

THE SUBMARINE MINE.

Throughout the great naval conflict in the Far East, which, to all intents and purposes, was closed by the battle of the Sea of Japan, it must be admitted that the most destructive agent has been the submarine mine and its first cousin, the torpedo. This, at least, is true of the earlier phase of the campaign, and, indeed, of all that part of it which preceded the above-named battle. The accounts of the fierce struggle in the Straits that have so far been made public are so confusing, and in some respects contradictory, that it is difficult to determine how far the wiping out of the Russian fleet was due to the gun, and how far to the torpedo. The consensus of opinion, based upon these reports, gives the credit for the destruction of Admiral Rojestvensky's fleet mainly to the gun, although it is generally agreed that in many cases the final death blow was delivered by the torpedo, after the sting of the Russian fighting ships had been drawn and they were in no condition to repel torpedo attack. The torpedo is to all intents and purposes merely an automobile mine, the charge of high explosive being carried in the bows of a self-steering and self-propelled vessel in the case of the torpedo, and being carried in an anchored vessel in the case of the submarine mine.

Great things were expected of high explosives in the present war, and they have certainly vindicated their reputation with a vengeance. The list of fatalities to ships of both fleets is certainly a tremendous one. Among the Russian warships put out of action, permanently disabled, or sent instantly to the bottom are such costly ships of the Russian navy as the battleships "Czarevitch," "Retvizan," "Petropavlovsk," "Pobieda," and "Sevastopol," in the Port Arthur campaign, several battleships and cruisers in the Sea of Japan, and the battleships "Hatsuse" and "Yashima," and the cruiser "Takasago" on the Japanese side, to say nothing of many a cruiser and torpedo boat of less size and value than these that have felt the deadly stroke of this much-dreaded weapon.

Although the submarine and the floating mine have been used by both the Russians and the Japanese in what might be called active or aggressive warfare, it is generally recognized that the legitimate sphere of the submarine mine is that of harbor defense and the obstruction of channels, straits, and other waterways. The supreme value of the mine lies in its perfect adaptability to harbor defense, for which purpose it holds a position which many experts consider to be more important even than that of the high-powered breech-loading rifle. As a matter of fact, however, artillery, heavy and light, go hand-in-hand with the submarine mine for harbor defense; for no matter how heavily and scientifically the approaches to a harbor might be sown with mines, they would present but little real obstacle to the entrance of an enemy's fleet, were they not themselves covered and protected by numerous and well-placed batteries of rapid-fire guns. Without such protection, it would be entirely possible for a hostile fleet to send out its boats and steam launches in pairs, with a cable passing from stern to stern of each pair, and by dragging this cable slowly across the mine field to locate the mines and explode them prematurely. This is provided against by mounting, in positions commanding the mine field, batteries of rapid-fire guns, big and little, which cover the mine-strewn area so completely with their rapid fire as to render sweeping operations of this kind impossible.

In all well-defended harbors there is a co-operation of artillery mines, searchlights, and range and position finders which is so complete as to render the entrance of a hostile fleet well-nigh impracticable, or at least so

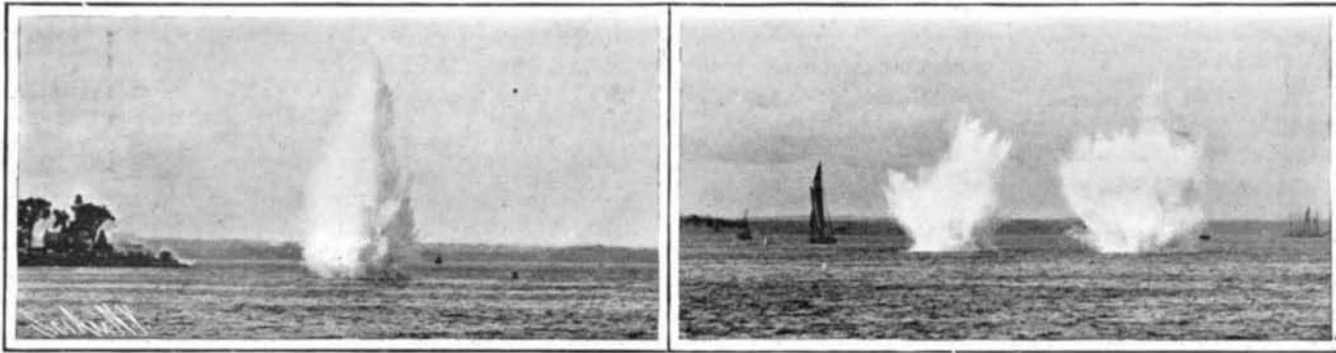
hazardous that no admiral would feel himself justified in incurring the inevitable loss of ships that would result from attempting to force a passage. The truth of this will be evident from the consideration of the defenses of New York harbor. Here we have several lines or zones of protection. A fleet attempting to enter the harbor, say for the purpose of placing itself within shelling range of the most valuable section of Manhattan Island, would encounter the first line of defense at a distance of, say, 7 or 8 miles from Sandy Hook, where the ships would come within accurate range of the 10 and 12-inch guns mounted at the forts. As the fleet drew closer, to within a range of, say, 5 or 6 miles, the ships would be subject to an almost vertical fall of 12-inch mortar shells, which would begin to rain from the sky, passing easily through the protective decks, which would merely serve to burst their high explosive charges within the magazines, engine rooms, and boiler rooms of the ships. As the ships drew yet closer, the 12-inch and 10-inch guns, to say nothing of the 8-inch pieces, would begin to deliver their projectiles against the armored portions of the ship with a velocity that would insure penetration; for the fleet, if it were successful in finding and following the main entrance channel, would have to draw in almost within point blank range of the heavy artillery at Sandy Hook. Here also it would begin to pass over the outer mine fields. The ships that succeeded in passing Sandy Hook would now be subjected to a deadly and accurate fire from the big guns located at Fort Hamilton and Fort Wadsworth, on opposite sides

The heavy column of water thrown up to the great height shown in our front-page engraving gives a very realistic impression of the energy exerted by the gases of explosion. When this energy is let loose against the thin plating of a ship's hull, it can easily be understood that a large section of the ship is blown bodily inward. Although, as the war has shown us, contact with a submarine mine does not mean necessarily the immediate and absolute loss of the vessel, as in the case of the "Hatsuse," or the "Petropavlovsk," it does in every case mean the total disablement for the time being of the vessel struck.

Primeval Insect Finds.

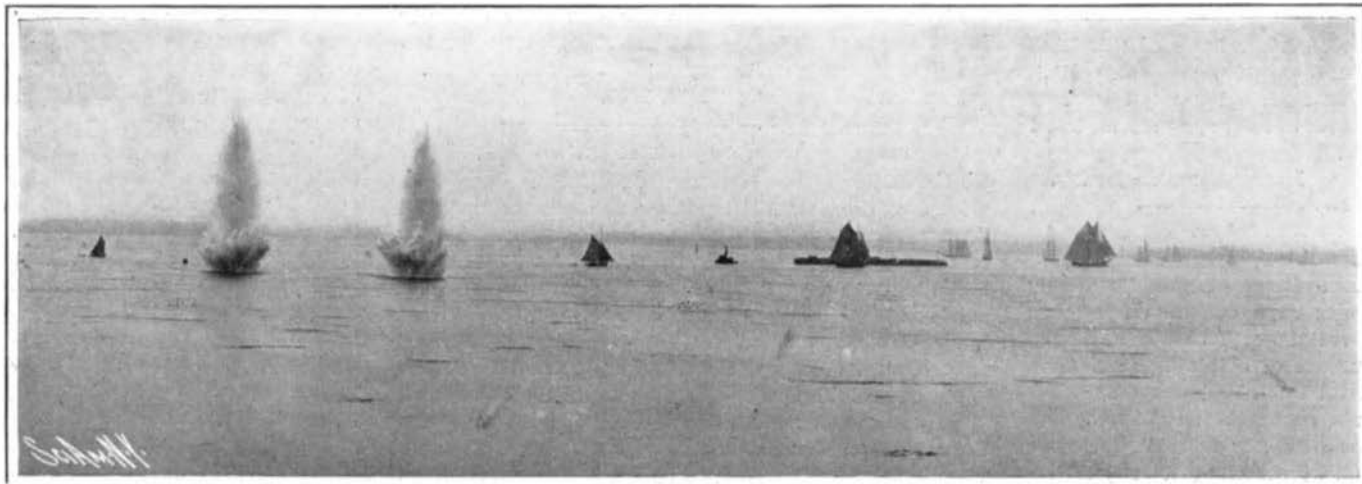
Some highly interesting finds of insects have recently been made in Permian groups (lower division of red sandstone rock) in Russia, about which an interesting paper has now been filed among the minutes of the Imperial Academy of Science at St. Petersburg. In the coal fields of Europe and North America, and in the immediately adjacent lower divisions of the Permian formations or Dias of both countries, the finds hitherto made have (apart from members of the Blattoidea) consisted exclusively merely of remains of such insects which could not be classified with certainty with any of the still existing orders. In the Russian Permian strata there have now been brought to light what may well be termed "the missing links" between extinct and recent groups of those orders which are already met with (in many and highly developed forms) in the mesozoic or secondary period

of the earth's existence or development. Retschajew, in his work dealing with Russian Permian formations, has already described some fossil forms which, however, only demonstrate the existence of true Ephemeridæ and of what are assumed to be Perlidæ, which, until that date, were quite unknown as being contemporaries of the Paleozoic period, although some predecessors or rather forerunners of the family have been found among insect remains in Carbonaceous deposits. Among the new and highly valuable finds made by Prof. Koken, of Tübingen, at Tichagori on the Kama (a tributary of the Volga) and which have been sent to the museum of



Effect of 200 Pounds of Gun Cotton.

The Mines are Laid so Closely that a Ship Cannot Pass Through Without Contact.



Exploding Two Submarine Mines in Long Island Sound.

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of the Narrows, and such vessels as had not already been disabled or sunk by gun-fire, or wrecked by submarine mines laid in the entrance channel, would, in attempting to pass the Narrows, be certain of destruction either by gun or mine. The ships would be under close range of the guns on either shore and they would have to thread their way through a channel so thickly sown with mines as to render their passage unharmed an absolute impossibility.

Submarine mines are divided broadly into three different kinds. First, observation mines, fired from shore when a ship is judged to be within range—a type seldom used to-day; second, automatic mines, which are self-firing when they are struck by a passing ship, which is the type that did the damage in the Japanese war; and third, electrical-contact mines which, when they are touched by a ship, give notice to an operator on shore, who, by throwing a switch, fires the mine. This last type is particularly suited for the defense of harbors and waterways which are frequented by friendly ships, either ships of war or merchant vessels; for if these are used, a vessel may pass through the mine field and touch the mines without coming to grief, the firing of the mine being intelligently directed.

The accompanying illustrations were made from photographs, taken when mines that had been laid in certain harbors and channels of the United States were exploded as the most expeditious way of removing them after the close of the Spanish-American War.

the Imperial Academy of Science in St. Petersburg, there are included forms which may be regarded as the direct ancestral group of the bug family (Hemiptera) as they plainly show the characteristics of the two still existing sharply defined groups of bugs. One of the most interesting forms is that of a praying cricket or mantis; a comparison of which with the wings of those found in Jura formations shows a remarkable correspondence whereof with all the characteristic features of the family. From the point of view of the evolutionist it is a most interesting fact that these, relatively speaking, already at the time highly organized insects were so well defined as early as the Paleozoic period, their different orders being then apparently as sharply and clearly defined as at the present time. In marked contradistinction to this, vertebrate animals have required a far longer period for their development. As is well known, the first birds and mammals are found in the Mesozoic period, while man—"creation's crown," as he calls himself, or is called poetically but perchance satirically—does not appear upon the scene till a much later date. Human fossil remains are found only in diluvial strata; the deposits or formations of the immediately preceding Tertiary period only show traces of his existence in the shape of very crude stone implements, but no traces of the makers have ever been found.

The Danube flows through countries in which fifty-two languages and dialects are spoken.

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Explosion of a Submarine Mine at Willet's Point.
THE SUBMARINE MINE.—[See page 160.]