THE LATEST BATTLESHIPS FOR THE UNITED STATES NAVY.

The latest report furnished to Chief Constructor Schiff, showing the progress which is being made in the construction of the five battleships which are building in private yards for the United States navy, shows that the "Kearsarge" and "Kentucky" are more than half completed, and that from 32 to 39 per cent of the work has been accomplished on the "Alabama," "Illinois" and "Wisconsin.

These five vessels, all of which will be first-class, super-ocean battle ships, belong to two different types, the first of which, authorized in the fiscal year 1890, includes two twin ships, the "Kearsarge" and the "Kentucky," which are building at Newport News; the other type, authorized in the following year, consists of the "Alabama," building at the Cramp's yard, the "Illinois," at Newport News, and the "Wisconsin," which is being constructed at the Union Iron Works, San Francisco.

On our front pages will be found excellent engravings of two of these ships, representing the two designs, from which it will be seen that they differ considerably from each other and from the class of ships which preceded them, represented by the "Indiana," "Massachusetts" and "Oregon." They represent the advance which has taken place in battleship design since the year 1890, when the "Indiana" class was authorized, and in the "Alabama" we have embodied those features of high freeboard, widely separated main battery and broadside secondary battery of rapid fire guns which are likely to remain permanent in the navies of the world.

The leading features of the two ships are as follows:

<table>
<thead>
<tr>
<th>Ship</th>
<th>Waterline length</th>
<th>Beam</th>
<th>Draft</th>
<th>Arm. 305 mm.</th>
<th>Secondary 280 mm.</th>
<th>155 mm.</th>
<th>120 mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky</td>
<td>125 ft</td>
<td>94 ft</td>
<td>36 ft</td>
<td>36 ft</td>
<td>94 ft</td>
<td>36 ft</td>
<td>36 ft</td>
</tr>
<tr>
<td>Alabama</td>
<td>125 ft</td>
<td>94 ft</td>
<td>36 ft</td>
<td>36 ft</td>
<td>94 ft</td>
<td>36 ft</td>
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If it is compared with the "Indiana," it will be evident that the greatest change in the "Kentucky" is in the novel method adopted for carrying the 8-inch guns. In the "Indiana" there were eight of these disposed in four turrets, at the four corners of the central armored battery. By this arrangement it was hoped to be able to train four guns on either beam or directly ahead. In the gunnery trials, however, it was found that if these guns were fired direct ahead or astern, that blast rendered the sighting boards of the 13-inch guns unusable. To prevent this "interference," as it is called, the double-deck turrets shown in the engraving were adopted. They constitute the most striking feature in these ships, nothing like it has ever been attempted before and will cost a long head of the 13-inch gun turret below it, and no serious effects will probably be felt by the man stationed within it. It will be noticed, moreover, that the "Kentucky" will be able to bring the 8-inch guns to bear in any direction as the "Indiana," that is, two ahead or astern, and four on either beam; in fact, owing to the inability of the 8-inch guns of the "Indiana" to be fired dead ahead or dead astern, the four 8-inch guns of the "Kentucky" may be said to be more efficient than the eight similar guns on the "Indiana." The great weight of two turrets and four guns is that on the "Kentucky" with their ammunition is thus saved and can be put to other uses.

We have said that it is not likely that any more double-deck turrets will be built. The reason for this is the objection which naval designers feel to putting "too many eggs into one basket." It is an accepted axiom in warship design that the various gun stations of a ship should be widely separated as possible, with a view to localizing the damage inflicted by a successful hit. If the lower half of a double-deck turret should be crippled, the upper turret would also be placed hors de combat, and a light shell which was passing through the 15-inch armor of the lower turret might pass through the 9-inch armor of the upper turret and wreak the gunner below thereby doing part of the four guns. There is a further objection urged by the gunners in the fact that the two sets of guns must be trained together, whereas it might be desirable in the course of a fight to train the 13-inch guns upon one part of the enemy and the lighter guns upon some other part. The whole question, however, was well thrashed out by the experts at the time the ships were designed, and it was considered that the economy in weight and machinery more than offset the objections which were raised against the system.

Next to the turrets the most novel feature in these ships is the powerful broadside battery of fourteen 5-inch rapid-fire guns which it has been possible to substitute for the four 8-inch guns and turrets and the four slow-firing 6-inch guns of the "Indiana." This battery is shown in the engravings ranged within a central battery on the main deck between the two turrets. There are seven guns on each broadside, each firing through an arc of 90 degrees. Though the shell for the 8-inch gun weighs only 50 pounds as against 250 pounds for the shell of the 8-inch gun, so great is the rapidity of fire from the former gun, that three times the weight of metal will be thrown as a carrying case on the rapid-fire battery. The gunners will be protected by 8 inches of Harveyg ed steel. On the deck above will be another battery of twelve 6-pounder guns and eight others will be located forward and aft on the forecastle deck. It will be the work of these guns to repel the attack of the torpedo boats. A number of 6-pounders and Gatlings will be carried in the tops of the military masts for the purpose of sweeping the decks and other exposed
portions of an enemy. The ship will also carry five
ammunition charges for the broadside torpedoes. The full com-
plement will consist of 46 officers and 460 men.
In the "Alabama," we note a further departure from the "Indiana," and a further development of the line followed in the "Kentucky." The 8-in. broadside guns are equally
amazing. The charge for the broadside gun is 1,050 pounds of
powder, and the projectile weighs 1,037 pounds, or equal to the performance of 845 grains of wrought iron. The 8-in.
piece has a muzzle velocity of 1,405 feet a second, and a 1,050-
inch shell will be fired at the rate of 10 rounds a minute, the
300-yard limit being exceeded. The ship's speed, which is
16 knots, is probably more than can be said for the broadside guns of ships with a freeboard somewhere between six and eight feet.
The upper deck extends as far as the after-end of the cruiser. It is all carried above the main deck, or some 15 or 20 feet lower than the forecastle, thereby increasing the stability of the ship. They carry the machinery and the 8-in. broadside guns. They are in two main sections, with the forecastle section divided and
the after section vertical. The form is adopted, of course, to
place the 8-in. broadside guns on the sides of the ship. It is
a common form of gun carriage in the gunboats and the large
steamer. In the old form of circular turret there was more room than was necessary at the sides and too little for the guns. The diameter of the stationary turrets is made somewhat larger than the shorter axis of the turret, and the center of gravity of the piece is far enough in the axis of rotation so that the turret, in spite of its considerable overhang at the rear, is balanced and can be turned to its engine without effort, even when the ship has a heavy list. Of the three
sighting hods, the outer one is for the man who turns the
turret, whose work it is to keep the gun upon the target, as far as their lateral direction is concerned. The hoods on each side are operated by the
winding and unwinding of ropes, giving the gun the proper elevation or depression.
The removal of the 8-in. guns and turrets has en-
abled the strength of the secondary battery to be
much increased, the four 8-in. guns of the "Kent-
ucky" giving place to a battery of four 6-in. guns in the "Al-
abama." These four have a 100-pound shot against the 30-pound shell used by the smaller gun, and their
rapidity of fire is only slightly less. Each of these guns will be loaded on the 18-ton elevator and capable of being
fired from 280 feet to 3,000 feet. Their maximum range will be about 15,000 feet. Their altitude will be 33 degrees, and their elevation 20 degrees. Two of these guns will be mounted on the upper deck above the after section, and the other two on the main deck of the after section. The gun mounts will be protected with 6-in. steel armor, and they will be capable of firing dead ahead and dead astern as well as on the broadside. The con-
eguided energy of the 4-in. battery alone will amount to
about 23,900,000 tons per minute—sufficient, when
impounded to boring shells, to tear the unprotected and lightly protected parts of an enemy's forecastle and
quickly turn the gun positions into a mere shambles of iron.
To these is added a battery of 20-pounders, of about
12,600 tons of metal, which, in combination with the
plating of the smokestacks abreast of each other in
stead of on the side of the ship, will be poised on the
5-in. gun turret. It should be pointed out that they maintain the reputation of our naval constructors at the highest level at which it was possible to place the appearance of the great American West-Indies type some eight years ago. Take them, they carry heavier armor and heavier guns for a given displacement, and they have a superior workmanship.

In conclusion, we note this: four fine ships and it
should be observed that they maintain the reputation of our
naval constructors at the highest level at which it was possible to place the appearance of the great American West-

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hythrons Notes and Receipts.

Acid-resisting Aluminum.—While aluminum is known to be easily attacked by alkalies, even strong acids do not injure it to the least. It behaves almost as insulati-

Making Plaster Casts of Carved Articles.—If the ob-
curates are cut out, they are first roughly turned into a lump form, then covered with a good coating of

ew-0x0 to 720x1055]