

**RECENTLY COMPLETED BATTLESHIP "NEBRASKA."**

The largest class of battleships of the United States navy is the "Georgia" class, which comprises five ships—the "Georgia," "Nebraska," "New Jersey," "Rhode Island," and "Virginia"; and of these the last to be completed will be the "Nebraska," which forms one of the subjects of illustration on the front page of this issue. Especial interest attaches to this ship because of the fact that she was built in the young State of Washington and at the thriving city of Seattle, which, a quarter of a century ago, was not much more than a village in size. The construction of a modern battleship calls for the highest skill and a thoroughly complete and costly shipbuilding plant, and that this great vessel, with a displacement of about fifteen thousand tons, should have been built and engined in an industrial center so modern is certainly a striking evidence of the material development of this flourishing maritime city of the extreme Northwest.

The "Nebraska" and her sisters are distinguished among battleships by the extraordinary concentration of fire of the guns of the main battery of which they are capable, being in this respect, at least in the number, if not in the weight of shell which they can deliver in any direction, unsurpassed either in our own or any other navy. This concentration is obtained by the method of mounting the 8-inch guns, of which four are carried at the great elevation of 32 feet upon the roofs of the turrets containing the 12-inch guns. The other four 8-inch are mounted amidships, 26 feet above the water, in two turrets, one on either broadside. This disposition enables the "Nebraska" to concentrate two 12-inch and six 8-inch guns directly ahead or astern, while on either broadside she can deliver the fire of four 12-inch and six 8-inch guns. In the secondary battery she carries in broadside on the gun deck twelve 6-inch rapid-fire guns, and for repelling torpedo attack she mounts twelve 3-inch, twelve 3-pounders, and eight 1-pounders. She also carries two 3-inch field guns and eight small-caliber automatic guns. Her torpedo armament is also an exceedingly powerful one, consisting of four of the new 21-inch torpedoes driven by turbine engines, of the kind described in the SCIENTIFIC AMERICAN of January 6, 1906, which are capable of a speed of 36 knots at a range of 1,200 yards, and a speed of 28 knots at a range of 3,500 yards.

The distribution of armor on the "Nebraska" is as follows: She carries a water-line belt which is continuous from stem to stern and varies in thickness from 11 inches amidships to 4 inches at the ends. With this is associated a deck 3 inches in thickness. The main barbettes and turrets carry 10 inches of armor and the secondary turrets 6 inches. The broadside battery is protected by side armor 6 inches in thickness which extends between the main barbettes from the top of the main armor belt to the upper deck. There are 9 inches of armor on the conning tower, and the 14-pounder guns also are protected by 2 inches of armor. The total weight of armor is 3,690 tons.

The ship is driven by twin reciprocating engines, which are designed to give a speed of 19 knots with 19,000 horse-power. The maximum coal supply is 1,700 tons.

The ship has a water-line length of 435 feet; her beam is 76 feet 2½ inches, and her maximum draft 26 feet. Her complement of officers and men will consist of 41 officers, 675 enlisted men, and 60 marines. On her builders' trial, carried out on July 2 of this year, she made a speed of 18.95 knots.

**OUR LATEST BATTLESHIPS, "SOUTH CAROLINA" AND "MICHIGAN."**

The recent letting of contracts for the construction of the two new battleships "South Carolina" and "Michigan" to the Cramp Ship and Engine Building Company and to the New York Shipbuilding Company, has brought these two formidable vessels into special prominence, and a description of the leading features of their design will be timely.

Particular interest attaches to these vessels because of the fact that they are the first battleships to be designed by our Navy Department subsequently to the conclusion of the Russo-Japanese war, and that in their design they embody the valuable experience gathered during that great conflict. The most marked feature is the complete elimination of the intermediate battery, which in our earlier ships consisted of a large number of 5-inch, 6-inch, 7-inch, or 8-inch guns. The customary number of guns in the main battery has been doubled, so that instead of four 12-inch carried in two turrets, the new ships have eight such guns mounted in four turrets. The numerous battery of small rapid-fire guns is retained, since its service will always be necessary for the repelling of torpedo-boat attack. In length and displacement the new vessels are approximately the same as their predecessors, the "Louisiana" and "Connecticut," though with greater beam and ½ knot more speed. They are also more effectively armored than those ships, and in fighting power they are believed to be vastly superior; that is to say,

if the new theories as to the probable tactics of future naval conflicts prove to be correct.

The general dimensions of the vessels are as follows: The length on the load water line will be 450 feet; the breadth is greatly increased over that of the "Connecticut," being 80 feet 2½ inches. The mean draft at trial displacement must not exceed 24 feet 6 inches, on which draft the displacement must be 16,000 tons.

THE GENERAL APPEARANCE OF THE NEW BATTLESHIPS.—The two ships when completed will, in appearance, be distinctly different from any of our other battleships. The most noticeable feature, of course, will be the four 12-inch turrets and their guns, mounted in pairs on the axial line of the ship, two forward and two aft of the superstructure. The doubling up in the number of 12-inch turrets, and the placing of them one ahead of the other, has necessarily shortened the length of the superstructure, and crowded the masts, smokestacks, etc., into a shorter space amidships, a fact which is readily noticeable on looking at the engraving of the new ships. In order to save weight the freeboard of the ship has been reduced by the depth of one deck, or about 8 feet, from aft of the superstructure to the stern. Hence the "South Carolina" and "Michigan," while they will have the same freeboard forward as the "Connecticut" and "Louisiana," will have a lower freeboard by about 8 feet throughout the after third of the vessels' length. The most forward pair of 12-inch guns is carried at about the same height as the 12-inch guns of the "Connecticut," or say about 24 feet above the water line. Immediately abaft of these is the second pair of forward 12-inch guns, which are so mounted as to fire clear across the roof of the forward turret, the barrette for these guns being increased in height by about 8 feet in order to give the requisite elevation. The guns have the great command of 32 feet above the water line. The after pair of turrets with their four guns are mounted similarly, although at an elevation in each case 8 feet lower than that of the forward guns.

The shortening of the superstructure has been accompanied also by a moving of the two military masts toward the center of the vessel, and a distinct novelty is seen in the placing of these masts, not on the longitudinal axis of the ship, but diagonally, the forward mast being moved over to starboard and the mainmast to port. Advantage is taken of this new position to mount the boat cranes on these masts, with, of course, a considerable saving of weight.

ARMOR AND ARMOR PROTECTION.—The armor protection has been exceedingly well worked out, and forms one of the most commendable characteristics of these vessels. Its most important element is a water-line belt 8 feet in width, and more than 300 feet in length. The midship portion of the belt varies in thickness from 11 inches at the top to 9 inches at the bottom, while that in the wake of the magazine is 12 inches thick at the top and 10 inches at the bottom. The casemate side armor above this water-line belt is nearly 300 feet long; it will be 8 inches thick at the top, 10 inches at the bottom, and will be about 8 feet 1 inch wide amidships. This is a casemate protection which, in extent and in thickness, has never been approached in our previous battleships. Triangular athwartship armor, 10 inches thick, will be fitted at the after end of the belt armor, between the slope of the protective deck and the extension of the flat protective deck. Also an athwartship armor bulkhead, extending entirely across the ship between the upper platform and the protective deck, will be fitted at the forward end of belt. This will be 10 inches thick throughout. Furthermore, an athwartship casemate armor bulkhead will be fitted between the shell plating and the barbettes between the berth and main decks at forward and after ends of casemates; this will be 8 inches in thickness throughout.

BARBETTE ARMOR.—The forward barrette extends from the protective deck to about 4 feet above the upper deck, and it varies in thickness from 10 inches to 8 inches, according as it is flanked by the side armor of the ship. The after forward barrette extends to a height of about 12 feet above the upper deck, and carries the same general thickness of armor. The forward after barrette extends from the protective deck to 12 feet above the main deck, and the barrette aft of this extends from the protective deck to 4 feet above the main deck. In the case of each of the four turrets, the port plate will be 12 inches in thickness, the rear and side plates 8 inches, and the top plates 2½ inches in thickness.

The vessels will be propelled by vertical twin-screw four-cylinder triple-expansion engines of 16,000 horse-power. The steam pressure will be 265 pounds in the high-pressure valve chest, and the revolutions per minute will be 125. Steam will be supplied by twelve water-tube boilers fitted with superheaters, carried in three water-tight compartments. The vessels will be lighted throughout by electricity, and the operation of the turrets, ammunition hoists, and, indeed, most of the mechanical work throughout the ship, will be performed by electrical power. The coal bunkers will be

arranged with a direct reference to the rapid and efficient supply of coal to the fire rooms, and with especial reference to efficient water-tight subdivision of the vessel. There will be provided for coaling the ships not less than five winches, ten booms, wire spans, with the necessary whips at all the usual chutes and other openings, special provision having been made for the rapid coaling of the vessels. There will be a bridge both forward and aft, built according to the latest practice. The masts will be fitted with searchlight platforms, and arranged for wireless telegraphy. There will be one signal yard on each mast, a battle gaff on the mainmast, and a lookout platform on the foremast.

DISTRIBUTION OF WEIGHT.—It is instructive to study the distribution of weights in these new vessels; the guns, mounts, ammunition, and ordnance stores will represent about 7 per cent of the trial displacement; the motive power, including engines, boilers, piping, etc., about 10 per cent, and the total armor protection reaches the great figure of more than 25 per cent of the trial displacement.

CONCENTRATION OF FIRE.—It will be seen at once that by arranging the two extra pairs of 12-inch guns at a sufficient height to enable them to be fired across the roofs of the adjoining turrets, the theoretical all-round concentration of fire is remarkably powerful. Forward, when in pursuit of the enemy, or when fighting in the end-on position, it will be possible to concentrate four 12-inch guns, which is double the number that can be trained in a similar direction on the "Connecticut" and "Louisiana." Aft there is a similar concentration of four 12-inch guns, while on the beam these ships will be able to train eight 12-inch guns.

In a previous issue of the SCIENTIFIC AMERICAN we have criticized this method of placing the armament, on the ground that previous experience with the "Oregon" and her class showed that if heavy guns were fired across the roofs of the adjoining turrets, the work of the gun crews in these turrets would be seriously interfered with. We are informed, however, that particular attention has been given by the Navy Department to this difficulty, and that by virtue of the improved sighting ports and the closely-fitting port shields employed, and other arrangements, it will be possible, in an emergency, to fire any of these 12-inch guns in any position of training without serious interference with the work of the other gun crews. If this should prove to be the case, our Navy Department will be the subject for congratulation on having produced, in proportion to their displacement, by far the most powerful fighting ships built or building in the world to-day; for it must be remembered that these vessels are of but 16,000 tons displacement, while the latest battleship designs of other governments are of from 18,000 to 19,000 tons displacement.

There are many novel details of construction in these vessels, which, for obvious reasons, it is not expedient to make public at the present time—such, for instance, as the more complete water-tight subdivision of the vessel, and provision against heeling due to damage in action; and the protection of the vessels' longitudinal strength when damaged by gun fire, the provision of adequate longitudinal strength being particularly important in view of the concentration of the weight of the barbettes and heavy guns so near the extremities of the ship.

**Distribution of Patent Office Models.**

It appears, according to an act of Congress passed on June 22, 1906, the Secretary of the Interior is authorized to dispose of a part or of all the model exhibit of the Patent Office, either by sale, gift, or otherwise. Acting Commissioner E. C. Moore has issued a notice to the effect that immediate requests from polytechnic schools and colleges having technical courses for portions of the exhibit will be considered in the disposition of the models.

It is presumed that the pressing need of additional space in the Patent Office building is the reason for this general clearing out of models.

An opportunity is now afforded for technical schools to secure models of interesting and well-known inventions pertaining to important industries. Inquiries should be addressed to the Commissioner of Patents, Washington, D. C.

According to the recent report of the British consul for New Caledonia, the indigenous Canaques are rapidly becoming an extinct race. Owing to the inroads of disease, more especially the more virulent maladies of phthisis and leprosy, combined with the abuse of alcoholic liquors, the natives are becoming greatly degenerated, and the people do not now number more than 17,000 souls in all. Although the disposal of spirits is forbidden to the natives, they yet obtain enormous quantities by surreptitious methods, and it kills them very quickly. Moreover, the children now born are for the most part very stunted and seldom attain adult age. The consul is of opinion that it will not be many years before the Canaques become totally extinct.