THE GOVERNMENT'S GASOLINE LIFEBOATS.

In the accompanying photographs is illustrated the latest design of the lifeboats constructed for the United States Life-Saving Service. This is of the self-righting, self-bailing, non-sinkable type, of which the government has in service some fifty examples. At the present, those in use are with one or two exceptions handled by means of sails and oars, but in the latest design auxiliary power has been installed in the form of a 20-horse-power Standard gasoline engine, of the four-cylinder, auto-marine type. The advantage of independent motive power of this character is unquestionable. Primarily it relieves the crew of the boat from a great deal of labor of the most exhausting kind, and it furthermore renders the craft independent of the assistance of a tow, formerly frequently necessary when a long distance had to be covered, in reaching a wreck. None of the salient features which are so important in this type of boat has in any way been interfered with by the addition of the power equipment. This motor lifeboat was built for the government by the Electric Launch Company, of Bayonne, New Jersey, and has fully met the severe requirements and tests necessary for its satisfactory acceptance.

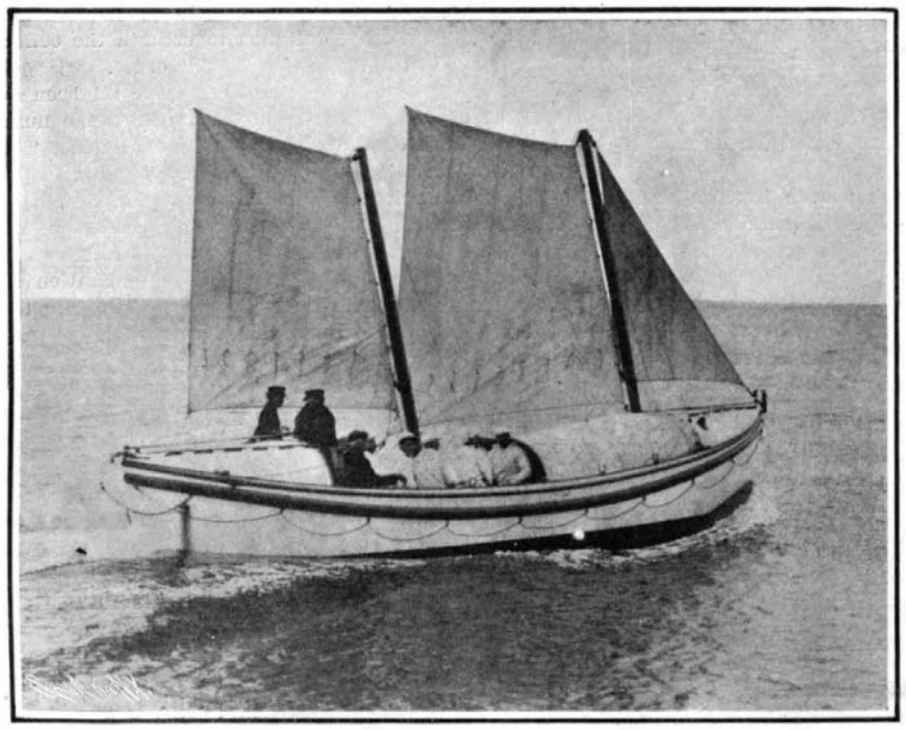
The plans for the boat were furnished by the government, and no previous design has approached the present type in the combination of buoyancy, stability, self-bailing and self-righting ability, passenger accommodation, strength, and speed. Experiments with power lifeboats have been carried on by foreign governments, particularly in England and France, but from the reports obtainable, every indication points to the fact that the boat described herewith is the most successful of its type so far constructed for this class of work.

The dimensions of the boat are: Length over all 34 feet, beam 8 feet, and draft 3 feet. There is a deck at the load water-line, and three cross bulkheads and two longitudinal bulkheads below the deck divide this space into water-tight compartments, which are completely filled with eighty-two copper air tanks, shaped to conform to the spaces they occupy, and removable through hatches in the deck. These air chambers possess sufficient buoyancy to render the boat unsubmergible. In addition there are two air chambers, one at the bow and one at the stern, which are capable alone of supporting the craft, though they are intended principally to aid the boat in righting itself when capsized. Longitudinal air chambers are provided under the side thwarts, and these direct the water coming inboard to the amidships emptying tubes. The combined buoyancy of the air cases is between 11 and 12 tons, and it was necessary to place a load of 44 men of average weight aboard to bring the deck scuppers awash.

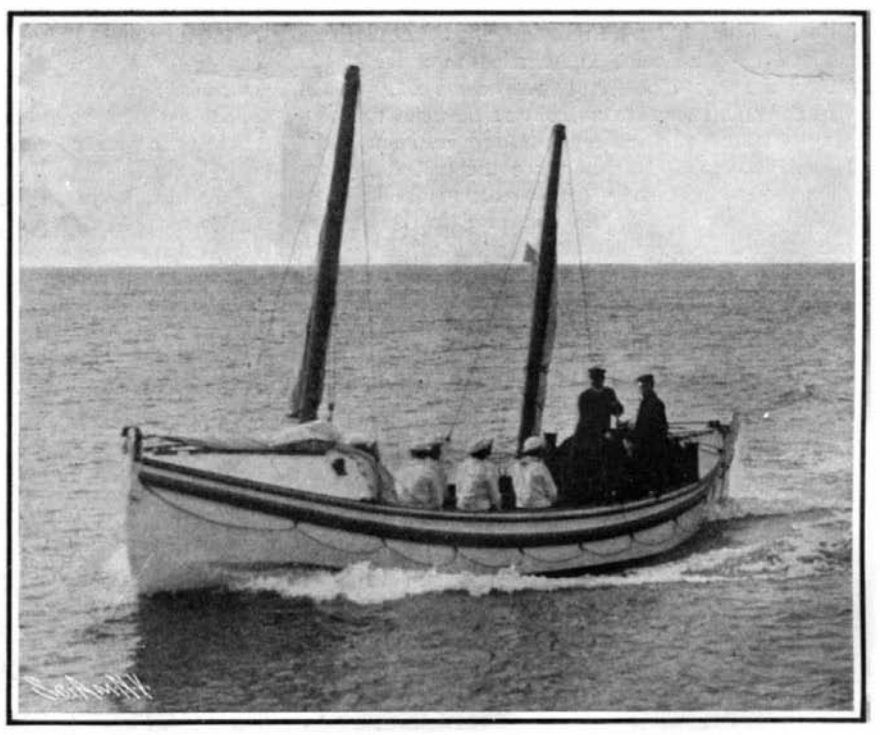
The boat automatically frees itself from water taken aboard, through a series of ten six-inch copper tubes, five on each side of the deck. As the latter is above the water-line, the water shipped over the rails, or when the boat is on her beam-ends, will escape through the tubes within a few seconds. These tubes are, of course, provided with automatic valves properly balanced to permit the flow in one direction and to shut off communication from the other. In case of an upset, the boat rights itself almost instantly, and in the tests carried out by the government it was found that it could be held in an inverted position only with considerable difficulty. The self-righting quality is due to the decided gunwale sheer, the six-foot air chambers at each end, and the location of the heaviest weights below the center of gravity. The latter include the gunmetal keel, weighing 1,050 pounds, the centerboard of similar material, weighing 750 pounds, and the copper air cases, which weigh 900 pounds, aggregating a total of 2,700 pounds, thus effecting an exceedingly stable equilibrium, when the boat is right side up, and almost instantly returning it to a normal position after a capsizing. As the danger of boat upsetting is always present in the life-saving service, lateral stiffness is of great importance in the little vessels. In the present design this is excellently obtained by the outside gunmetal keel, the centerboard, the long, flat floor, and the construction and disposition of air chambers, all giving stability in an exceptional degree. The high, raised air chambers at the extremities are invaluable, also, in preventing the overloading of the ends by water or other weight, in giving great resisting power to the submerging of the bow and stern, and in preventing waves from breaking over these.

It is difficult to conceive of a craft which is forced to undergo rougher usage than a lifeboat, and to guard against serious injury from contact with the beach, rocks, floating wreckage, or the vessels' sides, it must be constructed of the finest material, and with the best workmanship. In the present design the keel, keelson, stem and stern posts, are of the best white oak obtainable, while the planking is of clear Honduras mahogany. The latter is in two layers, each ⅜ of an inch thick, the planks laid in diagonally opposite directions at an angle of 45 deg. with the keel, while between the two mahogany layers is a layer of ten-ounce cotton duck, laid in white lead and oil. The planking is copper-riveted through and through. The boat is provided with white oak fenders, six inches wide and two inches thick, extending the length of the hull; two inside bilge keelsons, of 1½-inch yellow pine, forming longitudinal water-tight bulkheads between the end air chambers; and three athwartship bulkheads of the same material, dovetailing into the longitudinal partitions. The deck is very strongly constructed of mahogany.

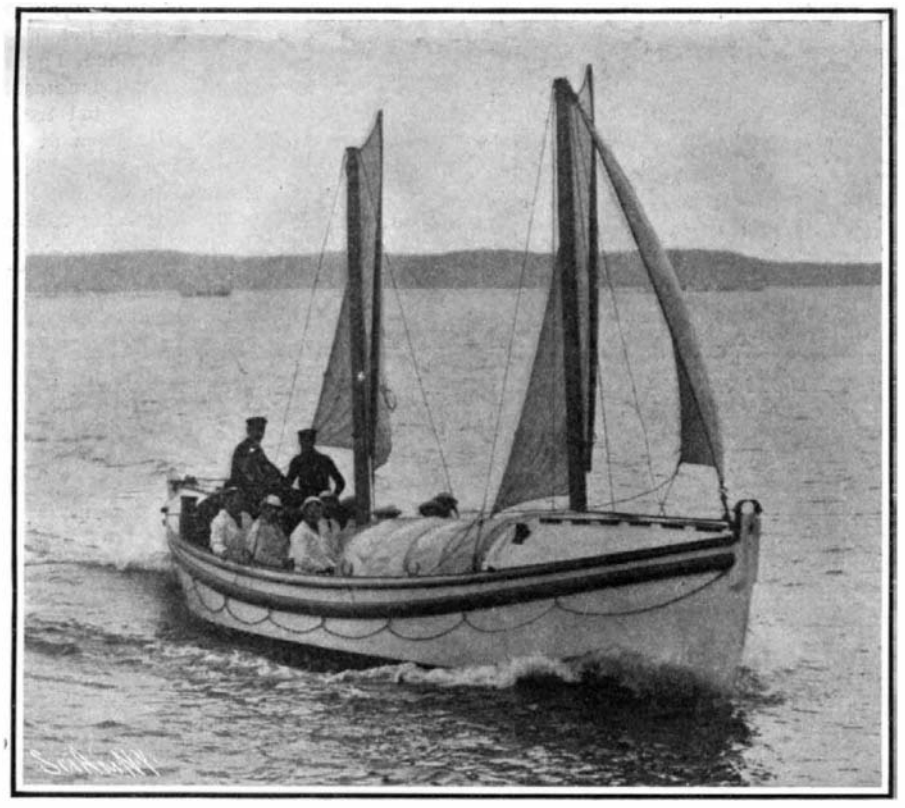
As means of propulsion the boat is provided with two hollow spruce spars, with sprits, sails, and a jib, ten double-banked 15-foot oars, and the before-men-



Broadside View Under Sail, Showing the Protective Hood in Place.



At Full Speed Under Power.



The Boat Under Sail Alone.

Quarter View of the Boat Hove To.

THE GOVERNMENT'S GASOLINE LIFEBOATS.

tioned 20-horse-power gasoline engine. The rudder, which is worked through a spur-wheel and curved rack, is so arranged that the steering gear can be instantly disconnected from the rudder head, and the rudder hoisted out of the water by means of a fixed purchase, thus allowing the craft to be steered by the oars when entering broken water where steering by rudder would be dangerous.

The motor, which drives an 18-inch propeller at a rate of 400 revolutions per minute, is located in the after air chamber, and a watertight door in the bulkhead gives easy access thereto. The necessary attachments for the engine are protectively secured in casings to the outside of this air chamber bulkhead, where they are always within reach of the man in charge of the motive power. The motor is provided with an ingenious device which instantly stops it in case of an upset. This attachment, which is of very simple construction, consists of two pairs of rings suitably mounted in a vertical position, the lower halves being of metal, while the upper halves are of insulating material. A metal ball can roll freely between these rings, and as the device is included in the ignition circuit of the motor, this ball permits the flow of current as long as it maintains contact between the conducting portions of the rings. However, should the boat keel over to a certain degree the ball rolls onto the non-conducting halves, thus breaking the current, and this is followed by the instant stopping of the engine. The latter can be started again when the boat is righted, as soon as some member of the crew is able to reach the starting crank. The main fuel tank, capable of holding 75 gallons, is in the bottom of the forward air chamber, while a 25-gallon auxiliary tank is placed in the upper part of the same case, fuel being pumped from the lower to the upper tank as required. The feed from the latter to the motor is by gravity through a brass pipe let into the outside keel.

The boat was recently tested in the most thorough manner, and very satisfactorily answered all the requirements as to speed, endurance and carrying capacity. In pursuance of its usual policy in this connection, the government has spared neither expense nor labor to make these lifeboats of the highest utility and efficiency, and it is believed that in this craft the life-saving service possesses a boat as completely equipped for its purpose as it is possible at present to make it, and as thoroughly trustworthy as the danger and gravity of its uses demand.

WIRELESS TELEGRAPHY IN SOUTHWEST AFRICA.

BY OUR BERLIN CORRESPONDENT.

In the beginning of the Herero uprising, the German troops used heliographs for signaling whenever the existing wire connections failed. This service was satisfactory in clear weather, except for the drawback that the communicating stations had to "seek" each other beforehand, a feat possible only in case the approximate position of each is known.

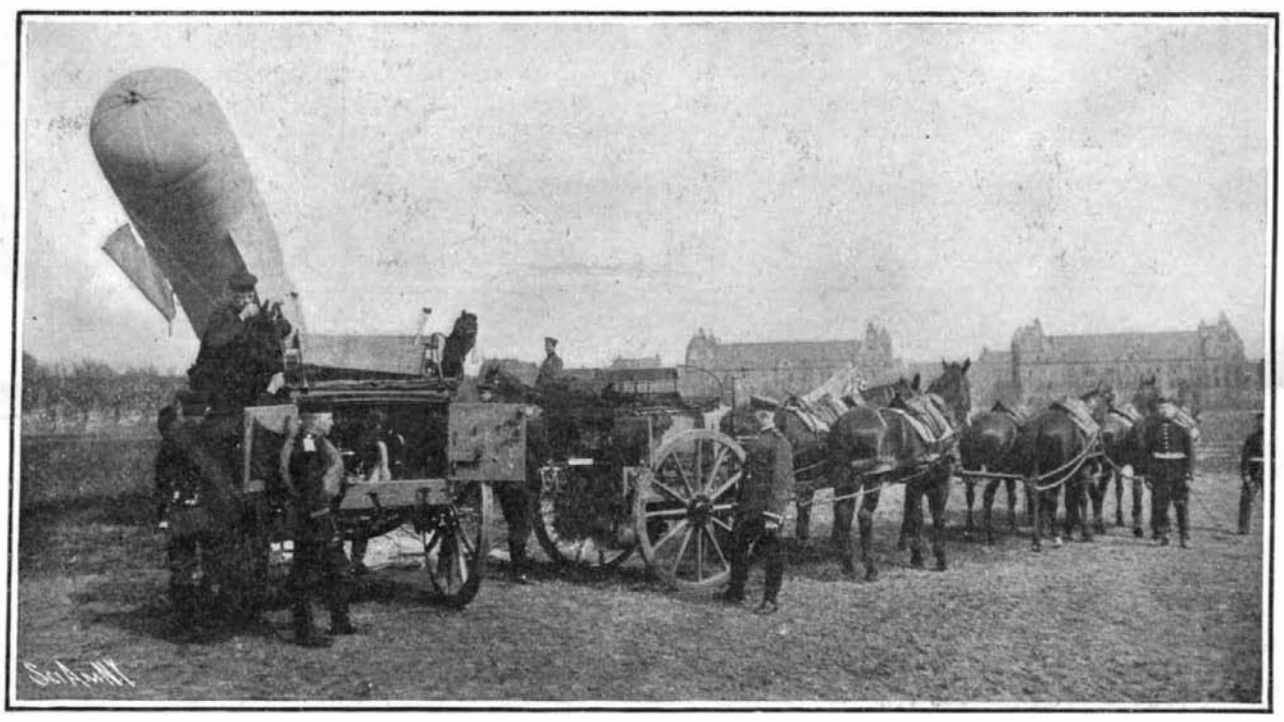
It was accordingly decided to use wireless telegraphy. The Gesellschaft Für Drahtlose Telegraphie, of Berlin, supplied the apparatus, which was mounted by the aerostatic battalion. Three stations were organized, viz., two wagon detachments and one cart detachment, the staff including four commissioned officers, four non-comissioned officers, and twenty-seven men. Gas balloons were used to raise the antennæ.

These stations were first used in practical operation in connection with the attack made against the Hereros near Waterberg. Each of the three detachments was provided with a wireless station, and though the men were not very well trained in the limited time allotted, the troops nevertheless succeeded in maintaining a permanent mutual communication. For transmission up to about 100 kilometers (62 miles) recording telegraphs were used, whereas for greater ranges up to 150 kilometers (93 miles) the Morse signals were received by telephone. The latter course was exclusively adopted later on. While the antennæ were 200 meters in length (656 feet), the men did not always succeed in raising the full length of the wire, the drift of the balloon being mostly too small, owing to the considerable altitude of the ground. This obviously decreased the range of the stations. The dryness of the air and the frequency of atmospheric discharges, as well as of storms and whirlwinds, were other unfavorable factors. Moreover, the dry cells were damaged by the sudden changes in temperature. The projectiles of the enemy obviously were frequently directed against the balloons, which marked the position of the German troops. The balloons, on the other hand, rendered good service to the German detachments, marking as they did the direction of marching.

The whole of the wireless telegraph plant was temporarily placed out of service in October, 1904, in order to allow for the necessary preparations before proceeding to the new theater of war situated southward, some time being occupied in repair work. Three other outfits had arrived in the meantime, which however were not provided with skilled operators.

As regards the relative merits of the various types of station, the wagon stations are said to be more readily transportable than the old cart stations, which owing to their great height are apt to tilt and do not enable the men to ride on them. On traversing some inundated ground the wagon stations readily passed through the water, whereas the cart stations had with considerable difficulty to be transported across a railway bridge.

Wireless telegraphy has thus proven itself a most trustworthy and useful means of communicating information in warfare, though in the present case any disturbances on the part of the enemy were excluded, for the Hereros were not provided with any similar apparatus. It should, however, be remembered that the difficulty arising from atmospheric influences is far greater in that part of Africa than either in Europe or America, while the country is absolutely devoid of any resources for repairing the apparatus.



WIRELESS TELEGRAPHIC BATTALION OF THE GERMAN ARMY. BALLOONS CARRY THE ANTENNÆ TO A SUITABLE HEIGHT.

The Current Supplement.

The opening article of the current SUPPLEMENT, No. 1576, is entitled "Mining for Fossils," and explains the methods which paleontologists employ in obtaining the specimens which they prize so highly. An article of great technological value is that on Valuable Alloys, describing as it does how many metallic compounds are made. Philip M. Wormley's article on "Cement Mortar and Concrete: Their Preparation and Use for Farm Purposes," is continued. "Producer Gas and Gas Producers" is the title of an excellent discussion of a subject of great importance to the modern engineer. Jacques Boyer writes entertainingly on Snail Culture in Bergundy. The report of the Isthmian Canal Commission favoring the high-level canal is also published. This gives a detailed account of the work which will be performed at the Isthmus in excavating one of the greatest ship canals of the world.

One of the largest steel ingots that has ever been made was recently cast at the Manchester foundries of Sir W. G. Armstrong, Whitworth & Co. The ingot weighing 120 tons was cast on the well-known fluid pressure system of this firm. The molten metal, representing 120 tons in weight, was poured from the melting furnaces into a huge ingot mold-box weighing 180 tons. When the run was completed the mold-box was placed in a hydraulic press, the ram of which is 6 feet in diameter, and subjected to a pressure of 6,720 pounds per square inch. The ingot is for the machinery of the new turbine Cunard liner now in course of construction on the Clyde.

THE ROYAL MUSEUM OF NATURAL HISTORY, BRUSSELS.

BY L. RAMAKERS.

The Museum of Natural History of Brussels, one of the most interesting institutions of its kind in Europe, has lately enhanced its collections with new specimens, some of which have excited the admiration of the naturalists of the entire world. Some of these recent additions have completed certain of the collections, that of the iguanodons, for example, and hence the government has been induced to make material alterations in the museum and to provide it with certain special installations, among the latter a gallery set apart exclusively for the splendid iguanodon groups described below. Heretofore few museums have completely carried out, architecturally, the objects for which they were constructed, and the rational distribution of the exhibitions has often been neglected. In the new galleries of the Brussels institution, on the other hand, these very points have been taken into consideration, and the halls constitute, as it were, great glass show cases designed to contain the collections arranged in advance in scientific order.

The arrangement and dimensions have all been so calculated as to be directly proportional to the number and nature of the objects to be exhibited. The fundamental division of the edifice is according to the geological chronology which may be regarded as definitely established. Moreover, since the zoological distinction between the vertebrates and invertebrates is very sharply defined with regard to organization as well as size, and since the methods of exhibiting the two categories of beings must of necessity be entirely different, the national galleries designed to contain the products of the scientific exploration of the Belgian soil comprise two great superposed halls, the lower of which is for the vertebrates and the upper for invertebrates, fossil plants, and minerals.

The vertebrate hall, which has just been opened to the public, is nearly 280 feet in length and 100 feet in width and owing to the slope of the ground has been divided into four great landings, each separated from the next by a flight of three steps. The landing or division corresponding to the present entrance in the reconstructed building is that of the Quaternary Epoch, which also includes the modern period. The others, in the order named, are the Tertiary, the Upper Cretaceous, and the Lower Cretaceous divisions. While it has not been necessary to construct the Jurassic and Primary floors, these have nevertheless been provided for. The accompanying engravings illustrate respectively the hall of vertebrates as a whole, and the splendid group of mounted iguanodons at the rear of the last landing.

Among the important groups, which are all supplemented by charts, drawings, etc., are: On the Quaternary floor, those of the magnificent fauna of the great herbivores and that of the no less important great cave carnivores, as well as the innumerable series of prehistoric industries collected both in the alluviums and in the caves; on the Tertiary floor the great cetaceans of the Upper Tertiary of Antwerp, the sirenidæ of the Oligacene and the reptiles of the Eocene, as well as certain remains of primitive mammifers of very great interest; on the third floor, the Upper Cretacean, are found the great marine saurians of Maestricht and Ciply, the latter from the exploration of the phosphate chalk; on the fourth landing, the Lower Cretacean, the iguanodons of Bernissart and the contemporary animals and plants. Ten iguanodons are mounted upright on a large platform, while fourteen others are placed in a large pit in the positions in which they were discovered. The engraving gives us an idea of the splendid effect of these mountings. The back wall and one of the sides of the hall are provided with a gallery which contains the large collection of the fossil fish of Belgium. Of all these the most remarkable group is unquestionably that of the iguanodons, those prehistoric reptile giants which have so long puzzled paleontologists.

In 1822 Mantelle discovered in the Wealden of Tilgate Forest, England, the isolated fossil teeth of a reptile which he named iguanodon because of the re-