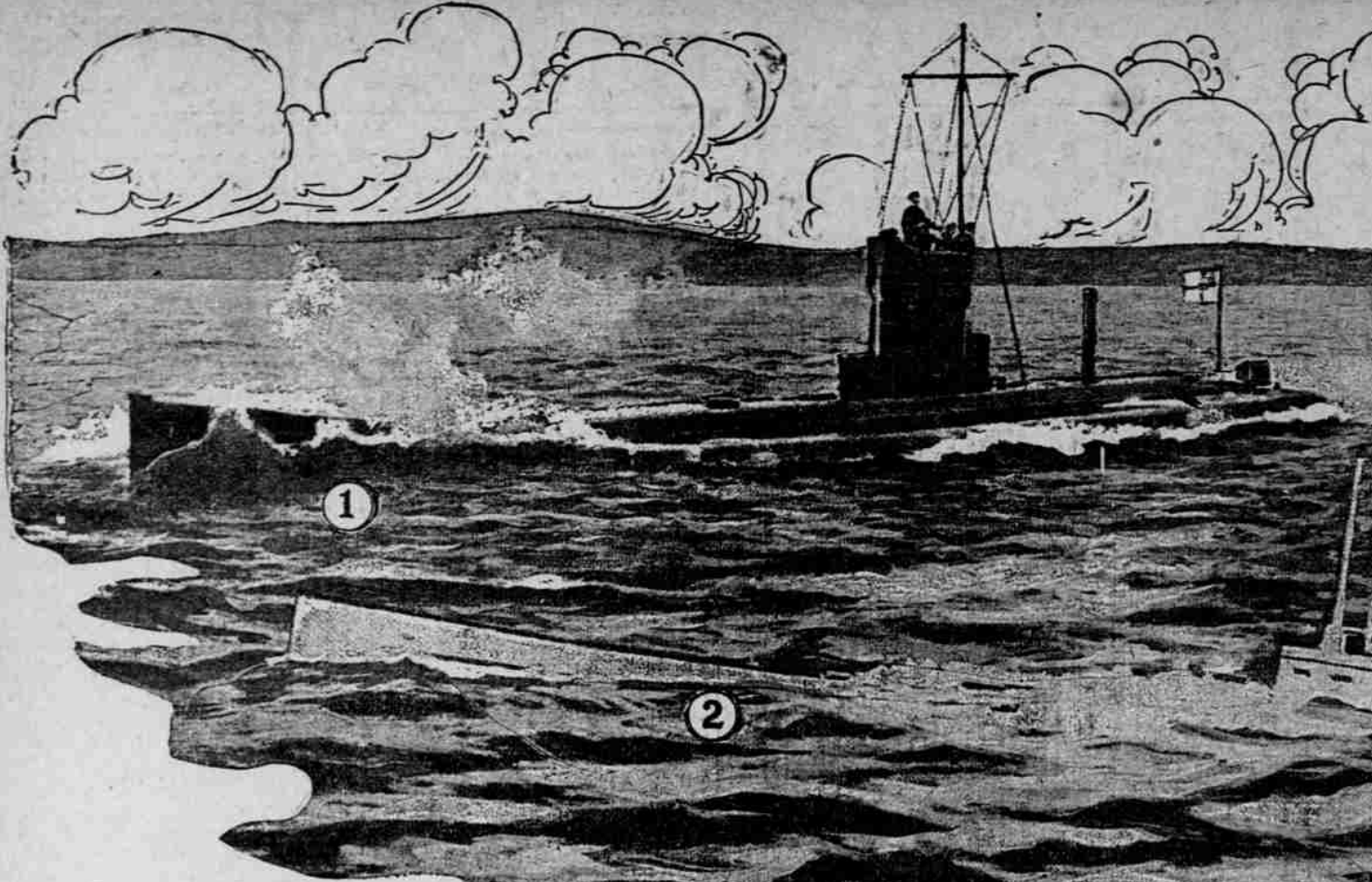


BLOCKADE BY MINE AND SUBMARINE



GERMAN SUBMARINES

- 1- LIGHT CONDITION
- 2- AWASH
- 3- SUBMERGED.

TIMELY to the very tip of the investigation point is Charles W. Domville-Fife's book, "Submarines, Mines and Torpedoes in the War," just brought out in America by the George H. Doran Company.

Germany, with her battle fleet, has her coast defenses, has proclaimed a blockade of Great Britain. She depends upon her under-sea fleet to starve the British despite their cordon of massive battleships, through which it is doubtful if the surface craft of any navy in the world could break.

Will Germany succeed? What are these fighting engines which may fairly blow the United States, against the will of her people, into a war which has already assumed almost world proportions? How are these sub-sea monsters operated? How do they attack? What can be done in defense against them? Will Germany be able to cripple, perhaps annihilate, British trade? These questions are on thousands of lips and Mr. Domville-Fife's book answers them all—except the first and the last.

Some idea of the importance of this comparatively new branch of the naval service may be gained from figures cited by Mr. Domville-Fife in his introduction. He says that no fewer than 254 under-water fighting craft are engaged in the present conflict and that nearly 20,000 highly trained men are required for their manning, repairing and overhauling.

In what Mr. Domville-Fife terms the first, or submarine phase of the war, he says no fewer than eight warships have been sunk by submarine torpedoes. All of these were perhaps not fired from submarines, but technically they come under the heading of sub-surface attack.

In a chapter on the construction of submarines the author says: "It may sound ridiculous, in face of the many accidents which have occurred, to say that one of the greatest difficulties is to make a submarine sink sufficiently quickly, and one of the easiest operations to make her rise, and yet such is undeniably the case.

"When a submarine is traveling on the surface she is in what is technically called the light condition—that is to say, with her water ballast tanks empty—but when it is required to sink her so that only the tiny platform, or deck, and conning tower are above the surface water is let into these ballast tanks and the additional weight causes her to sink into the sea until her back is almost flush with the surface. This is known as the awash condition.

"To many it may appear strange that total submergence is not accomplished by letting still more water into the ballast tanks, but entirely with the aid of the propellers and rudders. A submarine has two and sometimes three pairs of rudders; one pair of ordinary vertical ones to guide her to port or starboard, and a horizontal pair to cause her to dive and rise.

"In order to make the submarine dive beneath the surface, the horizontal rudders are deflected when the boat is traveling at full speed. The action of the water against the rudders is such that the bows are forced down and the whole vessel slides under the surface.

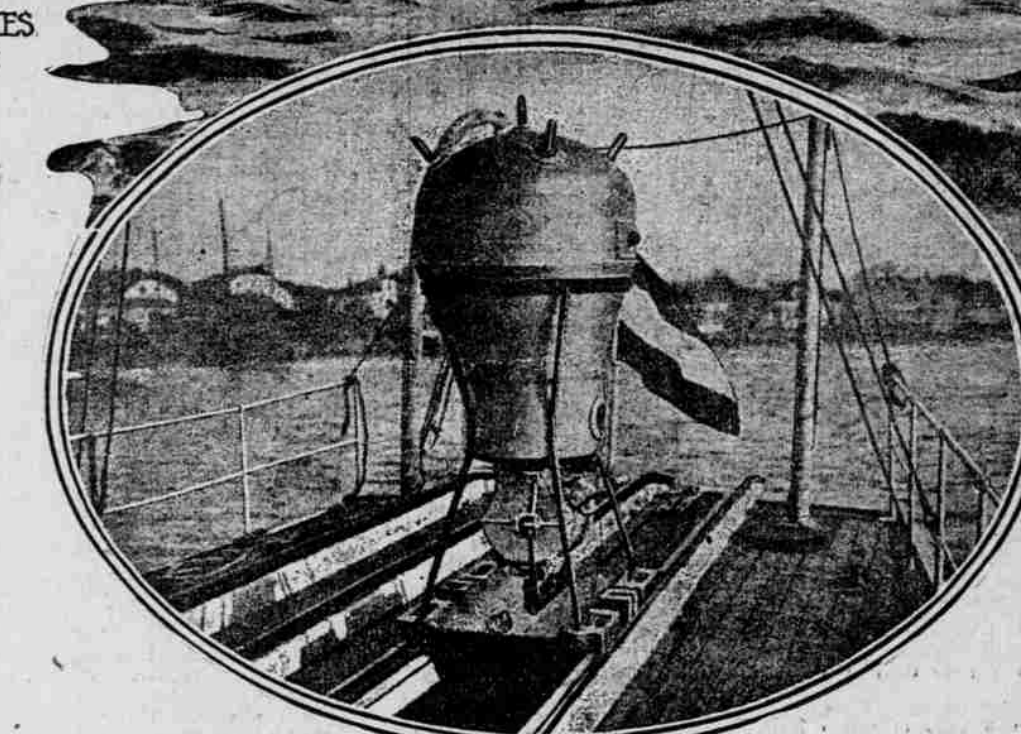
"From this it will be seen that a submarine is only held below the surface by the action of her rudders on the passing water; should the propellers driving her along cease to revolve and the vessel slow down she automatically rises to the surface because the rudders have no longer any effect.

"Of the many complicated problems surrounding submarine boat construction the motive power and propeller engines have been in the past and are still the most profound puzzles. Steam, compressed air, electricity, petrol and heavy oil have all been used with varying results.

"About steam and compressed air little need be said, for although given a good trial, especially by the French naval authorities, they were abandoned some years ago in favor of a combination of petrol and electric engines, which in turn have given place to more powerful machines using heavy oil and electricity.

"American inventors are, however, still experimenting with air engines. Steam also is again being used in conjunction with turbine engines for surface propulsion.

Must Have Electric Engines.
"It being quite impossible, for obvious reasons, to use a petrol engine when running submerged" is quoted from Mr. Domville-Fife's book again, "a second motive power, an engine, with its additional space and weight, has to be carried to drive the submarine when under water. For this purpose electricity is used in almost all types. This is extremely dangerous, for should salt water in any way gain access to the storage batteries, chlorine gas would be given off in large quantities, al-



A GERMAN SUBMARINE TROYL MINE ON THE DECK OF A MINE LAYER.

FROM "SUBMARINES, MINES AND TORPEDOES IN THE WAR" COPYRIGHT, GEORGE H. DORAN & CO.

though in the more recent vessels of the British, American and French navies this danger has been minimized by enclosing the batteries in airtight cases.

"Perhaps the greatest difficulty which has beset both submarine construction and navigation is the puzzle how to see when submerged. This is now accomplished by means of periscopes or tubes extending up from the roof of the submarine to a height of several feet above the surface—not unlike hollow masts. By a series of lenses and reflectors a picture of the surface is thrown down these tubes onto reflectors inside the submarine. A man with his eyes at the bottom of the periscope can see the surface clearly. Although it may project above the water when the whole submarine is submerged, it is far too small an object to be easily seen moving through the water and extremely difficult to hit by gun fire.

"The latest panoramic periscope, two of which are fitted in modern submarines, has a field of vision of about 60 degrees.

"The chief armament of all submarines is the torpedo, which is expelled by a blast of compressed air from one of the tubes fitted in the bow and stern. Several torpedoes are usually carried by each boat.

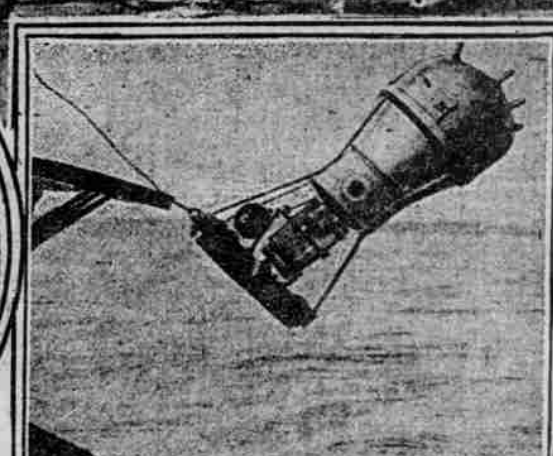
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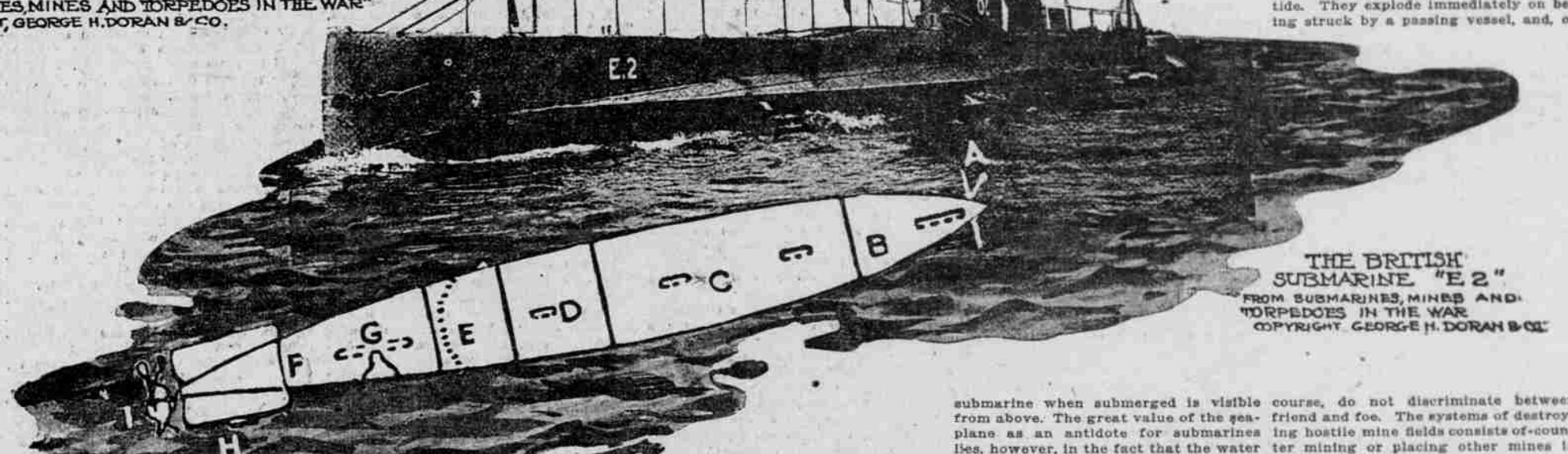
"The modern torpedo varies in length from 14 to 19 feet and weighs up to half a ton. It has an extreme range of 4000 yards, or just over two miles and a quarter. There are three types of torpedoes in use by the fleets at war—the Whitehead, the Schneider and the Schwartzkopf. All these types are alike in their essential features, and therefore need not be described separately.

"The latest pattern 18-inch Whitehead torpedo is propelled by compressed air stored in that section of the weapon known as the air chamber. (See diagram.) The air on being released is heated and expanded in a tiny three or four-cylinder engine which operates twin screws, moving 'clockwise' and 'anti-clockwise.' The 'war head' contains about 200 pounds of wet gun-cotton, which is exploded on the torpedo striking an object. The essential features of the Whitehead torpedo are shown in the diagram. This torpedo maintains a speed of 42 knots for 1000 yards, 38 knots for 2000 yards, 32 knots for 3000 yards and 28 knots for 4000 yards. Thus if discharged at a distance of half a mile it reaches its object in about 45 seconds.

"Torpedoes are fired, or ejected, into the sea from surface or submerged tubes, and on striking the water are propelled by their own engines in an absolutely straight course toward the target. The exact mechanism of the submerged tube—which is used in surface war ships as well as in submarines—is a naval secret. When fired



LAUNCHING A GERMAN TROYL MINE FROM SUBMARINES, MINES AND TORPEDOES. IN THE WAR. COPYRIGHT BY GEORGE H. DORAN & CO.



THE BRITISH SUBMARINE "E 2" FROM SUBMARINES, MINES AND TORPEDOES IN THE WAR. COPYRIGHT, GEORGE H. DORAN & CO.

Sketch showing the essential parts of a Whitehead torpedo. A. Pistol, detonator, primer, which causes the explosion of "B" when the torpedo strikes an object. B. Explosive head, filled with wet gun-cotton. (The "war-head" is substituted by a weighty dummy during practice.) C. Air chamber with compressed air, at a pressure of approximately 350 lbs. per square inch, for action. The chamber is tested to stand a pressure of 1700 lbs. per square inch. D. Balance chamber, containing mechanism for regulating the depth of submergence at which the torpedo is adjusted to run. E. Engine-room, containing propelling machinery (I.H.P. 60 in latest 18-in type). F. Buoyancy chamber—a practically empty chamber—to give the necessary buoyancy to the torpedo. G. Gyroscope. An instrument for correcting any deviation of the torpedo from the line of fire. H. Rudders, and mechanism for operating. I. Twin-screws, operating "clockwise" and "anti-clockwise."

from a surface tube the torpedo sinks immediately to a depth of about 10 to 14 feet, and maintains this depth until it strikes its object. When fired from a submerged tube it rises, if necessary, to the same level. A torpedo always proceeds toward its object of attack at a depth of a few feet below the surface. This, combined with speed, renders it almost impossible to destroy an approaching torpedo by gun fire.

Regarding submarine attack, Mr. Domville-Fife says: "With the exception of one or two vessels, which it would be unwise to specify, all the submarines engaged in the present war have what are called fixed submerged tubes. This means that the tubes from which the torpedoes are discharged are fitted inside the submarine on a line with the center of the boat and cannot be moved or aimed in any way apart from the boat itself. It therefore becomes necessary for the submarine to be aligned by the steering rudders on the object of attack before the torpedoes can be discharged. In simpler vein, torpedoes can only be fired by a submarine straight ahead or straight astern. Hence a submarine with a hostile warship coming up on its beam is compelled to turn and face its opponent (or turn its stern toward her) before delivering an attack. Generally speaking, however, a hos-

wild plow up the waters around her. If the first two torpedoes missed their mark the submarine might either dive completely under the object of attack and then fire her stern tubes at close range or else maneuver below the surface for an attack from some other point.

"The submarine and the aeroplane are the only weapons against which there is no true means of defense, and yet one is being used as an antidote for the other.

"The seaplane may be able to distinguish the dark patch in the sea caused by the hull of the submarine in clear water, but she cannot destroy it, neither can she signal the exact locality to an accompanying destroyer flotilla, owing to the speed with which seaplane and submarine pass over and under each other; furthermore, in rough weather or in shallow, muddy water no sign of the

submarine when submerged is visible from above. The great value of the seaplane as an antidote for submarines lies, however, in the fact that the water of the open sea is usually clear and the submarine shadow is visible from above, and, second, in the great speed of these aircraft, which enables them to quickly cover miles of sea in their search for hostile submarines and to report their presence in a given locality by wireless to all ships operating within range.

"Many means of attack on submarines have been proposed, and no doubt some of these, in certain cases, would prove effective; but none can be relied upon. Therefore, one of the points in favor of the submarine still remains without its antidote. This is the moral effect, for if there is no absolutely reliable means of defense there can be no feeling of security for surface warships or merchant vessels when anywhere within the danger zone of the submarine.

"Let us now examine briefly what practical methods of defense a modern warship has against submarine attacks. Great speed is undoubtedly a surface

ship's most reliable defense, and, when combined with a frequent change of course, would greatly reduce the chances of a successful under-water attack. Should hostile submarines be on the line of advance they would not know whether to wait and chance the enemy approaching within torpedo range or whether to run to starboard or port. That is, if the surface warship was steaming in an erratic course—not a zigzag course, for then it might be possible to estimate, within torpedo range, the position of the ship at a given point if the 'tacks' were regular.

"Should submarines be seen approaching a surface vessel would do well to turn her stern to the attacking flotilla, presenting as small a target as possible, and deflecting the torpedoes by her propeller race.

"In addition to submarines, the Germans are counting on submarine mines to make effective the blockade of the British coast. The system of defense consists of the mooring of mines in such positions as to make it almost impossible for hostile ships to pass without either striking or coming within the destructive zone of one or more of them. What are known as floating mines are those set adrift to be washed about by the tide. They explode immediately on being struck by a passing vessel, and, of

course, do not discriminate between friend and foe. The systems of destroying hostile mine fields consists of counter-mining or placing other mines in the enemy's field and destroying it by their explosion and by sweeping. The latter method is the one mostly employed in modern warfare. The boats taking part in the sweep place themselves one on each side of the mine field and between them hangs a long wire rope, weighted in the center to keep it well submerged. They then move forward, sweeping the mines to the surface and exploding them harmlessly.

"For clearing away the mines dropped by an enemy special vessels are employed. Each vessel is fitted on both sides with a curious contrivance known as the 'picking up gear.' This apparatus is lowered into the water and 'picks up' any mines which may lie in the path of an oncoming fleet. When a mine field is discovered by either destroyers or seaplanes these vessels are immediately dispatched to destroy it, and they are aided, in the case of the British navy, by a large flotilla of steam trawlers.

MAY END PERILS OF RAILS

(Continued From Page 2.)

is that it is so constructed, on a closed circuit principle, that any break, failure or disarrangement of any part of the main track or contact rail connections, or the failure of the electric current, or any disarrangement of the locomotive attachments will cause the most restrictive indications, when the train will be brought to a stop until corrections or repairs are made, when it can proceed, but under control of predetermined speed only. The wiring is especially constructed so that any crosses or grounds will cause a danger condition. If repairs cannot be made immediately by the engineer he may cut out the instrument, when the train can proceed, but if this is done a record is made.

Another feature of the device is its elasticity and adaptability to the movement of any and all kinds of trains, irrespective of their motive power or frequency. The system will work equally well on trains operated by steam, electricity, gasoline or compressed air, and whether such application is direct or by means of the trolley, third rail or storage battery methods.

The initial purpose is to promote the safety of railway operation and to eliminate all danger from lapses of memory on the part of the engineer or others connected with the operation of railways, and to make such a

record as will provide an exhibit of proper or improper operation and observance of signals and orders.

The control of the movement of trains is in the hands of the engineer just as long as he observes the restricting signals provided for his guidance, but any failure to do so immediately and automatically relieves him of said control. As soon as the conditions permit of safely doing so, the control is again and automatically restored to the engineer.

The manner in which the purpose of the system is carried out is as follows:

When a train is standing at a terminal or at any other point, the automatic apparatus is in such condition that the train can only proceed at a predetermined reduced speed. When the engineer opens the throttle to proceed it automatically starts a whistle in the cab. This whistle continues to sound and the reduced speed regulation continues until the train contact shoe engages with a clear contact rail, shoe engages with a fully energized apparatus which sets the control in position to permit the train to proceed at full speed and also stops the whistle. The contact with this shoe is recorded by a recording apparatus, and the contact also causes the lighting of a signal lamp in the cab. The passage of this rail is acknowledged by the engineer, who presses a button which puts out the lamp and this ac-

knowledgement is also recorded by the recording apparatus.

The next action which may be described is when the contact shoe engages with a partially energized contact rail, which indicates a caution condition. When this occurs, the engine apparatus is again set for reduced speed, as when starting out, and the whistle blows continuously. If, in the meantime, the train in the advance block has moved on, or any other obstruction has been removed, so that the next contact rail is in "clear" condition, the cab system will be automatically returned to normal, full speed condition when it passes such contact rail and the whistle will stop.

On the other hand, if the danger condition continues and the contact rail is de-energized, denoting danger, the train will be automatically stopped when its contact shoe comes in contact with this de-energized rail. This stopping will also be recorded and at the same time a chime of two whistles will be sounded to warn the engineer that this is a stop application.

If the engineer desires to proceed, he must press a button on the cabinet door, which resets the automatic apparatus to caution or slow speed condition. Having reset the instruments, he may now proceed as in the first instance, at controlled reduced speed.

Oh, Goal 'Long!

(Chicago Herald.)
"What do you think of my football team?"
"Why do you call it that?"
"Because it has a full back."