The "Lusitania" and the Submarine Salvor

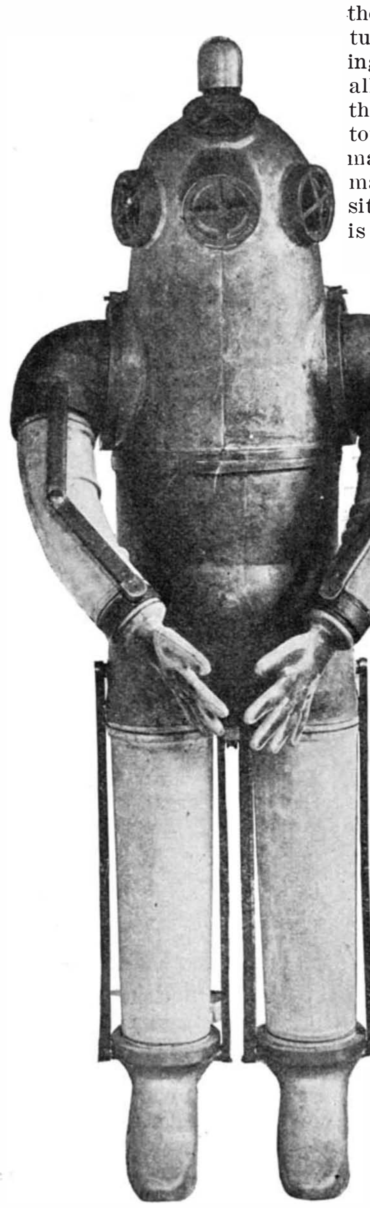
Some of the Schemes Proposed for Dealing with the War's Most Famous Wreck

By Robert G. Skerrett

THE inventive mind has been busy ever since the "Lusitania" plunged to her untimely end in May of 1915; and the records of the patent files here and abroad disclose a large number of methods and apparatus wherewith, it is claimed, that deeply sunken craft can be dealt with effectively. The purpose of the present article is not to review these manifold schemes, interesting as many of them are; the object is to call attention to three aspects of the problem and to mention a few of the ways in which these angles of the matter may be attacked. This treatment of the subject does not imply that we have confidence in any of them.

Broadly stated, salvage operations in connection with the "Lusitania" might consist in refloating the vessel and in moving her to a sheltered haven. The raising of the liner may be effected in either of two ways—*i. e.*, by buoyancy applied within her body or by buoyant media exerting a lifting force outside and upon the wreck through wire ropes or chain cables attached to the ship in a suitable manner. Or, the salvors might confine their labors to the recovery only of more or less of the valuable articles or goods carried by the steamer when she foundered—letting the "Lusitania" remain upon the seabed. Indeed, an attempt of the latter nature is shortly to be made; and special apparatus has been devised by B. F. Leavitt to promote the undertaking.

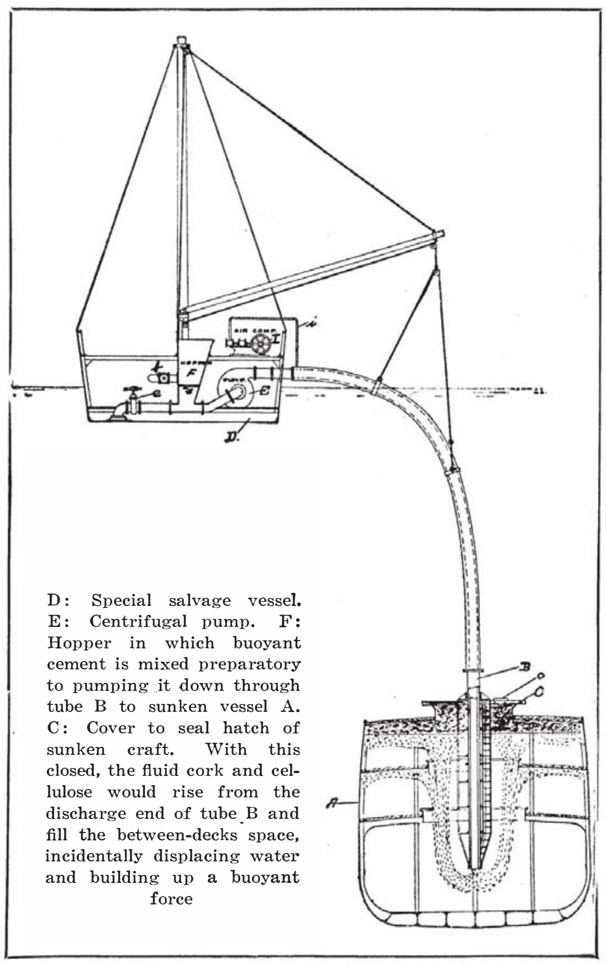
It is commonly agreed that the "Lusitania" rests upon a hard-shell bottom in water ranging from 38 to 42 fathoms in depth, and at a point about eight miles off the Irish Coast between Seven Heads and Old Kinsale Head. While no one has established the fact, the opinion prevails that the "Lusitania" is virtually upright and lying approximately parallel with the sweep of the tide, which has a total rise and fall normally of 11 feet. As may be realized, the site of the catastrophe is an exposed one.



Front view of the Leavitt diving armor

Mr. Leavitt and his associates, as we have indicated above, plan to recover cargo only, and only the more valuable of the cargo, at that. To this purpose they have outfitted the wooden steamer "Blakeley," an ex-Shipping Board boat of 2800 tons; and the craft is provided with a number of all-metal diving suits and several deep-sea electric lights which are encased in globes capable of resisting a hydrostatic pressure of 600 pounds to the square inch. The suits are improvements upon kindred submarine armor brought out by Mr. Leavitt some years ago and used during salvage operations on S.S. "Pewabic," which was sunk in Lake Huron off the east coast of Michigan in 1865. That vessel lay 176 feet below the surface, and therefore at a depth which could not be approached without great hazard by a diver in the ordinary type of dress. In fact, the greatest depth at which useful work has been done is 182 feet. At this depth a Spanish diver recovered $9000 in silver bars from a wreck off Cape Finisterre. But this is altogether exceptional; but two other cases of useful work at 150 feet or more are on the records; and ordinary dock and harbor work is conducted at depths between thirty and sixty feet.

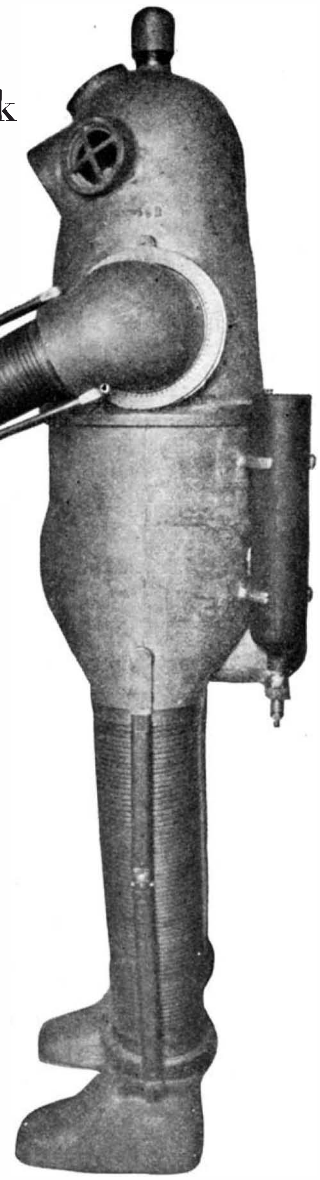
After demonstrating that he could descend 360 feet in his all-metal suit, and remain at that depth for 45 minutes, experiencing no physical distress the while, the same apparatus was employed during 1917 and 1918 in locating the "Pewabic" and in directing from under water the recovery of part of her remunerative cargo. The actual salvage work was done by big grab buckets. The present suits are constructed of bronze and weigh 350 pounds apiece. When submerged this weight is cut down to about 75 pounds by reason of the displacement of the diving dress. The arms and the legs of the armor are fashioned of flexible metal tubing, and can be bent at the elbows and the knees, respectively. Further, the shoulder sockets are watertight, annular joints, supported by ball bearings. This arrangement is counted upon to give the arms considerable movement and to offset any locking or jamming pressure of the enveloping water.



D: Special salvage vessel. E: Centrifugal pump. F: Hopper in which buoyant cement is mixed preparatory to pumping it down through tube B to sunken vessel A. C: Cover to seal hatch of sunken craft. With this closed, the fluid cork and cellulose would rise from the discharge end of tube B and fill the between-decks space, incidentally displacing water and building up a buoyant force

Simon Lake's system for refloating deeply sunken vessels

The suit is self-contained, inasmuch as the diver does not draw air from the surface through a connecting hose but gets his respirable air from a regenerative attachment. This is composed of a cartridge or case filled with caustic soda, which absorbs the exhaled carbonic acid gas, and of a steel flask charged at high pressure with oxygen. The latter, placed outside and at the back of the suit, furnishes just enough oxygen to make up for that consumed by the body; and a special type of reducing valve feeds this life-giving element into the free space within the diving dress to meet the physical needs of the occupant for a period of fully three hours. The encased man is lowered into the depths and brought up to the surface by a small steel cable, of a non-twisting type, secured to the extreme top of the helmet. This cable constitutes an electrical as well as a mechanical connection; its core carries a circuit providing means for carrying on continuously telephonic communication between the diver and his attendant aboard the salvage craft. Generally speaking, the lateral motions of the diver, when he reaches his destination, are controlled by the swinging of a derrick or boom, from which he is suspended, and this supporting medium is shifted agreeably to his vocal orders.



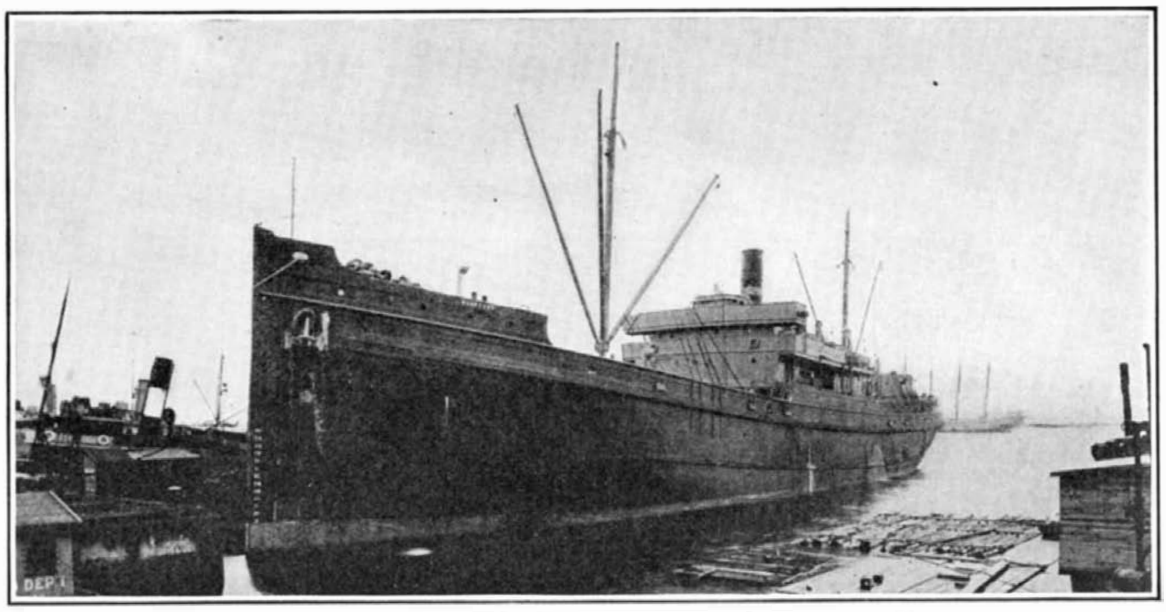
Side view of the Leavitt all-metal deep-diving suit, with oxygen flask at rear

The plan is to anchor the "Blakeley" so that she can be held directly over that part of the wreck in which the purser's office and the contiguous strongroom are located. It is said that the purser's safe and the strongroom together contain gold, jewelry, securities, etc., to the value of $6,000,000. Divers will descend to the uppermost deck where they will place charges of dynamite above and in line with their goal; and it is claimed that when these cartridges are detonated electrically that they will clear a way through that deck. Similarly the aim is to make wide-spread gaps in one or more of the decks below, and thus to create a yawning passage through which the divers may be lowered to their objectives. Then, by means of bucket dredges and other lifting tackle, the packages in the strongroom may be lifted to the surface. The "Blakeley" is equipped with a steel cargo boom capable of handling a load of 30 tons, and this is counted upon to raise the purser's safe when lines have been secured to it. The deep-sea electric lights, we are told, will illuminate the scene of operations within the "Lusitania."

Maritime wreckers of wide experience do not believe that either dynamite or nitroglycerine will be of much use in smashing and clearing away structural steelwork lying between the treasure seekers and their goal. Where these explosives have been used under water heretofore they have commonly produced a maze of tangled plates and angles and have brought about a condition that would ordinarily check the advance of a courageous diver in the usual dress and familiar with difficult subaqueous tasks. However, Mr. Leavitt is seemingly undismayed by his critics.

In contrast to this project are some of the systems developed to effect the refloating of the "Lusitania"—a far more staggering task than that just described. One of the most ingenious schemes is that offered by Simon Lake, which would utilize a buoyant force exerted from within the wreck. To this end, he would fill the damaged craft with enough material of a permanently buoyant character to overcome her dead weight so as to cause her to break away from the seabed and to rise to the surface. This, in itself, is not essentially novel, but the means which Mr. Lake would employ to achieve his purpose are unique. His proposition involves nothing more complex than pumping down and into the liner, after certain openings have been sealed, a large volume of cork or balsa wood mixed with melted paraffin. The paraffin would be heated in a tank provided with steam coils, and, when sufficiently fluid, would be fed into hoppers where it would be mixed with small blocks of cork or balsa wood. From the hoppers the buoyant stuff would be led to powerful centrifugal pumps which would send it, by way of insulated pipes of goodly diameter, down into the holds and 'tween deck spaces of the foundered ship.

Each cubic foot of the combined paraffin and woody matter weighs about 14 pounds, while every cubic foot of salt water displaced thereby weighs 64 pounds—the net result being a buoyant moment of 50 pounds. Inasmuch as the compound remains plastic for some time when surrounded by cold water, and as its tendency is to float upward, this light substance would attach itself first to the undersides of decks, fill interstices and small openings generally, and gradually push the water downward and outward through any passages that afforded avenues of escape. On hardening, this cement attains considerable rigidity, and its lifting effort would be distributed over a wide area against the superposed structure of the craft. This action would avoid any localized buoyant stresses which might be apt to occasion damage to the steel work and call for costly repairs afterwards. When safely landed in a drydock, the removal of the buoyant mass could be speedily accomplished by means of picks and shovels or by the cutting action of jets of steam. Mr. Lake claims that by this system he would be able to pump his buoyant material into a sunken vessel at the rate of 300 tons an hour and thus, in a short while, concentrate sufficient lifting force to raise a ship having a dead weight of thousands of tons.



S. S. "Blakeley" while outfitting to attempt the salvage of the treasure aboard the "Lusitania" by the use of the Leavitt diving suit

In passing, it may be said that various other schemes have been suggested by which buoyancy could be applied within a wreck. These run all the way from air-filled casks and bags to compressed air blown directly into some of the craft's compartments; but the consensus of opinion is against any of these expedients owing to two outstanding physical difficulties: first, the obstacles that would hamper placing casks or bags inside a vessel lying at so great a depth, and the well-nigh prohibitive conditions under which divers would have to work to make suitable connections for the use of compressed air; and, second, the fact that unless the buoyant air was free to expand and to escape as the ship mounted from the seabed the buoyant element would actually exert a tremendous explosive force which might blow away the decks and permit the boat to sink like a stone.

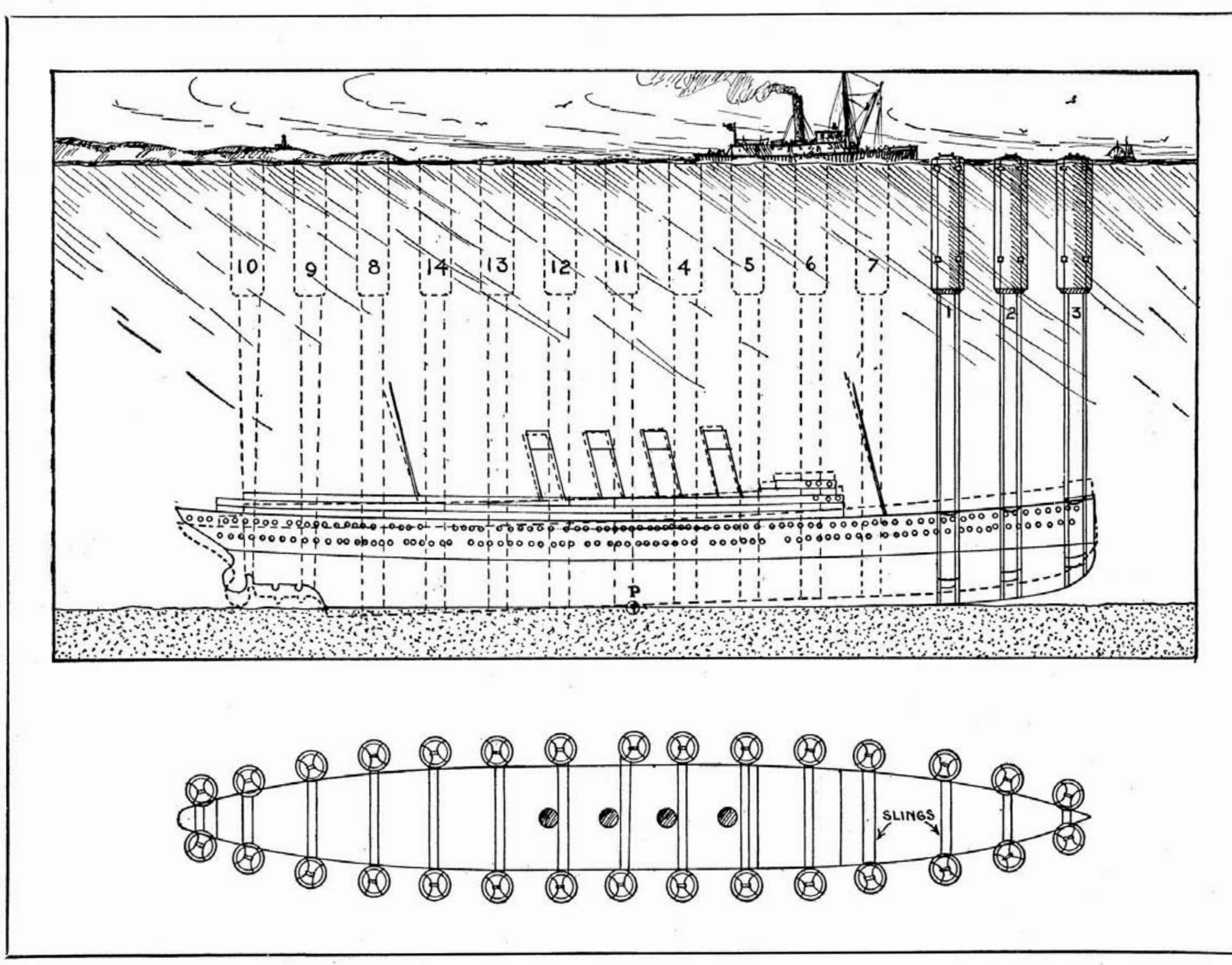
And now we come to some of the projects developed for dealing with deeply-sunken ships by recourse to buoyancy applied outside the wreck. It is probably in this field of maritime salvage that the inventive mind has given itself the fullest expression. Many methods have been devised by which external buoyancy might be brought into play; and while some of them have been well thought out and are based upon long-established engineering principles still only one of them has achieved practical results. This last was employed by the Admiralty Salvage Section of the British Navy in 1918 and 1919, and consisted of a series of horizontal surface pontoons attached to steel cables passing under the wrecks. In one case, a laden collier, having a submerged dead weight of 2500 tons, was lifted from a depth of 72 feet by sixteen 9-inch wire hawsers; and another craft, having a submerged dead weight of 3800 tons, was similarly raised from a depth of 138 feet. The utmost care had to be exercised, and much time was consumed in effecting these reclamations. Ordinarily, it would not pay to follow the same procedure; and the fact that kindred measures have not been requisitioned to salvage the "Lusitania" and other totally submerged vessels in view of these precedents plainly shows that they are hardly fitted for commercial application.

Four years ago, the SCIENTIFIC AMERICAN printed an article descriptive of Carl J. Lindquist's system for the refloating of deeply-sunken ships through the medium of a novel type of vertical pontoons, and Mr. Lindquist is now satisfied that his pontoons are especially suited to handle the "Lusitania." The pontoons are designed to take in water ballast so that they may be partly submerged vertically a matter of 18 feet, and their pull is, therefore, not dependent upon the rise of the tide, as is usually the case with surface pontoons. Again, by utilizing vertical instead of horizontal pontoons, Mr. Lindquist puts his stresses upon the pontoons in the direction in which they are structurally best able to sustain a maximum load; and, what is equally important, the diameter rather than the length of his pontoons limits the number which can be arranged around a wreck. By an ingenious arrangement of sliding bits, mounted on top of each pontoon, the inventor provides an equalizing device which automatically maintains a uniform tension on the four cables connected to every pontoon and passing under the keel of the boat.

To refloat the "Lusitania," Mr. Lindquist would have recourse to twenty of his pontoons, each 30 feet in diameter and 75 feet in length, and capable of lifting 1000 tons. He believes the keel of the liner, both at the bow and the stern, rises 10 or 20 feet above the seabed, and this would permit "sweeping" hawsers in under her at each end. By placing strings under the bow and the stern first, and by rocking the ship alternately by the lifting and tugging action of the attached pontoons, he is sure that the grip of the seabed could be broken. With this done, other slings could be swept into position fore and aft beneath the "Lusitania" until so distributed that each would bear its proportionate share of the load. By expelling the water ballast from the pontoons they would rise and carry the steamer with them. The flotilla would then be towed shoreward until the wreck came once more in contact with the floor of the sea. The pontoons, at that point, would again take in water ballast to increase their draft, when the slack of the slings would be taken up. This process would be repeated until the coast shallows were reached, where ordinary salvage work would ensue.

Following in the footsteps of Mr. Lindquist, Mr. Jesse W. Reno has devised a system of multiple-unit, vertical pontoons which was described in the SCIENTIFIC AMERICAN of November, 1921. Mr. Reno does not rely upon slings passing under the keel of a submerged vessel, but would fasten his pontoons by means of hooked rods, right to the hull plating at points close to the framing where the structure would be strongest. The terminal hooks of the rods would engage holes bored electrically in the steel skin of the wreck.

With all of his pontoons in position, Mr. Reno would admit air to them through their open bottoms — directing the buoyant medium into the pontoons by a wheeled, seabed siphon or some other suitable apparatus. When the pontoons had acquired the needful buoyancy they would pull the wreck loose from the bottom of the ocean.



The pontoons are numbered in the order in which the several pairs would engage the wreck by means of slings passing under the vessel's keel. The ship would be rocked forward and back upon the pivotal point P, to facilitate sweeping the slings under her entire length. It is claimed that the vessel's position is such, and the shell bottom of such hardness, that it would be comparatively easy to get the wire-rope slings in place

The manner in which the Lindquist vertical pontoon might be used in the salvage of the "Lusitania"