

THE LATEST BATTLESHIPS FOR THE UNITED STATES NAVY.

The latest report furnished to Chief Constructor Hichborn, 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 33 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, seagoing battleships, belong to two different types, the first of which, authorized in the year 1895, 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 Cramps' yard, the "Illinois," at Newport News, and the "Wisconsin," which is being constructed at the Union Iron Works, San Francisco.

On our front page 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:

	"Kentucky,"	"Alabama,"
Waterline length.....	368 ft.	368 ft.
Beam.....	72 " 2 1/2 in.	72 " 2 1/2 in.
Draft.....	23 " 6 "	23 " 6 "
Freeboard forward.....	14 " 3 "	20 "
" aft.....	13 " 3 "	13 " 3 "
Displacement.....	11,500 tons	11,500 tons
Speed.....	16 knots	16 knots
Coal supply.....	410 tons	800 tons
Horse power.....	10,000	10,000
Armor, nickel steel.....	16 1/2 in.	16 1/2 in.
Waterline belt.....	6 "	5 1/2 "
Side armor above belt.....	6 "	5 1/2 "
Turret armor.....	17 and 15 "	17 and 15 "
Barbette armor.....	15 "	15 " 10 "
Conning tower.....	10 "	10 "
Protective deck.....	2 3/4 "	2 3/4 to 4 "
Armament:		
Main battery.....	4 13-in. guns	4 13 in. guns.
Submain battery.....	4 8-in. guns	
Secondary battery.....	14 5-in. R. F. guns	14 5-in. R. F. guns.
	20 6-p'd'r R. F. guns	17 6-p'd'r R. F. guns
		6 1 " " " "

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, their blast rendered the sighting-hoods

of the 13-inch guns untenable. 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

ing-hoods of the 13-inch gun turret below it, and no serious effects will probably be felt by the man stationed within them. It will be noticed, moreover, that the "Kentucky" will be able to bring the same number of 8-inch guns to bear in any direction as the "Indiana,"

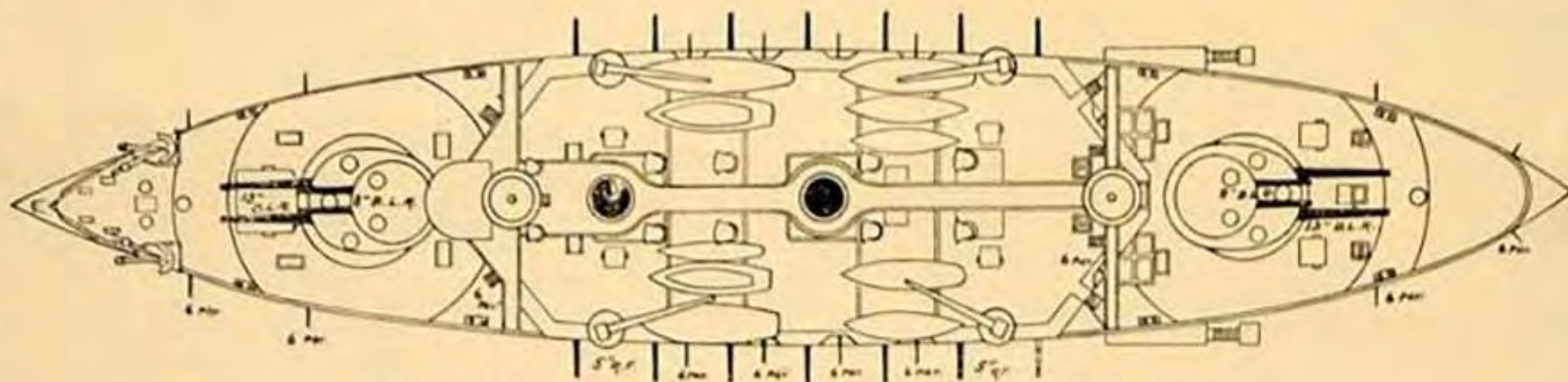
that is, two ahead or astern, and four on either beam; in fact, owing to the inability of the 8-inch guns of the "Indiana," to be fired dead ahead or dead astern, the four 8-inch guns of the "Kentucky" may be said to be more efficient than the eight similar guns on the "Indiana." The great weight of two turrets and four guns 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 as widely separated as possible, with a view to localiz-

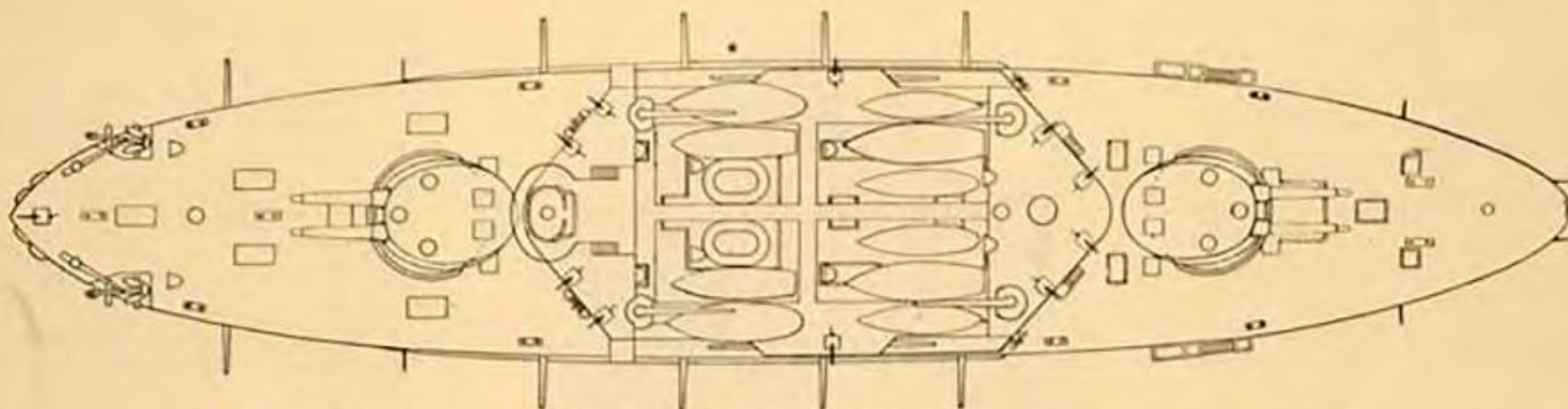
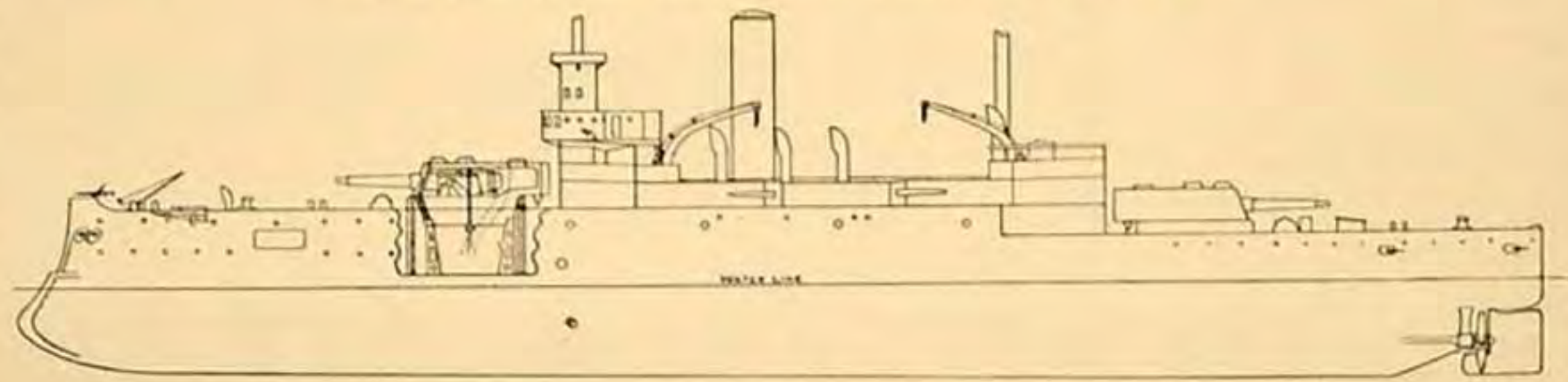
ing the damage inflicted by a successful shot. If the lower half of a double-deck turret should be crippled, the upper turret would also be placed hors de combat, and a light shell which was incapable of penetrating the 15-inch armor of the lower turret might pass through the 9-inch armor of the upper turret and wreck the turning gear below, thereby disabling 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 frequently 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 gun firing through an arc of 90 degrees. Though the shell for the 5-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 in a given time from the rapid-fire battery. The gunners will be protected by 6 inches of harveyized 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 berth deck. It will be the work of these guns to repel the attack of the torpedo boats. A number of 1-pounders and Gatlings will be carried in the tops of the military masts for the purpose of sweeping the decks and other exposed

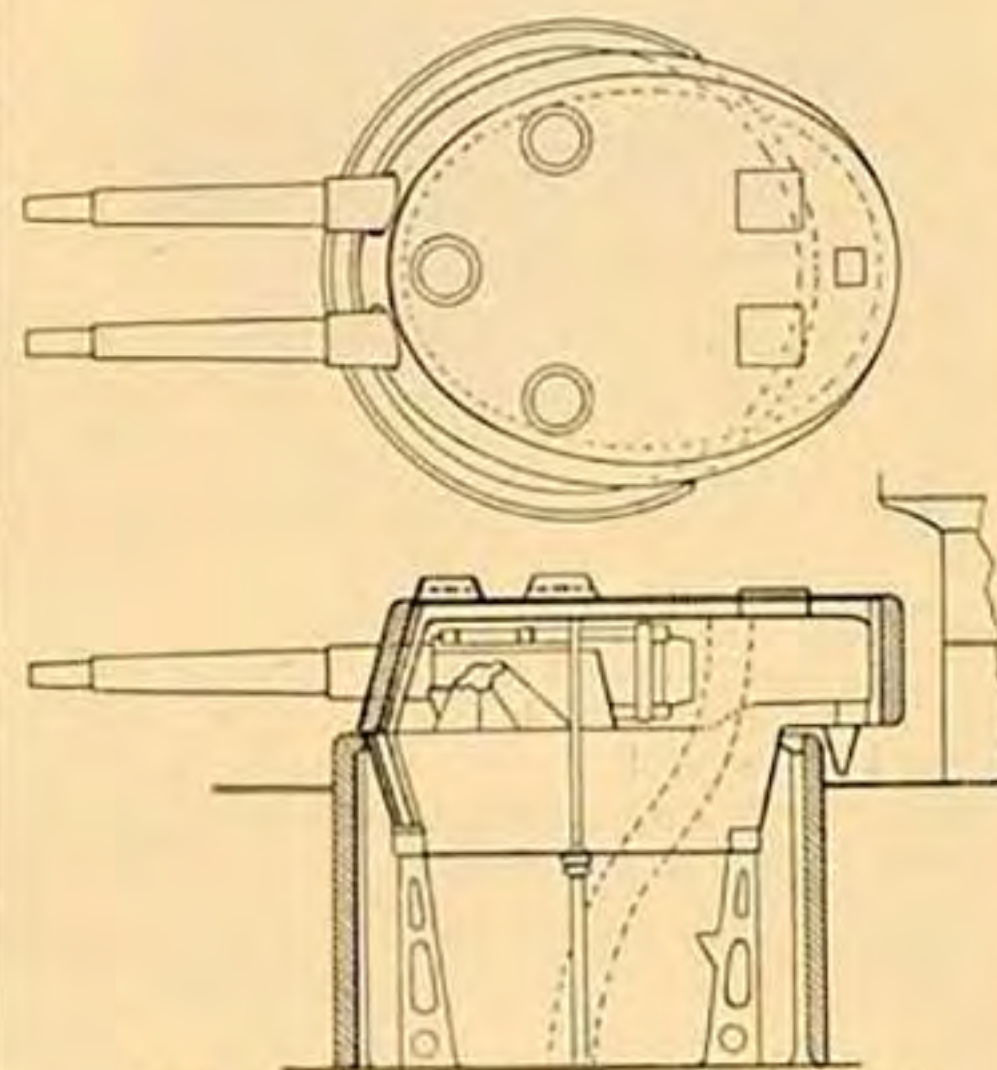


DECK PLAN OF THE UNITED STATES BATTLESHIP "KENTUCKY."

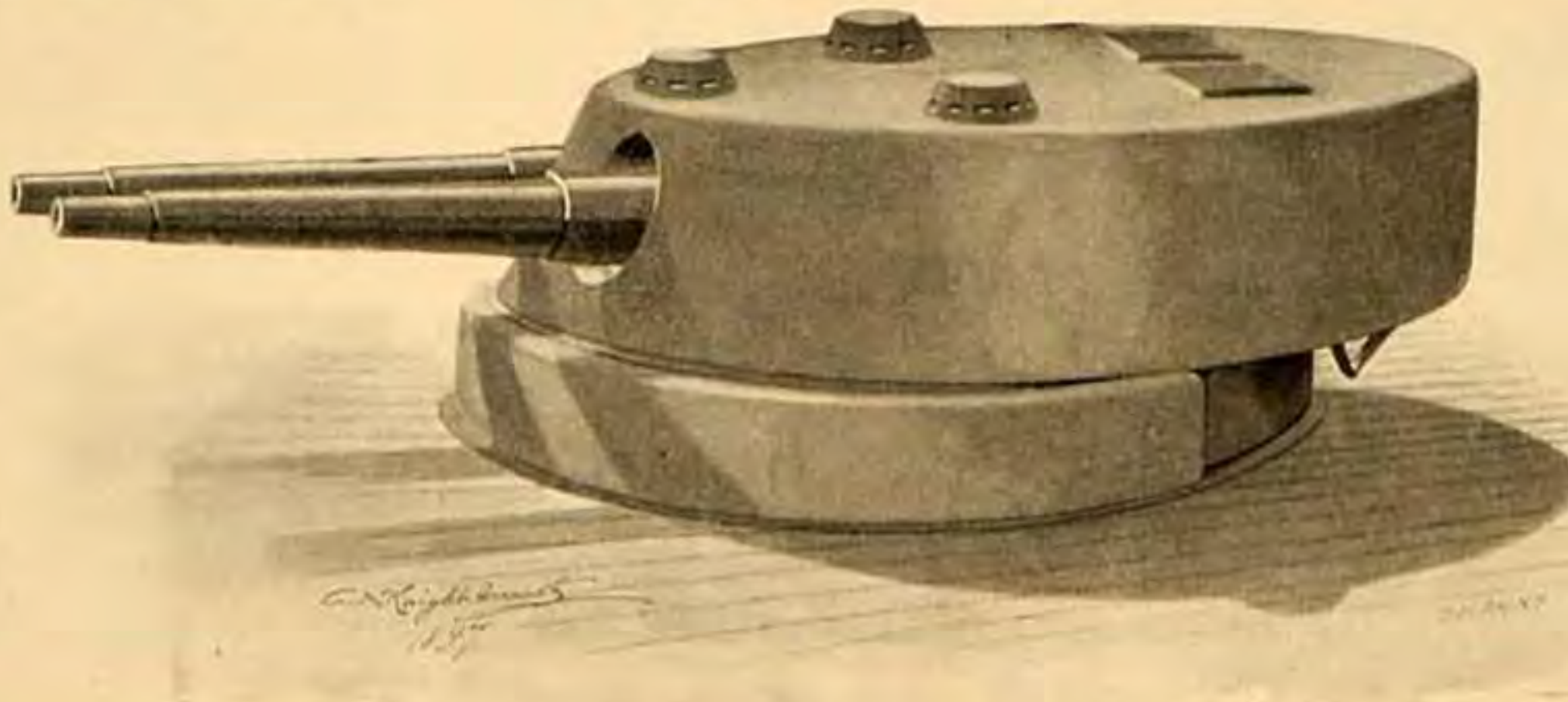


DECK PLAN AND SIDE ELEVATION OF THE UNITED STATES BATTLESHIP "ALABAMA."

it is not likely that it ever will be again. As far as the danger of interference is concerned, the device is likely to prove a success. The muzzles of the 8-inch guns project well beyond the sight-



PLAN AND VERTICAL SECTION THROUGH ELLIPTICAL TURRET.



ELLIPTICAL TURRET OF THE UNITED STATES BATTLESHIP "ALABAMA."

portions of an enemy. The ship will also carry five discharges for the Whitehead torpedo. The full complement will consist of 40 officers and 480 men.

Turning now to the "Alabama," we notice a further departure from the "Indiana" and a further development along the lines followed in the "Kentucky." The 8-inch gun has disappeared altogether, and the weight and power of the secondary battery has been greatly increased. Moreover, the seagoing qualities as compared with the former ships have been improved by adding another deck for the first three-quarters of the ship's length, thereby increasing the freeboard from 13 feet in the "Kentucky" to 20 feet in the "Alabama." The main battery is the same and consists of four 13-inch guns, which fire an 1,100-pound shell with a muzzle energy of 33,627 foot-tons, equal to the perforation of 34½ inches of wrought iron. The forward pair are carried above the upper deck at an elevation of 26½ feet above the water line. At this great height they could be fought in any weather, even when going head on to a heavy sea, which is probably more than can be said for the forward guns of ships with a freeboard some seven or eight feet lower.

The upper deck extends as far as the after end of the central battery. The after turret is carried above the main deck, or some 7 or 8 feet lower than the forward turret, thereby increasing the stability of the ship. The turrets are of what is known as the elliptical type. They are oval in plan, with the front plates slightly inclined and the rear plates vertical. This form is adopted as being lighter and giving more room for the handling of the guns and their loading appliances. In the old form of circular turret there was more room than was necessary at the sides and too little at the rear of the guns. The diameter of the stationary barbette is made somewhat larger than the shorter axis of the turret, and the center of gravity of the revolving parts is in the axis of rotation; so that the turret, in spite of its considerable overhang at the rear, is balanced and can be turned by its engine without serious retardation, even when the ship has a heavy list. Of the three sighting hoods, the center one is for the man who turns the turret, whose sole work it is to keep the guns always upon the target, as far as their lateral direction is concerned. The hoods on each side are occupied by the "gun pointers," who give the gun the proper elevation or depression.

The removal of the 8-inch guns and turrets has enabled the strength of the secondary battery to be enormously increased, the fourteen 5-inch guns of the "Kentucky" giving place to a battery of fourteen 6-inch guns in the "Alabama." These fire a 100-pound shell, as against the 50-pound shell used by the smaller gun, and their rapidity of fire is only slightly less. Each of these guns will have a muzzle energy of 3,204 tons and will be capable of penetrating 15½ inches of iron. In addition to its greater weight, the battery will be superior to that of the "Kentucky," because its guns are more widely separated and the protection afforded to the gunners is more complete. Eight of the guns will be inclosed within a central battery on the main deck, whose protection will consist of a continuous wall of 5½ inches of steel. Forward in the bows on the same deck will be two more 6-inch guns, similarly protected, and four other 6-inch guns, two on each side, will be mounted on the upper deck above this casement. They will also be protected with 6 inches of steel, and they will be capable of firing dead ahead and dead astern as well as on the broadside. The combined energy of the 6-inch battery alone will amount to about 225,000 foot-tons per minute—sufficient, when imparted to bursting shells, to tear the unprotected and lightly protected parts of an enemy's ship to pieces, and quickly turn the gun positions into a mere shambles. To these is added a battery of seventeen 6-pounders and six 1-pounders. There are also four broadside torpedo tubes protected with 6 inches of steel armor.

A feature which is a novelty in our navy, though it has been used in many of the later ships abroad, is the placing of the smokestacks abreast of each other instead of on the axis of the ship.

In concluding our notice of these fine ships, it should be pointed out that they maintain the reputation of our naval constructors at the high level at which it was placed by the appearance of the plans of the "Indiana" type some eight years ago. Like them, they carry heavier armor and heavier guns for a given displacement and speed than any ships in the world.

This is best shown by a comparison with the "Majestic" of the British navy. The "Majestic" has a displacement, loaded, of about 15,000 tons to about 11,500 tons for the "Alabama." In spite of this disparity, the "Alabama" carries four 13-inch guns, as against four 12-inch for the "Majestic"; she has fourteen 6-inch rapid-fire guns, as against twelve; she is protected with 16½ inches of side armor, as against 15 inches (9 inches side armor, 4 inches on slopes of deck); she has 17-inch turret armor, as against 6-inch, and her speed is only 1½ knots less. To this is to be added the fact that, being a smaller ship, she presents a smaller target to the enemy, and that, drawing 4 feet less water, she can navigate harbors and rivers and canals into which her bulky antagonist dare not enter. Noth-

ing could bear such eloquent testimony to the excellence of the ships turned out by Chief Constructor Hiebhorn as is given by the above comparison.

Electric Locomotives for London.

The General Electric Company, of Schenectady, N. Y., has just received an order for thirty-two electric locomotives for the Central London Underground Railway. When this company, some time ago, received the order for the electric apparatus for the road it was generally understood that the locomotives would be built in England, so that this order was somewhat of a surprise. The locomotives will weigh forty-five tons and will have a capacity of 800 horse power; they will be able to draw a train of five cars, weighing 150 tons, fifteen miles per hour. The same company is also preparing plans for the largest railway generator in the world. It will be of 4,000 horse power and will weigh 87 tons. It is to be built for the Lonsville Street Railroad Company.

NEW SCIENTIFIC AMERICAN OFFICES IN WASHINGTON, D. C.

We take pleasure in presenting to our friends and readers an illustration of our new office building in Washington, D. C.

We have just transferred our effects from the Pacific Building, where they have been for so many years, to this new building directly opposite, which has been especially fitted up for our own use. This building has been provided with every modern improvement and is



NEW SCIENTIFIC AMERICAN BUILDING IN WASHINGTON.

in all respects equipped for the needs of our extensive business. Any of our friends who may be visiting Washington will be accorded a cordial welcome by our manager.

The new building is located at 625 F Street, and is only a few steps from the Patent Office. We have had our own office in Washington for nearly half a century, but this is the first time we have had quarters that were exclusively our own, and we feel sure that our readers will sympathize with any feeling of pride which we may have in owning such a commodious and attractive building.

We take the liberty of making this brief statement, which must take the place of any formal housewarming.

The Current Supplement.

The SCIENTIFIC AMERICAN SUPPLEMENT for the present week, Number 1152, contains an interesting biographical sketch with portrait of Theodor Mommsen, the historian. "Auxiliary Engines and Transmission of Power on Naval Vessels" is a timely article by Mr. G. W. Dickie. "The Story of the Yukon," by Mr. William Ogilvie, F.R.G.S., occupies four pages and is one of the most reliable and entertaining studies of the Klondike region which has been published. It is a mine of valuable information and is well illustrated. Excellent articles on the progress of chemistry, bacteriology, and electricity in 1897 give a timely résumé of progress during the past year.

PROF. HANSEN, of Dakota, has about concluded his mission to Turkestan for the purpose of securing the seeds and plants best calculated to reclaim sandy wastes. He has secured a good collection.

Miscellaneous Notes and Receipts.

Acid-resisting Aluminum.—While aluminum is known to be easily attacked by alkalies, even strong acids do not injure it in the least. It behaves almost as indifferently as platinum. Aluminum may be left to the strongest nitric acid for days without any effect being visible. This property makes aluminum very valuable for certain purposes. The writer uses aluminum hooks to take out photographic plates from the acid trays. No other material is capable of withstanding the action of the rather strong nitric acid used for acidifying the plates, for any length of time; even hard rubber hooks were corroded in a comparatively short time. The aluminum hooks were found to be invaluable and have the advantage of infrangibility over glass hooks. For acid funnels aluminum may also be employed to advantage.—*Technische Mittheilungen.*

Making Plaster Casts of Carved Articles.—If the objects are cut conically, they are simply pressed into a lump of soft clay; then paint the mould thus produced with linseed oil, and pour in the plaster of Paris. For complicated objects such as animal heads, deepened reliefs etc., glue moulds are employed. Prepare a box just large enough to receive the model. Boil good joiner's glue in sufficient quantity, and after the model (which has been thoroughly coated with shellac, and after this is dry with linseed oil) has been laid in the box, pour the liquid glue into the box. After a few hours the glue is sufficiently dry so that the model can be taken out. Now coat the glue mould all over with linseed oil and pour in the gypsum. In this manner very good impressions are obtained at a comparatively slight expense. The moulding glue can be used over again at any time.

Waterproof Blacking.—Melt 18 parts beeswax with 1 part borax and stir until a sort of jelly has formed. In another vessel melt 6 parts spermaceti, add 5 parts asphalt varnish which was previously mixed with 66 parts oil of turpentine, stir the mixture thoroughly and finally add the mass to the wax. For color add 5 parts vine black and 2 parts Berlin blue previously ground in a little of the mass. Lastly perfume the grease with 1 part of nitrobenzole and fill in boxes. A little of this blacking is sufficient for use; rub it out with a rag and then brush. A weekly application is sufficient.

Underlays for Linoleum.—The question whether on cement floors a cement or gypsum plaster would be preferable as an underlay for linoleum was answered as follows in the *Nordd. Bangew. Ztg.*:

It is not advisable to provide cement concrete floors with cement plastering, because the latter allows the moisture that is still contained in the cement to pass through, which remains between the solid floor and the linoleum and cannot escape, as the linoleum is air and water proof. The solid cement floors generally contain still more or less moisture when the linoleum is to be laid, as it is a fact that cement attracts moisture in damp weather and gives it off when the air is dry. Furthermore, cement is a cold underlay. The disadvantages of linoleum lying on a damp underlay are not slight. Mould ensues, which causes unpleasant odors and gradually has a destructive effect on the linoleum, although the back is waterproof. These difficulties are obviated if a plastering of gypsum is used instead of the cement. The gypsum attracts the moisture contained in the concrete without giving it off again, and furnishes a beautiful, smooth, dry and warm flooring. In order to obtain a good gypsum wash floor, the concrete floors are only leveled, without being smoothed. If all the work in the different rooms is finished, so that only the laying of the linoleum remains, the concrete floors are made even with a thin layer of gypsum; then they are dried sufficiently and finally covered with linoleum. A padding of pasteboard is now frequently employed. The same serves for the purpose of dampening the sound and for warmth, as well as for a protection against a wearing off of the pattern. But in no case is it advisable to use this padding on cement plaster floors. One should be sure, before laying the linoleum, that the pasteboard is completely dry. Besides, the edges of the linoleum must fit together so exactly that seeping water cannot get through. The same possibility must be excluded along the skirting boards, as other disadvantages may ensue. It is furthermore advisable to provide the skirting boards with a groove or to fix them the thickness of the linoleum higher on the wall, whereby the laying of the linoleum is facilitated. It is also well to wipe the linoleum after it is laid, but before use, once or twice a week with clear cold water. During or after the wiping the windows should be opened. It cannot be recommended to rub the linoleum with oil. The oil applied to the surface would combine with the dirt and soon give a black, dirty surface to the covering. Waxing is also valueless. It is absolutely disadvantageous to paste the linoleum down entirely, as it is better in every way if it lies loose; the paste is saved and any small repairs that may arise will not necessitate the destruction of the whole covering. As regards the conservation of linoleum when stored, it must be observed that the dirt must be first removed before the linoleum is rubbed with oil and the latter must be spread apart well.