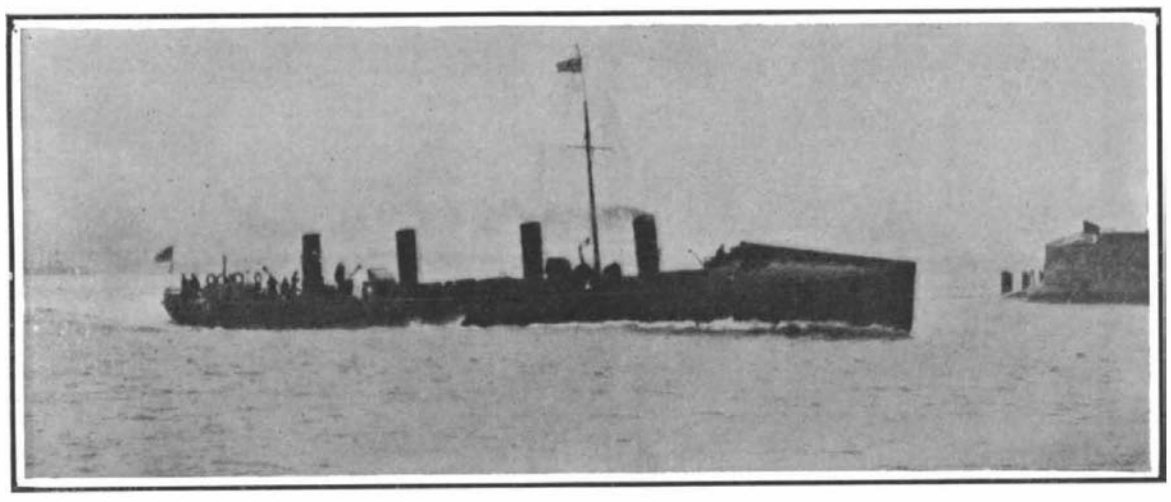
TESTING A TORPEDO-BOAT DEFENSE.

BY AN EYEWITNESS.

A most realistic test of the value of a boom for the defense of harbors against the attack of torpedo craft has just been made by the British Admiralty. In 1904 the submarine mine fields which up to that date had been maintained at the entrance to the principal British naval ports were abolished, and at the same time the Brennan torpedo—a weapon operated and directed from the shore by means of endless steel wires—was also discarded. These changes were followed by the organization of submarine and torpedo flotillas for the local defense of the ports, and simultaneously a great deal of attention began to be paid to the question of boom defense.

The latest pattern in these obstructions adopted by the British Admiralty consists of a number—generally from 100 to 150—of balks of timber, each about ten feet long, tied together by four lines of strong steel hawsers. At intervals along its length, the boom is attached to pontoons which are themselves anchored to the bottom of the channel by heavy mooring chains. Each balk of timber is about a foot square in section, and is studded with a number of stout, curved steel spikes, four projecting from either end, and others being placed along the length of the balk at intervals of about three feet. The object of these spikes is to prevent the "jumping" of the boom—an incident which has occurred more than once in maneuvers. It is achieved by all movable weights—including the crew—being taken aft, thus lifting the bow of the vessel well out of water. Then, running at the boom at full speed, the nose would be pushed well over the edge of the boom, and the impetus of the vessel and the sudden rushing of the men forward again would in most cases prove sufficient to carry the ship safely across. A few years ago, however, a British torpedo vessel broke her back while trying to jump a boom.



Destroyer "Ferret" as she appeared when approaching the boom at 15 knots speed.

It was, of course, well understood that any vessel larger than a destroyer could easily break any boom yet devised. The British Admiralty, however, after much discussion, came to the conclusion that the only vessels likely to penetrate the outer line of British port defenses were destroyers and torpedo boats (including, of course, submarines), and it was therefore decided to put to a practical test the problem whether a vessel of one of these types could burst through a boom of the latest pattern.

A section of a boom of the latest design was therefore erected across a small creek in the upper reaches of Portsmouth harbor. In addition to the spikes already described, the boom was furnished with a three-inch wire hawser stretched about three feet above the balks, with the object of shearing the masts and funnels from any destroyer which might have the audacity to charge the boom, and to force it down on to the steel spikes. Five feet below the surface there was another hawser, designed to impede the progress of the ship and to foul its propellers.

The attack was intrusted to the torpedo-boat destroyer "Ferret," an obsolescent vessel of 280 tons, launched in 1893. Her engines are of 4,810 horsepower, the designed speed being 27 knots. For the purpose of the test she was strengthened by means of steel plates fixed to either side of the bow, but this was only done to give her a greater resemblance to the latest vessels of the destroyer class. Nominally her crew consisted of seventy men, but for the purpose of the trials a volunteer crew of ten was selected, Lieut. J. C. Hodgson being in command and Artificer Engineer J. Hawkesworth in charge of the engines. Before starting, the whole of the crew were directed to come on deck as soon as the vessel got within one hundred yards of the boom and to be ready to jump overboard, while a large number of tugs and launches were in the vicinity to pick up the expected pieces. These facts alone are sufficient evidence that the Admiralty officials did not expect the "Ferret" to get through, at any rate without considerable damage to herself.

Of the trial itself there is little to say. It took place at five o'clock in the morning of July 28th. The "Ferret" left Portsmouth harbor, and, turning round, steamed toward the boom at about fifteen knots. The lieutenant and quartermaster stood on the bridge and at the wheel respectively, and steered a course direct for the center of the obstruction. When a hundred yards distant steam was shut off. The surrounding pinnaces and tugs closed in, the "Ferret" caught the boom between two balks—and went through it as easily as if it had been packthread. No shock whatever was felt on board. and everyone—engine-room staff and stokers included—remained at their posts, and were, in fact, unaware of the fact that the obstruction had been cleared. A glass of water left standing on the wardroom table was not even spilled.

The hawsers were cleanly cut, and the two halves of the boom swung round with the tide toward the shore.

The "Ferret" could easily have proceeded into the dockyard under her own steam, but two tugs took charge of her, and later in the day she was docked. An examination showed that she was quite undamaged. The hawsers had made a dent in her bows, but no plates were started, and she was making no water. It is not believed that she was strained in the slightest degree, but this will not be definitely known until a thorough examination has been made.

The experience was practically a repetition of what occurred in 1885, when the torpedo-ram "Polyphemus" charged and broke a strong boom at Berehaven in Ireland. In that case, however, the attacking vessel was a craft of over 2,000 tons, and the boom was not so scientifically constructed as that tested at Portsmouth.

It is understood that the Admiralty intend to carry out a series of tests, with the object of discovering a really efficient obstruction for harbor mouths. It is suggested that a series of wire entanglements, placed one behind the other, will next be tried. As was to be expected, the result of the Portsmouth trial has already led to a demand for the reinstallment of the submarine mine defenses of British harbors.

THE FIRST CROSS-COUNTRY FLIGHT OF THE AERONAUTIC SOCIETY'S BIPLANE.

As mentioned in our last issue, Mr. Charles F. Willard has been learning to fly the Curtiss biplane acquired recently by the Aeronautic Society. Last week, in the vicinity of Mineola, L. I., Mr. Willard made practice flights early in the morning almost daily. On the 14th instant he made a flight in the shape of the letter S of nearly five minutes' duration, in the course of which he traveled about three miles. The following morning, at 5:26 A. M., he started off as usual near the fair grounds at Mineola; but, instead of circling over the plain, he drove the machine above the fair grounds some three miles across country to Garden City. At this point he turned to the left and headed for the grounds of the Meadowbrook Hunt Club, passing over a group of men on their way to work, who waved their caps and cheered. From this point he flew toward Westbury, swerved to the south, and crossed the Motor Parkway, making several turns. He traveled to the outskirts of Hicksville, whence he directed his machine straight back to Mineola. Before reaching the starting point, however, something about the motor gave out, and the machine was forced to descend upon rather rough ground. The landing was made without damage, however. The machine was in the air over nineteen minutes, and covered a distance of about twelve miles. The height attained was about 150 feet. This is the second cross-country flight made in the United States by any aeroplane, the first one being that made by the Wright machine in its government test on the 30th ultimo. Mr. Willard traveled somewhat farther than did Orville Wright and Lieut. Foulois, though the ground over which he flew was much smoother and less dangerous in case the machine was obliged to alight. This flight surpasses any ever made by Mr. Curtiss himself, or by Messrs. McCurdy or Baldwin. In addition to being a cross-country flight, it is the longest flight yet made in the United States by any machine other than the Wright. It is probable that further exhibition flights will be made with this machine by Mr. Willard in the near future.

MR. CURTISS AT RHEIMS.

Mr. Glenn H. Curtiss arrived in France on the 12th instant with his aeroplane, which was packed in boxes. The machine was taken as personal baggage directly from Havre to Rheims, and after busying himself the following day with its erection, Mr. Curtiss announced that it was almost ready for trial. This will give him a full week in which to tune up the machine and prepare for the races, which start on August 22nd. There seems little doubt that Mr. Curtiss's new biplane will make an excellent showing against the two score machines with which he will have to compete.

THE TRIAL FLIGHT OF THE "BADDECK NO. 1."

"Baddeck No. 1," the new biplane with which Messrs. McCurdy and Baldwin are experimenting at Petewawa military camp in Canada, met with an accident when the first flight was attempted on August 13th. The machine reared suddenly in the air and

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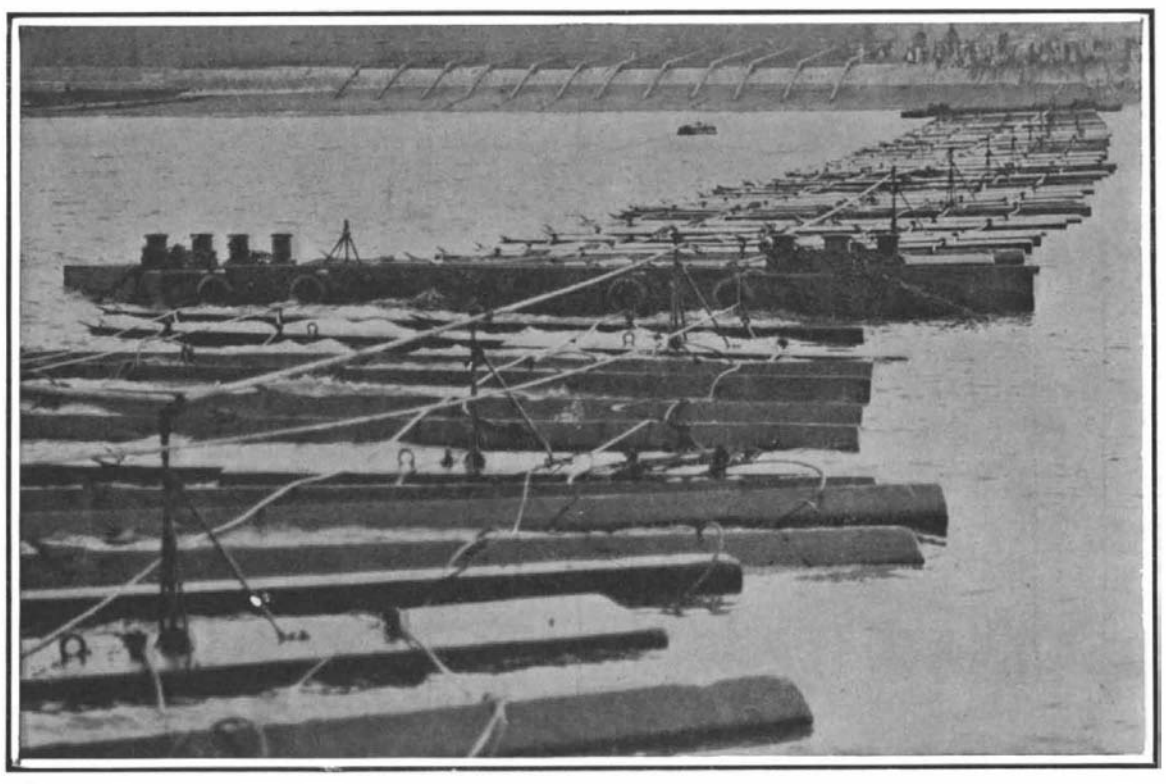
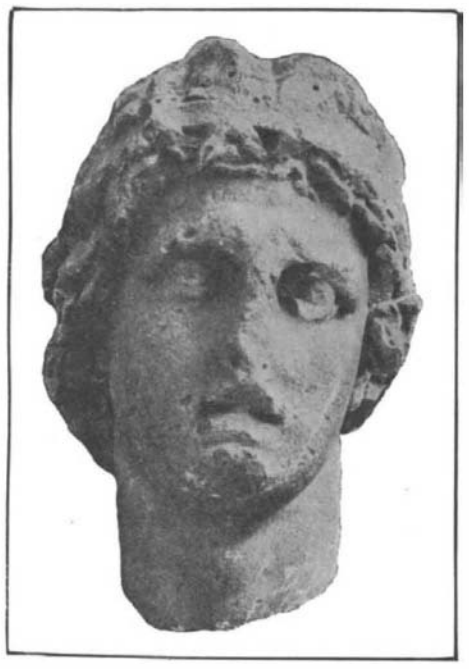


The boom consisted of 12-inch by 12-inch logs, tied together with four lines of heavy steel cable. Three feet above and five feet below the boom were stretched two 3-inch steel cables. At the front end and along the sides of each log were sharp, forwardly-projecting steel spikes, The torpedo-boat destroyer struck the boom between two logs, cut the cables, and passed through unharmed.

Torpedo defense boom before the attack in Portsmouth harbor.

TORPEDO BOOM EXPERIMENT.



THE EXCAVATIONS AT DELOS

BY THE

PARIS CORRESPONDENT

OF THE

SCIENTIFIC AMERICAN

In 1903 excavations in the island of Delos were begun on an extensive scale, owing to the liberality of the Duc de Loubat, who decided to make an annual gift to the enterprise of $10,000, in order that the work could be carried on in a manner which is justified by the great importance of the site. The work is carried on by the French School of Athens, and M. Homolle, whose connection with the excavations at Delphi we have already had occasion to note, directed the first part of the enterprise. Since then it has been carried on by his successor, M. Holleaux, and various archæologists of the French School. Because of the great number of discoveries which have been made at Delos, the archæological world is much indebted to the action which the Duc de Loubat took in aiding the excavation work.

From an early period, going back to the eighth century B. C., Delos was a center of the worship of Apollo, who had a celebrated sanctuary on the island. After passing through many political vicissitudes, Delos was completely ravaged by the army of Mithridates. Its most flourishing period appears to have been in the third century B. C.

Since Delos was a religious as well as a commercial center, it is but natural that we should find remains both of various temples and also of extensive buildings such as storehouses and wharves. In general, we may liken the site of Delos to Pompeii, because it is covered with remains of public and private buildings. But naturally it is far superior to Pompeii in the artistic character of the structures and other remains; for here is represented a flourishing period of Greek art. For this reason the excavations at Delos are of especial interest, and the remains have a high artistic value. On the one hand we have specimens of sculpture which belong to the principal epochs. There are also extensive remains of architectural forms, columns, etc. Not the least in importance are the fragments of mural decorations which are found in various places. While these are not in so good a state of preservation as those of Pompeii, they give a clear idea of the decorative borders, friezes, and large wall paintings that adorned the larger dwelling houses of Delos. Mosaics of brilliant colors are also found, and some of these are in a good state of preservation.

The excavation work is carried on with a view to clearing as much as possible the streets and edifices of the site. In the quarter of the port, very extensive wharves have been disclosed, as well as large quays and storehouses, evidences of considerable commercial activity. It is evident from their extent that Delos was one of the most important commercial ports of the archipelago.

As regards the work which has been undertaken at Delos since 1903, the year when the Duc de Loubat came to the aid of the enterprise, it is one of the most considerable to be carried out in Greece, so far as the amount of material i concerned. This is no less than 50,000 cubic yards of earth annually. As the various walls were brought to light they were consolidated to keep them together and efforts were made to preserve the stucco decorations and mural paintings. The appearance of the paintings, mosaics, and various decorative *motifs* is shown in a collection of water-color drawings which were made on the spot by two artists belonging to the expedition.

Among the points which have been explored up to the present are the sacred inclosures in which was the leading sanctuary of Delos, also the quarter of the Theater. Near the inclosure is the sacred lake, a small body of water. One of the most remarkable finds is a tomb belonging to the Mycenæan epoch, to which we may assign a date between the twelfth and the fifteenth century B. C. Thus we remark the great antiquity of the early remains of Delos, showing that it flourished at even this remote period. On this spot were found fragments of pottery which are of value in the study of this epoch. A great terrace or esplanade was uncovered near the sanctuary. Here were found five colossal lions which were set up in a range and spaced at equal distances apart along the terrace. One of our engravings shows the appearance of this site, and another one represents one of the lions, showing the considerable size and also the great antiquity of the specimens. They rank in date after the above-mentioned tomb, and from their archaic character we may place them in the seventh century B. C. M. Salomon Reinach, however, considers that the group of lions may have been offered to the sanctuary by Croesus, King of Lydia, fabled for his riches. He bases his theory on the fact that Herodotus states that Croesus had offered a massive gold lion to the temple of Delphi having a weight of ten talents, the lion being the ancestral sign of the king's family. It is possible, therefore, that the group at Delos may have come from the same source, and this would place them in the sixth century.

Coming to the remains of a later epoch, we find a street which led from the theater to the sanctuary, a very narrow street, only five feet wide. It was bordered with small houses and shops, and must have been much frequented.

As to the general character of the excavations at Delos as they appear at the present time, one of the accompanying views will give a good idea of the extent of the work. It will be observed that it covers a very wide area. Like modern buildings in some countries the dwellings of Delos consist of a central court surrounded by a portico with columns, opening into which were the various rooms of the building. Some of the columns in this and other structures of a like character are in a good state of preservation, and the walls in some cases are high. The remains slightly resemble the dwelling houses at Pompeii. One of the dwellings, which has a considerable interest, is similar to the above and is known as the "villa of Cleopatra." Here the portico is upheld by high Doric columns. There were found here the statues of the owners of the villa, Dioscourides and his wife Cleopatra (who has, of course, no relation to the Queen of Egypt). The latter statue, which is shown here, is in a good state of preservation, although the head is unfortunately missing. An inscription on the statue relates that Cleopatra, native of the town of Myrrhinonte in Attica, executed the statue of her husband, which is the accompanying one, and that he himself had offered two silver tripods to the temple of Apollo. As the inscription bears the name of the archon Timarchos, we are able to fix the date of the statue in the second century B. C. The draped statue retains some of the characteristics of the grand epoch in its treatment.

A NEW APPLICATION OF THE DIVING BELL.

BY THE GERMAN CORRESPONDENT OF THE SCIENTIFIC AMERICAN

A remarkable diving bell or portable caisson has recently been constructed for the German Navy Department for use in the deepening of the harbor of its naval base at Tsingtau. The remarkable features are not so much those of the bell itself, but of its connection with the imposing structure above water shown in our frontispiece, the whole making a complete and self-contained unit for excavating to a maximum depth of 15 meters below water level.

Two pontoons, each 16.5 meters long, 5.6 meters wide, and 2.2 meters deep, are rigidly braced together bow and stern, forming between them a well into which the diving bell may be completely withdrawn from the water. Upon the deck of the joined pontoons is erected the superstructure, from which the diving bell is suspended and operated, consisting principally of conventional I-beams and angles.

The diving bell is built of sheet iron, externally braced, and is 10 meters long, 5 meters wide, and 2½ meters high. Extending upward from the top of it are three telescopic shafts, two for the hoisting of the excavated material, each 80 centimeters in diameter, through which a bucket of 1 ton capacity can pass, and one of 1 meter diameter for the workmen. Each of these is provided with such an "air lock" as is now familiar in connection with tunnel and foundation work in New York and elsewhere, in which, as workmen enter, the air pressure is gradually raised from that of the atmosphere to that required to exclude water and mud from the interior of the caisson, being similarly reduced for those ascending from work. The air locks of the spoil shafts are identical, but the air may be compressed or exhausted much more rapidly in the hoisting of buckets of excavated material, the gradual change of pressure being necessary in the case of men only as a precaution against caisson disease.

The bell is suspended by four sets of chain tackle, one at each corner, which are mounted on opposite ends of two shafts on the operating platform of the superstructure, driven simultaneously by an electric motor when it is desired to raise or lower the bell.

Higher platforms carry two cranes, which receive the buckets of excavated material from the top of the spoil shafts and deliver them into scows alongside or however desired, the cranes also being electrically driven, as are the winches inside the spoil shaft for hoisting the buckets from the interior of the bell. One man on the platform at the top of each of the latter can hoist the bucket with the winch, detach it, and hook it onto the crane, and *vice versa*, and also raise and lower the bell as desired. Two more operators for the cranes above are required.

On the deck are three compressors supplying the necessary air pressure to the interior of the bell, power for the whole equipment being supplied from a stationary plant on shore. Both the superstructure and the interior of the bell are electrically lighted, and communication is maintained between them and from either to the shore by telephone. Quarters for the crew are provided in the interior of the pontoons.

The design of the superstructure permits of continuous operation being carried on independently of the varying height of the pontoons due to rise and fall of tides.

THE FIRST CROSS-COUNTRY FLIGHT OF THE AERONAUTIC SOCIETY'S BIPLANE.

(*Concluded from page 124.*)

fell backward, breaking the rudder and propeller and damaging the running gear. Mr. McCurdy, the aviator, was unhurt, and the engine was not damaged. The accident is said to have been due to the engine being placed too far to the rear. The machine will be repaired in about a week, when further flights will be attempted.

M. SOMMER'S RECORD FLIGHT.

The record endurance flight of 2 hours and 27¼ minutes in France, mentioned in our last issue, was wrongly attributed to M. Gaudart. This flight was made by M. Roger Sommer with a Farman-type biplane, and although unofficial, it is probably the longest ever made with an aeroplane.

In an article appearing in the American Machinist on annealing high-speed steel, the author states experiments have been carried on looking to electrical annealing and to bright annealing by immersion in a bath of fusible metallic salts, somewhat after the manner of the barium-chloride process for hardening. Moderately successful results have in some cases been obtained; but the methods are not as yet sufficiently developed for commercial use. The two methods have also been combined, with results apparently good, the salts bath being heated by the passage through it of a low-tension electric current.