

**THE JOURNAL OF  
SUBMARINE COMMANDER  
VON FORSTNER**

TRANSLATED BY  
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WITH AN INTRODUCTION BY  
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## INTRODUCTION

will be seen that a tremendous fleet will have to be placed in commission to offset a thousand submersibles. Thus the problem becomes increasingly difficult, and the protection of the trade route will be no more thoroughly effected than it is to-day — unless we overwhelm the enemy by a tremendous fleet of destroyers.

## THE JOURNAL OF SUBMARINE COMMANDER VAN FORSTNER

### I

ORDERED TO COMMAND A SUBMARINE

**E**VERY year about the first of October, at the time of the great army maneuvers, new appointments are also made in the navy; but, unlike our army brothers, who from beginning to end remain permanently either in the artillery, cavalry, or infantry, we officers of the navy are shifted from cruiser to torpedo boat, from the ship of the line to the hated office desk on land at the Admiralty, in order to fit us to serve our Almighty War Lord in every capacity and to the best advan-

## THE JOURNAL OF

tage. The commander of a torpedo boat must be familiar with the service on board a dreadnaught or on any other large ship, for only those who are intimately acquainted with the kind of ship they are going to attack possess sufficient skill to destroy it.

For the first time in the autumn of 190— some of us were surprised at the announcement: "Ordered on board a submarine." This order naturally met with an immediate response, but it brought a new outlook on the possibilities of our career, for we had not yet been trained to this branch of the service which our Almighty War Lord had only recently added to the Imperial Navy. The question was, should we be able to perform this new duty?

It is well known that the French were the first to complete a type of

## A SUBMARINE COMMANDER

submarine navigable underseas, and the English unwillingly, but with a sly anticipation of coming events, copied this type of boat.

To all outward appearance we kept aloof from following the example of our neighbors, and our chiefs of the Admiralty were beset with expostulations on the subject, but they were silently biding their time while our enemies of to-day were bragging about their successful experiments with their newly constructed submarines. To the dismay and astonishment of our opponents it was only when the right hour had struck that our navy revealed that it had similar weapons at its command; it therefore prepared for them some disagreeable surprises, and set its special seal from the very beginning on the maritime warfare.

## THE JOURNAL OF

I remember a talk I had with an old army officer a few years ago, when I had just received my appointment to a submarine. We were speaking of U-boats and aëroplanes, and he exclaimed: "Ach! my dear Forstner, give it up! The bottom of the ocean is for fishes, and the sky is for birds."

What would have happened to us in this war had we not so proudly excelled above the earth and beneath the sea?

At first a mystery still veiled our knowledge concerning our submarines; we were told that the dear, good, old U-boat No. 1 had splendidly stood every test, and shortly after, in October, 190-, I went on board, and had the honor later to command her for two years. But during this period, for several years, the greatest secrecy surrounded this new weapon of our navy;

## A SUBMARINE COMMANDER

strictest orders were given to admit no one on board, not even high officers; only admirals were allowed to penetrate within, and on every matter concerning our U-boats we had to maintain absolute silence. Now, however, that our usefulness has been so fully justified, the veil of discretion can be somewhat lifted, and I can describe within certain limits the life and activities on board a submarine.

## THE JOURNAL OF

### II

#### BREATHING AND LIVING CONDITIONS UNDER WATER

A SUBMARINE conceals within its small compass the most concentrated technical disposition known in the art of mechanical construction, especially so in the spaces reserved for the steering gear of the boat and for the manipulation of its weapons.

The life on board becomes such a matter of habit that we can peacefully sleep at great depths under the sea, while the noise is distinctly heard of the propellers of the enemy's ships, hunting for us overhead; for water is an excellent sound conductor, and conveys from a long distance the approach of a steamer. We are often

## A SUBMARINE COMMANDER

asked, "How can you breathe under water?" The health of our crew is the best proof that this is fully possible. We possessed as fellow passengers a dozen guinea pigs, the gift of a kindly and anxious friend, who had been told these little creatures were very sensitive to the ill effects of a vitiated atmosphere. They flourished in our midst and proved amusing companions.

It is essential before a U-boat submerges to drive out the exhausted air through powerful ventilating machines, and to suck in the purest air obtainable; but often in war time one is obliged to dive with the emanations of cooking, machine oil, and the breath of the crew still permeating the atmosphere, for it is of the utmost importance to the success of a submarine attack that the enemy should not detect our presence;

## THE JOURNAL OF

therefore, it is impossible at such short notice to clear the air within the boat. These conditions, however, are bearable, although one must be constantly on the watch to supply in time fresh ventilation.

Notwithstanding certain assertions in the press of alleged discoveries to supply new sources of air, the actual amount remains unchanged from the moment of submersion, and there is no possibility, either through ventilators or any other device so far known in U-boat construction, to draw in fresh air under water; this air, however, can be purified from the carbonic acid gas exhalations by releasing the necessary proportion of oxygen. If the carbonic acid gas increases in excess proportion then it produces well-known symptoms, in a different degree, in different in-

## A SUBMARINE COMMANDER

dividuals, such as extreme fatigue and violent headaches. Under such conditions the crew would be unable to perform the strenuous maneuver demanded of it, and the carbonic acid must be withdrawn and oxygen admitted.

The ventilation system of the entire submarine is connected with certain chemicals, through which the air circulates, whose property is to absorb and retain the carbonic acid. Preparations of potassium are usually employed for this purpose. Simultaneously, cylinders of oxygen, under fairly high pressure, spray oxygen into the ventilation system, which is released in a measure proportionate to the number of the crew; there is a meter in the distributing section of the oxygen tubes, which is set to act automatically

## THE JOURNAL OF

at a certain ratio per man. The ordinary atmosphere is bearable for a long time and this costly method of cleansing the air is used only as a last resort; the moment at which it must be employed is closely calculated to correspond, not only with the atmospheric conditions at the time of submersion, but also to the cubic quantity of air apportioned to each man according to his activities and according to the size of the boat.

It is unnecessary to clear the air artificially during a short submersion, but during prolonged ones it is advisable to begin doing so at an early hour to prevent the carbonic acid gas from gaining a disproportionate percentage, as it becomes then more difficult to control, and it is obvious that it is impossible to dissipate the fumes of

## A SUBMARINE COMMANDER

cooking, the odors of the machine oil, and the breath of the crew.

Taken altogether one can live comfortably underseas, although there is a certain discomfort from the ever-increasing warmth produced by the working of the electrical machinery, and from the condensation created by the high temperature on the surface of the boat plunged in cold water, which is more noticeable in winter and in colder regions.

It is interesting to observe that the occupations of the crew determine the atmospheric conditions: the quantity of air required by a human body depends entirely on its activity. A man working hard absorbs in an hour eighty-five liters of air. Besides the commander, who is vigorously engaged in the turret, — as will be hereafter described,

## THE JOURNAL OF

— the men, employed on the lateral and depth steering, and those handling the torpedo tubes, are doing hard physical work. The inactive men use up a far smaller quantity of air, and it is ascertained that a man asleep requires hourly only fifteen liters of air. A well-drilled crew, off duty, is therefore expected to sleep at once, undisturbed by the noise around them, and their efficiency is all the greater when the time comes to relieve their weary comrades. We had a wireless operator on board whose duties ceased after submersion, and he had so well perfected the art of sleeping that he never cost us more than fifteen liters of air, hourly, underseas.

The length of time that a U-boat can remain under water depends, as we stated above, on the atmospheric con-

## A SUBMARINE COMMANDER

ditions at the moment of plunging, and on the amount of oxygen and chemicals taken on board. We can stay submerged for several days, and a longer period will probably never be necessary.

The distance of vision varies somewhat under water, as we look out from the side windows cut into the steel armor of the commander's conning tower. We can naturally see farther in the clear water of the deep ocean than in the turbid, dirty water at the mouth of a river, and the surface of the water-bottom has a direct influence on the sight, which is far more distinct over a light sand than over dark seaweed or black rocks, and at an upper level the sunshine is noticeable many meters under water. But in any case, the vision underseas is of the shortest, and does not extend beyond a few

## THE JOURNAL OF

meters; light objects and even the stem and stern of our own boat are invisible from the turret. We are unaware, therefore, of advancing ships, derelicts, or projecting rocks, and no lookout can preserve us from these dangers.

The crew is entirely ignorant of their surroundings. Only the commander in his turret surveys through the periscope now and then a small sector of the horizon; and in turning round the periscope he gradually perceives the entire horizon. But this survey demands great physical exertion, which on a long cruise is most fatiguing. The periscopes erected through the upper cover of the turret must not be too easily turned in their sockets, and the latter are very tightly screwed in, for otherwise they would not be able to resist the water pressure at a great

## A SUBMARINE COMMANDER

depth. The effort of simply turning the periscope is so exhausting that casual observations of the horizon are made by the officer of the watch; but during naval maneuvers or in time of war, the commander alone manipulates the periscope. It is essential in this case that the periscope should not arise needlessly above water and betray the presence of the U-boat.

The commander must possess the absolute confidence of his crew, for their lives are in his hands. In this small and carefully selected company, each man, from the commanding officer down to the sailor boy and down to the stoker, knows that each one is serving in his own appointed place, and they perform their duties serenely and efficiently.

I have always allowed every man on board once, in turn, to have a look

through the periscope; it is their highest ambition, and the result is excellent, for it reassures them and they feel more confident as to their own safety after the granting of this small favor.

As we advance underseas, unless passing through a school of fish, we seldom see any fish, for the noise of the propellers frightens them away; but when we lie at rest on the bottom of the ocean, the electric lights allure them, and they come and stare at us with goggling eyes close to the windows in the turret.

The life, therefore, in our "cylinder" as we call it, offers a good deal of variety. The term "cylinder" is exact, for the inner conformation of a submarine is necessarily rounded, so that relatively thin partitions can successfully resist the greatest pressure of water.

## III

## SUBMERSION AND TORPEDO FIRE

A NEW passenger, for the first time in a submarine, has often professed to be unaware that he was fathoms deep under water and has been quite unconscious that the boat had been diving. Of course his astonishment indicates that he was not in the compartment where these maneuvers take place, for it is in the commander's turret that the whole apparatus is centralized for submersion, for steering to the right depth, and also for emersion. At this juncture every man must be at his post, and each one of the thirty members of the crew must feel individually responsible for the

## THE JOURNAL OF

safety of the whole in the difficult and rapid maneuver of plunging, for the slightest mistake may endanger the security of the boat.

The central control, situated in the commander's turret, is in reality the brain of the boat. When the alarm signal is heard to change the course from surface navigation to subsurface navigation, several previously designated members of the crew take their post of duty in the commander's turret. The commander, himself, is on duty during the whole of the expedition in time of war, and he seldom gets a chance for rest in his tiny little cabin. Day and night, if there is the slightest suspicion of the approach of the enemy, he watches on the exposed bridge on the top of the turret; for a few seconds' delay in submerging might for-

## A SUBMARINE COMMANDER

feit the taking of a much coveted prize. So he learns to do without sleep, or to catch a few brief seconds of repose by lying down in his wet clothes, and he is at once ready to respond to the alarm signal of the officer of the watch.

In one bound he is once more surveying the horizon through the periscope, or mounts to the bridge to determine with his powerful field glass whether friend or foe is in sight. His observations must be taken in the space of a few seconds, for the enemy is also constantly on the lookout, and continual practice enables the sailor in the crow's nest to detect the slender stem of a periscope, although the hull of the boat is scarcely visible on the face of the waters.

The commander must come to a

prompt decision as soon as he locates the adversary's exact position. Not only may a retarded submersion spoil our plan of attack, but we are exposed to being rammed by a rapidly advancing steamer; our haste must be all the greater if the conditions of visibility are impaired, as is often the case on the high seas, for it takes time for the U-boat to submerge completely, and during this process it is helplessly exposed to the fire of long distance guns.

Calmly, but with great decision, the commander gives the general orders to submerge. The internal combustion engines, the oil motors which, during surface navigation are used to accelerate the speed of the boat, are immediately disconnected, as they consume too much air underseas, and

electric motors are now quickly attached and set in motion. They are supplied by a large storage battery, which consumes no air and forms the motive power during subsurface navigation. Of course electricity might be employed above water, but it uses up much current which is far more expensive than oil, and would be wasted too rapidly if not economized with care.

It would be convenient to employ the same oil motor for underseas navigation, but such a machine has not yet been constructed, although various futile attempts of this kind have been made. With only one system of propulsion we should gain much coveted space and a more evenly distributed weight; within the same dimensions new weapons of attack could be in-

## THE JOURNAL OF

served, and also effective weapons of defense. The inventor of such a device would earn a large reward. Let him who wants it, try for it!

Quickly, with deft hands, the out-board connections, which served as exhausts for the oil motors, must be closed in such a way as to resist at once the high water pressure. It is well known that for every ten meters under water we oppose the pressure of one atmosphere — one kilogram to the square centimeter — and we must be prepared to dive to far greater depths.

When all these openings have been carefully closed and fastened, then begins the maneuver of submersion. The sea water is admitted into big open tanks. Powerful suction engines, in the central control of the boat, draw out

## A SUBMARINE COMMANDER

the air from these tanks so as to increase the rapid inrush of the water. The chief engineer notifies the captain as soon as the tanks are sufficiently filled and an even weight is established so as to steer the boat to the proper depth for attack. Notwithstanding the noise of the machinery, large, wide-open speaking tubes facilitate the delivery of orders between the commander's turret and the Central, and now is the moment the commander gives the order to submerge.

All this may sound very simple and yet there are a great many things to consider. In the same manner in which an airplane is carefully balanced before taking wing into the high regions of the sky, a submarine must be accurately weighed and measured before it descends into the watery depths

## THE JOURNAL OF

of the ocean. The briny water of the North Sea weighs far more than the less salty water of the Baltic Sea, whose western basin is composed of practically fresh water. A boat floats higher in the heavily salted waters of the North Sea and lies deeper and plunges farther down in the waters of the Baltic. The same U-boat, therefore, must take into its tanks a greater quantity of water ballast in the North Sea, to be properly weighted, than when diving into fresher waters. Even with small submarines of 400 tons displacement, there is the enormous difference of 10 tons between 1.025 specific weight in the intake of North Sea water and 1.000 specific weight of fresh water. On the other hand, if too much water is admitted into the tanks, the submarine may plunge with

## A SUBMARINE COMMANDER

great velocity deeper and deeper beyond its appointed depth, and in such a case it might even happen that the hull of the boat could not withstand the overpowering pressure and would be crushed beneath the mass of water. And yet again if too small a quantity of water ballast is admitted into the tanks, the boat may not sink sufficiently below the surface, and thus we could not obtain an invisible attack which is positively necessary for our success.

How much water then must we take in? The answer to this question is a matter of instinct, education, and experience and we must also depend on the cleverly devised apparatus made for this purpose.

The submarine like the airplane must be always maintained at the

## THE JOURNAL OF

proper level. The weight of the boat varies continually during a prolonged voyage. Food is devoured and the diving material of the machinery is consumed. The water in which the boat swims continually changes weight and the boat is imperceptibly raised or lowered in a way very difficult to ascertain. The officer responsible for the flooding of the submarine must painstakingly keep its weight under control during the entire navigation. The weight of a meal eaten by each man of the crew, the remains of the food and the boxes in which it was contained, which have been thrown overboard, must be calculated as well as the weight of the water, and the officer employs delicate apparatus for these measurements.

On the open seas these alterations

## A SUBMARINE COMMANDER

in weight do not occur very rapidly; but whenever a boat approaches the mouth of a river, then the transition from salt to fresh water happens very suddenly and may provoke the undesirable disturbances to which we have already alluded. Also warm and cold currents at different depths produce thermotic conditions, which surprisingly change the weight of the water.

Peculiar as it may appear, a submarine must be lightened to descend to a very great depth, whereas, in steering to a higher level, more water must be admitted into the tanks to prevent our emerging to the surface with too great suddenness. This demands careful attention, skill, and experience.

The principal condition for the success of a submarine attack is to steer

## THE JOURNAL OF

to the exact depth required. The periscope must not rise too far above water, for it might easily be observed by the enemy; but if, by clumsy steering, the top of the periscope descends below the waves, then it becomes impossible to take aim to fire the torpedo. The commander therefore must be able to depend on the two men who control the vertical and horizontal rudders, whom another officer constantly directs and supervises.

When the boat has reached the prescribed depth a close examination is made of all the outward-leading pipes, to see if they can properly resist the water pressure; if any tiny leak has been sprung, every cap must be tightly screwed down; for it is evident it would be very undesirable if any leak should occur and increase the

## A SUBMARINE COMMANDER

heaviness of the submarine. Absolute silence must prevail so that any dripping or greater influx in the tanks can be observed.

Quietly and silently the boat advances against the enemy; the only audible sounds are the purring of the electric motors and the unavoidable noise made by the manipulation of the vertical and horizontal rudders. Alert and speechless, every man on board awaits a sign from the commander, who is watching in the turret; but some time may elapse—now that the periscope is lowered and nearly on the level of the waters—before the adversary becomes visible again. The ship may have changed her course and have taken an opposite direction to the one she was following at the moment we submerged. In that case she would be

## THE JOURNAL OF

out of reach and all our preparations prove useless.

At various intervals, the commander presses an electric button and raises and lowers the periscope as quickly as possible, so as to take his own observation without, if possible, being observed himself; for he knows that any injury to the periscope — his most priceless jewel — would, as it were, render the boat blind and rob him of the much coveted laurel leaves. During these short glimpses the commander only perceives a little sky and the wide, round plate of the reflected sea with its dancing waves, while the nervous tension of the expectant crew increases every minute.

At last is heard a joyous outcry from the commander, "The fellows are coming!" — and after one quick glance,

## A SUBMARINE COMMANDER

to locate the enemy exactly, the periscope is lowered. Now every heart beats with happy anticipation and every nerve quivers with excitement. The captain quickly issues his orders for the course to be steered and for the necessary navigation. The officer in charge of the torpedoes receives the command to clear the loaded torpedo for firing, while the captain quietly calculates, first, the relative position of his boat to the enemy's ship, according to the course she has taken; secondly, at which point he must aim the torpedo to take surest effect, and — in the same way as in hunting a hare — he withholds the shot to correspond to his victim's gait.

Many thoughts fly through his brain. Here, among his companions, the annihilation of the enemy will cause

## THE JOURNAL OF

joyful enthusiasm, while among them their downfall will cause overwhelming sorrow. But without doubt they must vanish from the seas, and only a man, who has experienced these sensations, knows how many secondary matters occur to him at such a time.

With lowered periscope, he sees nothing that goes on above him on the sea, and like a blind man the boat feels its way through the green flood. Every possible event becomes a subject of conjecture. Will the fellow continue on the same course? Has he seen our periscope in the second it was exposed, and is he running away from us? Or, on the contrary, having seen us, will he put on full steam and try to run us down with a fatal death stroke from his prow?

At such an instant of high nervous

## A SUBMARINE COMMANDER

tension, I have caught myself giving superfluous orders to let myself relax, and yet I knew that every man was at his post, fully conscious that his own safety, the safety of the whole boat, and the honor of the Fatherland were all at stake, and dependent on his individual effort. I knew, of course, that each fine fellow, down in the machinery room or at the torpedo tubes, had done his very best, and that all his thoughts were centered like mine in keen expectancy on the firing of our first torpedo — the eel as we call it, guarded with so much love and care — which would speed along accompanied by our warmest wishes. We give nicknames to our torpedoes, mostly feminine names: side by side below lie “the fat Bertha,” “the yellow Mary,” and “the shining Emma,” and these ladies

## THE JOURNAL OF

expected to be treated, like all ladies, with the tenderest care and courtesy.

Now comes the announcement from the torpedo officer, "The torpedoes are cleared for firing." He stands with a firm hand awaiting the signal from his commander to permit the torpedo to drive ahead against the hated, but unconscious adversary, and to bore its way with a loud report deep into the great steel flank.

Once again the periscope springs for an instant to the surface and then glides back into the protecting body of the turret. The captain exclaims, "We are at them!" and the news spreads like wildfire through the crew. He gives a last rapid order to straighten the course of the boat. The torpedo officer announces, "Torpedo ready"—and the captain, after one quick glance through

## A SUBMARINE COMMANDER

the periscope, as it slides back into its sheath, immediately shouts, "Fire!"

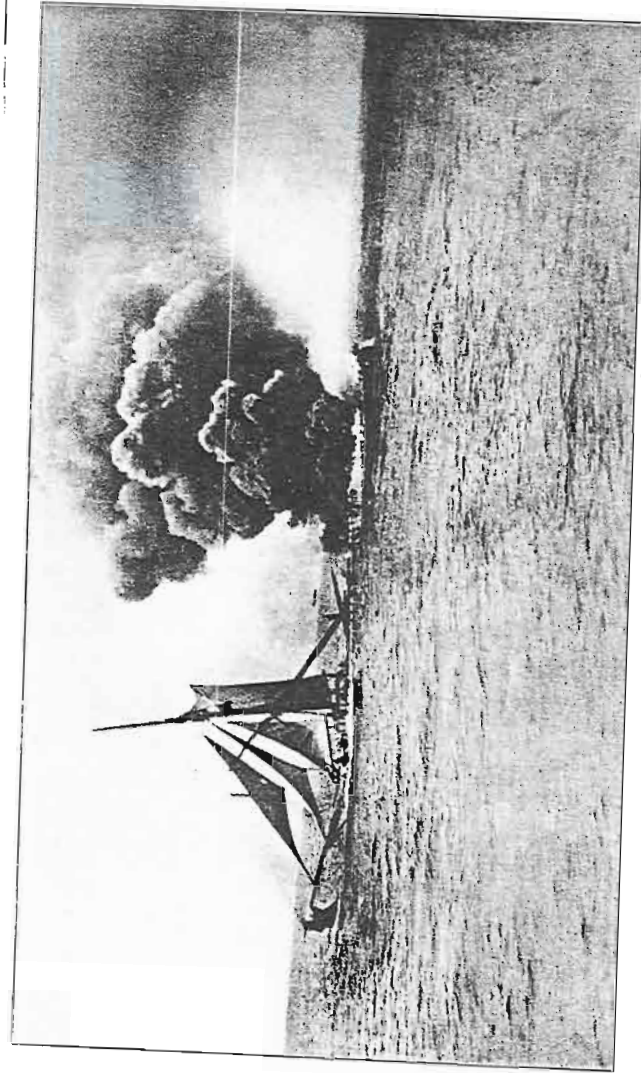
Even without the prescribed announcement from the torpedo officer that the torpedo had been set off, every one knows that it is speeding ahead, and for a few seconds we remain in anxious suspense, until a dull report provokes throughout our boat loud cheers for Kaiser and for Empire, and by this report we know that "the fat Bertha" has reached unhindered her destination. Radiant with joy, the commander breathes a sigh of relief, and he does not check the young sailor at the wheel, who seeks to grasp his hand and murmur his fervent congratulations. But congratulations must be postponed until we ascertain that our success is complete.

And once again the periscope runs up

## THE JOURNAL OF

towards the laughing daylight, while the commander in happy but earnest tones utters the reassuring words, "The ship is sinking, further torpedoes can be spared." He then permits the gratified torpedo officer, who stands by his side, a quick glance through the periscope to verify the result of his own efficiency. It is chiefly owing to the care of the personnel of the torpedo squad, that the torpedoes are maintained in such perfect condition and that their aim is so correct; and to them is due in great part the success of our attack.

The commander and his officer exchange a knowing look, for they have seen the enemy's ship heavily listing to one side, where the water is rushing into the gaping wound, and soon she must capsiz. They see her crew



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A TORPEDOED SCHOONER

## A SUBMARINE COMMANDER

hastily lowering the life boats—their only means of escape—and this is a sufficient proof of our victory. We can depart now in all security. Concealing our presence, we plunge and vanish beneath the waters; having reached a certain distance, we stop to make sure that our victim lies at the bottom of the ocean. We behold the waves playing gently and smoothly as before over the cold, watery grave of the once proud ship and we hasten away from the scene of our triumph.

There is no need of our going to the help of the enemy's crew struggling in the sea, for already their own torpedo boats are hurrying to the succor of their comrades, and for us there is further work to be done.

Imagine the enthusiasm our dear fallen comrade, Weddingen, and his

## THE JOURNAL OF

crew must have felt as the loud report of their last torpedo announced the destruction of their third English armed cruiser!

## A SUBMARINE COMMANDER

### IV

#### MOBILIZATION AND THE BEGINNING OF THE COMMERCIAL WAR

**A**FTER long and agitated waiting, we received [in the last days of July, 1914, the command to mobilize. Joyful expectation was visible on every face, and the only fear that prevailed was that those of us who were awaiting our orders on land might be too late to take part in the naval battle we were all looking forward to so eagerly.

A few years ago, one of the Lords of the English Admiralty had predicted that in the first naval battle fought between Germany and England, the German fleet would be entirely annihilated. We naturally only smiled in derision at these boastful words. The