatly refused.

After being cast off by the submarine, moving pictures were taken from aboard the submarine of the *Ticonderoga* as she went down, and the life raft.

While on the raft, the lifeboat in which the commanding officer had abandoned the ship, drifted down upon them. He signaled the boat asking them to come alongside. The captain recognized Ringleman, hailed him, and inquired who were aboard. Upon receiving the reply that Mr. Sanghove and C. Q. M. Tappley were aboard, the captain ordered them into the boat. They left the raft

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and swam to the boat. A fairly heavy sea was running and a high wind, was blowing at the time and the boat and the raft were separated. Sail was made in the boat and an attempt was made to pick up the raft again but after three or four hours of maneuvering it was impossible and the attempt was finally abandoned. Ensign Ringleman stated that at no time was it possible to approach the raft nearer than 30 feet. That was the last time the raft or the men aboard were seen. They had no water, nothing to eat, and according to Ringleman were lost.

Ringleman stated that he then took charge of the boat and remained in charge, standing watch and watch with C. Q. M. Tappley for a period of four days, when they were picked up on October 4 by the British steamship *Moorish Prince*. They were aboard the *Moorish Prince* three days, and were transferred to the *Grampian*, and were landed in New York on October 10, 1918.

Ringleman also stated that after reaching the lifeboat in which was the commanding officer, two shots were fired within close range of the lifeboat but he could not state positively whether they were the result of direct shot intended for the lifeboat or just ricochet shots.

Only 24 survivors, including the executive officer and first assistant engineer, who were taken prisoners, succeeded in leaving the ship. Many of those who did leave were severely wounded.

It would appear that the following facts are established and deductions justified from the statements of the survivors.

1. That being from 12 to 14 miles astern the convoy, the *Ticonderoga*, became an easy victim for attack by the submarine. This shows the necessity and importance of vessels at all times maintaining their positions in convoy.
2. That the *Ticonderoga* had her gun covers on at the time of the attack. This demonstrates conclusively the necessity of at all times having the guns cleared and ready for action. Had the gun covers been off, it would have been an easy matter, when at such close range, by the proper maneuvering of the ship, to have effectively shelled the submarine. It would also appear that there was quite a delay in bringing the after 6-inch gun into action.
3. That the method of attack pursued by the submarine, and the use of shrapnel in the manner described would certainly tend to establish that the German submarine commander was actuated by revenge, as well as perhaps that he had other objects in mind other than the destruction of the ship and her cargo.
4. The fact is conclusively established, beyond any question of dispute, that medical assistance was requested in behalf of the injured and such assistance refused.
5. The submarine commander, notwithstanding his knowledge of the plight and condition of the men on the raft, in the lifeboat, and in the water, made no effort or attempt to rescue them or render any assistance.
6. While there is some evidence to the effect that the lifeboats were shelled, yet such evidence is not of such a positive character as to justify the conclusion that a deliberate attempt was made to shell and sink the lifeboats.

Source: "ONI Publications, WWI" ZV file, Navy Department Library.

28 February 2006