THE BRITISH NAVAL SCHOOL FOR THE TRAINING OF DIVERS.

BY OUR ENGLISH CORRESPONDENT.

Every vessel in the British navy carries a diving section, composed of men expert and skillful in all kinds of submarine work. Such a detachment is absolutely indispensable, in view of the fact that through unforeseen circumstances the submerged portion of the hull of the armorclad, and especially the propellers, often require examination; while in cases of accident, such as collision and running aground, a close investigation to discover any possible injury to the iron sheath of the ship has to be carried out, and occasionally, if the damage is serious, considerable submarine patching has to be done until the vessel can reach drydock.

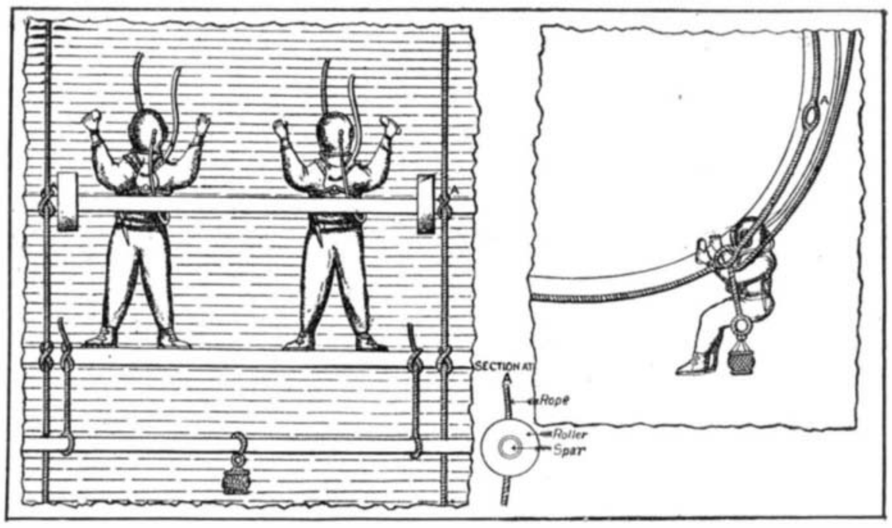


Diagram Showing How Divers Work on the Staging in Order to Clean the Bottoms of Warships.

The diving section of the British navy is comprised throughout of volunteers. No man is compelled to become a member of the detachment, even if physically fit, owing to the peculiarly hazardous and arduous nature of the work. As an inducement, however, the Admiralty pay the divers a higher salary, as well as offering the men other special privileges.

When a man volunteers for diving service, he is at first submitted to a rigorous medical examination. Owing to the enormous pressures to which the body is subjected at different depths, only those with the strongest constitutions and in perfect health are admitted. No man is passed who has a short neck, is full blooded, or has a florid complexion; nor those suffering from head and heart complaints, or from a sluggish circulation of the blood. The medical qualifications are very strict, as indeed they should be, as a weakened constitution would expose the man to extremely dangerous risks under water. Furthermore, when a man passes beneath the water's surface, any physical defects he may possess immediately show themselves in an accentuated manner.

The Diving Tank at Whale Island, Where Sailors Are Taught How to Dive.

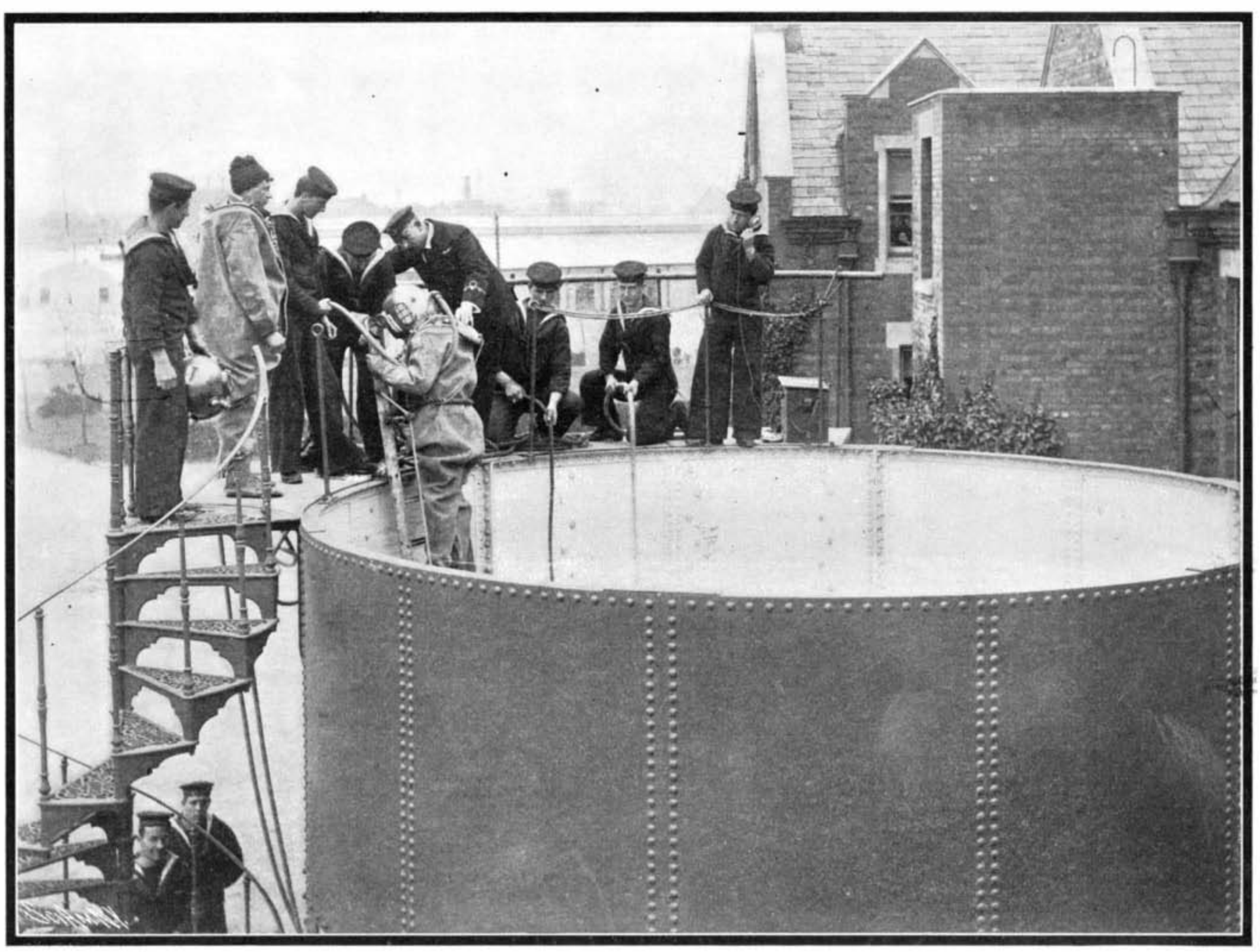
The Sailor's First Lesson in Diving. He Rises on His Back.

The medical conditions satisfied, the man is drafted to one of the three diving schools. These are at Portsmouth, Devonport, and Chatham respectively, but the largest and most important is at the premier dockyard of Portsmouth. Here the man is initiated into submarine work, special classes for this purpose being held. As the first and greatest difficulty which the man has to surmount is nervousness, the training is not carried out in the open sea, but in a large circular steel tank built on the shore. This tank measures about 13 feet in height by approximately 18 feet in diameter, and is pierced with a number of glazed portholes, through which the instructor can follow and watch his pupils' movements. A gallery extends around the top of this tank a short distance, from which the diver makes his descents into, and ascents from, the water within.

The man is first instructed in the nature of his dress and equipment, and how to employ the appurtenances with which he is provided, such as the telephone, lifeline, and ladder. Owing to the clumsy and weighty nature of the diving dress, the sailor experiences considerable difficulty in becoming accustomed to it. He is then instructed as to the manner in which he must descend and ascend the ladder, and how to utilize the outfit and tools with which he is supplied. The first named is a most important point.

Directly the diver disappears beneath the surface of the water, his body becomes subjected to a heavier pressure. For instance, at a depth of 20 feet the pressure is 8½ pounds to the square inch above atmospheric. It increases proportionately as he descends lower and lower until at, say, 204 feet, which is the greatest depth to which a diver has penetrated — this depth was reached by the diver James Hooper, when in quest of the "Cape Horn," sunk off Pichidanque, South America—the enormous pressure of 88½ pounds to the square inch has to be sustained. Even at the moderate depth of 32 feet the man's body has to support an aggregate pressure of 20,000 pounds weight, besides the ordinary normal air pressure, which represents another 20,000 pounds, making a total pressure of 40,000 pounds.

When a diver makes his initial descent, owing to the strangeness of the experience, he suffers from a curious pulsation and gasping for breath. These peculiarities will not be overcome until the man has regained his confidence.



The Pupil Receiving His Last Instructions Before Descending Into the Tank.

THE BRITISH NAVAL SCHOOL FOR THE TRAINING OF DIVERS.

Should a man betray evidences of more than usual nervousness after his first descent into the water, he is expelled from the class; for although the Admiralty do not compel a man to become a diver, they insist that he should immediately overcome any inherent timidity. The instructor accompanies the man to the gallery of the tank, conveys to him his commands, especially insisting upon slow ascent and descent. The diver then enters the water, and the instructor follows his movements through the glazed portholes, transmits his instructions through the telephonic apparatus, and inculcates the man into the code of signals generally employed. At first the sailor experiences considerable difficulty in moving about the bottom of the tank in his 40-pound shoes—the total weight of a diver's dress is 160 pounds—but in a short time he becomes accustomed to the task.

The diver undergoes six weeks' training at this curious school. At the conclusion of this term he is attached to the open-sea class, and has to carry out his work under natural conditions.

As the instructor cannot now watch the diver's movements, the pupil has to rely upon his own confidence. Diving in a tank in a limited water space he soon finds to be vastly different from diving in the open sea, where he has to encounter currents and tides.

Before he makes his descent, the instructor impresses again upon the diver the urgent necessity of careful descent and ascent, and what to do if he desires to come to the surface suddenly, or emergency necessitates a rapid ascent. These instructions are most vital, especially in descending and ascending carefully. At times he must cease in his descent to recover his equilibrium, and if he experiences any pain in his head, he must ascend a few feet until the pain has passed away, and then resume his descent even more slowly than before.

A slow ascent is even more essential than a slow descent, especially if the man is at all full blooded. As the pressure upon the body decreases, there is a tendency in this case for the blood rush to the head, and serious results may be incu ed unless extreme care is taken. A man of strong constitution is not advised to ascend at a greater speed than two feet a second when the depth does not exceed 80 feet. At a greater depth slower speed is even more imperative, for as the man passes to decreased pressures, he must allow the muscles and tissues of his body to be relieved gradually of the enormous pressure they have sustained.

The pupil is at first only taken to a shallow depth, but this is gradually increased as he becomes proficient, until a maximum depth of 120 feet is attained. Beyond this depth naval divers are not compelled to go, but in nearly every instance they do descend to the normal limit of 150 feet. Beyond this latter depth it is not advisable for a man to descend, unless possessed of an abnormally good constitution. The pressure at this depth is enormous, being no less than 65¼ pounds of water to the square inch of the body. Even at the naval limit of 120 feet, the diver experiences a heavy pressure upon his chest and legs, and is supplied with a wickerwork crinoline to wear over his chest, to relieve the pressure upon his lungs.

The pupil is allowed to work under water for only a short time, without coming to the surface for a rest. The emergency ascent constitutes an important part of the diver's curriculum. To accomplish this double-quick rise, the diver has to inflate his diving dress. This is done by closing the regulating valve in his helmet. The result is that the man is impelled to the water's surface like a rocket. Very often the pupil makes this impromptu ascent unintentionally by operating the valve, and he floats in an undignified manner, like an immense India-rubber ball.

When the diver has become accustomed to walking upon the rugged sea bottom, avoiding holes and projections, and is familiarized with the action of currents and tides, he is handed the various tools which he will ultimately have to use. Once more his troubles begin. Considerable practice has to be made before the diver can handle these properly while under water. There is a constant strong tendency for the tool to rise upward, and it is not until the man has handled them for some time that he can manipulate them with any measure of dexterity.

As soon as his diving education is complete and he has become proficient in the work, the diver is at once drafted to form a unit of one of the warship diving detachments. He receives a slightly increased pay for his qualification. When engaged in the actual diving work, however, he receives from $1 to $1.50 per hour, according to the nature of his task and the depth at which he is working.

The naval diver has to fulfill a wide variety of operations. He is in every respect an emergency man, and must be ready at any requisite moment. His principal duties consist of cleaning the warship's bottom, inspecting the underwater fittings, propellers, etc., investigating and temporarily repairing any damage that may be inflicted upon the hull of the vessel in an accident, recovering any valuable article that may be accidentally dropped overboard, if the depth of water is not excessive, recovering torpedoes that may have gone astray during target practice, and such work. On board the vessel the divers are allotted a station at collision quarters, ready to fix the collision mats if the exigencies demand. When the British armorclad "Victoria" sank in the Mediterranean, after being rammed by the "Camperdown," the divers were immediately at their positions with the mats, which unfortunately in this case proved abortive. Then again, if a fire breaks out on board, the diver acts the part of fireman, as he is able, with his helmet, to penetrate smoke that would suffocate the ordinary members of the fire crew.

Cleaning the bottom of the ship is, however, the most common of his duties, as it is imperative, if the vessel is to maintain her high speed average, that her hull should be kept cleared of barnacles and other similar submarine growths that impede her traveling. This work is somewhat tedious. A practised and skillful man can work at it from four to seven hours a day in two shifts, morning and afternoon, and can clean from 63 to 135 square feet per hour, the work accomplished naturally varying with the condition of the bottom of the ship. For this task the Admiralty have designed a special staging.

Three spars measuring from 20 to 25 feet each in length are slung together in the manner shown in the diagram. Two of these spars are secured four feet apart to two bottom lines, and the third spar is slung by two rope tails to the lower spar on the bottom lines, and weighted with a slung shot, so as to hang vertically from three to four feet below it. When working upon the vertical portion of the bottom of the ship, the diver stands on the lower bottom line spar, and is supported in the middle of his back by the upper spar. On the latter, inside the bottom lines, two roller chocks, each about 2 feet 6 inches in diameter, are fixed at either end, so that no risk may be incurred of the upper spar becoming jammed or binding against the vessel's side, and thus disturbing the diver's balance. When working upon the lower curved portion of the bottom, the diver sits upon the slung spar, and adjusts his position by the manipulation of the length of the rope tails.

One of the most important functions of the naval diver, especially in time of war, is the laying of the electrically-fired submarine mines across the entrances to docks and harbors. Taken on the whole, however, the diver is generally regarded as an experienced jack of all trades.

A New Type of Furnace.

A United States patent has been granted to Amos H. Mylin and Lewis B. White for a type of furnace that presents certain novel features of construction, and that may be very economical in coal consumption.

The important features of the invention are an outer casing or fuel-receptacle of any suitable shape forming an outer combustion chamber, and a shell of refractory material arranged within the outer chamber and forming an inner combustion chamber. The latter chamber is in communication by openings in its lower portion with the outer chamber, and the outer chamber is provided with an opening at the top for supplying fuel and air down and around the inner chamber, while the inner chamber has a draft outlet the size of which may be increased if the heat is to be delivered and utilized outside of the furnace, and made smaller, merely to conduct away the incombustible gases, if the heat is to be used inside. Except for this shell, the interior of the receptacle is entirely open and without grate or other obstruction, so that it may be filled with coal, entirely surrounding the shell, which should be of refractory material to resist the intense heat. The air passes down from the top opening through the coal from the coldest to the hottest part of the furnace while the gases are being progressively generated, until, when intimately mixed together and gradually raised in temperature, the air and gases are delivered into the inner combustion chamber, where the heat is highest and most of the combustion takes place. This shell is not clogged with coal or ashes, so that the inner chamber is maintained at a high and uniform heat and all the combustible gases are there consumed without waste and with a high efficiency of fuel.

The Wright Airship Again.

The flying machine invented by Orville and Wilbur Wright, which made a successful flight at Kitty Hawk, N. C., last December, had another trial near Dayton, O., on May 26, which the brothers say was successful. Great secrecy was maintained about the test, and but few witnessed it.

The machine after being propelled along a track for the distance of a hundred feet, rose in the air, and flew a short distance, when it dropped. This was due, the inventors say, to a derangement of the gasoline engine that furnishes the power. In the fall the propellers were broken, and the test could not be repeated.

Electrical Notes.

In several towns in Europe, notably at Cologne, a system of synchronizing the clocks from one central timepiece is in operation. The principle of the invention, which has been devised by an inventor of Zürich, although electrical, dispenses with batteries and contacts. A central clock somewhat similar to the obsolete grandfather's type is established, and this is wound up in the usual manner. In this clock is fitted a specially-designed magnetic inductor, comprising an iron core placed within a fixed coil. This core is magnetized and demagnetized. Any number of secondary clocks, as they are termed, may be synchronized from this timepiece. These secondary clocks, however, are not supplied with the works generally fitted, but carry instead a special apparatus connected to the master clock by electric wires. Once a minute the inductor in the central clock is actuated. A momentary current is thereby generated, and this is transmitted to all the secondary clocks instantly and simultaneously. The result of this current is to operate upon the small mechanism in the secondary clocks, thereby advancing their minute hands minute by minute. By this means a uniform time is maintained among all the secondary clocks, irrespective of the distance they may be from the master timepiece. The advantage of this system is that there are no batteries to break down, and no contacts to wear out. In Cologne alone over two hundred clocks are controlled and synchronized in this manner.

News of a somewhat sensational character is announced relative to the cheap production of metallic calcium. Prof. Borchers, of the Electro-metallurgical Institute of Aix-la-Chapelle, states that he has been making a series of experiments with the electric furnace, and now succeeds in obtaining the metal by the electrolysis of chloride of calcium in fusion. The chloride melts at a comparatively low temperature, 800 deg. C., which makes the operation easy, although considerable trouble was experienced at first in obtaining the proper kind of electrode for reducing the chloride. This difficulty has now been overcome, and he now produces the metal at very low cost, only a small fraction of the price which is now quoted. Although the metal cannot be used in manufacture, seeing that it oxidizes quickly, it will be of great service in the different arts, should it be produced cheaply. It will be especially useful in the chemical industry in organic operations, where its reducing properties will allow it to replace sodium, although it is less powerful than the latter. Calcium would be of value in the metallurgy of iron, seeing that it frees iron from phosphorus, sulphur, and oxygen. It has recently been found useful to add a certain quantity of aluminium to iron for this purpose, and although the specimens of iron containing aluminium are preferable to those containing sulphur and phosphorus, they are inferior to pure iron as regards tensile strength and shocks. If, as some metallurgists suppose, a very small quantity of calcium could be used to eliminate the sulphur and phosphorus and bring the iron to a nearly pure state, and if the presence of the calcium in the metal is no disadvantage, there would be a brilliant future for the use of calcium.

The latest reports concerning the new Rome-Naples electric railroad, which is to be used especially for rapid express trains, state that a royal commission has been formed for studying the new route. Instead of the 150 miles covered by the existing railroad, a shorter route will be chosen, as the former takes five hours with the rapid trains owing to the unfavorable profile of the district. The commission propose to run an entirely new double-track road at about four miles from the coast. It will run at nearly level grade and use maximum curves of 2,700 feet. The two terminal depots at Rome and Naples will be built near the center of each city. The railroad will have about fifteen intermediate stations. The estimated cost of the proposed 122 miles of track, including the part within the two cities and the expenses of the preliminary work is about 18 millions. No special system of traction has as yet been adopted by the commission, but it approves the Valtellina or the new Marienfeld-Zossen system, both from a technical and an economical standpoint. It prefers the use of independent motor cars with common control system such as are used extensively in America. A train of 120 tons would be made up of three motor cars. At a speed of 75 miles an hour such a train would require about 1,500 horse-power. Six trains running on the road at once would take a total of 9,000 horse-power. It is proposed to use hydraulic power for running the road, as there are a number of falls in the district. As much as 100,000 horse-power can be obtained, and it is proposed to distribute part of it to the city of Naples by an overhead line. One-quarter of the total could be thus employed. The main sources of hydraulic power are situated at Cisterna and Sessa Aurunca, lying at a few miles from each of the terminal stations. The total cost of the Rome-Naples system is estimated at $22,000,000, in which the electric outfit figures at $3,000,000.