Correspondence.

Ovid and Land Reclamation.

To the Editor of the SCIENTIFIC AMERICAN:

I lately chanced to come across the following passage in Ovid, which as it records one of the earliest instances of land being reclaimed for building purposes within the boundaries of the city of Rome, may prove of more than passing interest to some of your readers at a time when such schemes are being very widely considered, both in this country and in Europe. I may add that to me it appealed strongly, from the fact that it seemed to bear a striking analogy to the plan which through your courtesy I proposed in the columns of the SCIENTIFIC AMERICAN of July 9, 1904, for dealing with the East River by means of a process of dyking and filling in, though of course on a very much lesser scale.

I have added a free translation of the passage for the benefit of the general reader.

"Forte revertebar festis Vestalibus illac,
Qua Nova Romano nunc via juncta Foro est
Huc pede matronam vidi descendere nudo:
Obstupui, tacitus sustinuique gradum.
Sensit anus vicina loci, jussumque sedere
Alloquitur, quatiens voce tremente caput.
Hoc, ubi nunc fora sunt, udoe tenuere paludes:
Amne redundatis fossa madebat aquis.
Curtius illelacus, siccas qui sustinet aras,
Nunc solida est tellus, sed lacus ante fuit.
Qua Velabra solent in Circum ducere pompas,
Nil proeter salices crassaque canna fuit.
Soepe suburbanas rediens conviva per undas
Cantat, et ad nautas ebria verba jacit.
Nondum conveniens diversis iste figuris
Nomen ab averso ceperat amne deus.
Hic quoque lucus erat juncis et arundine densus
Et pede velato non adeunda palus.
Stagna recesserunt, et aquas sua ripa coërcet:
Siccaque nunc tellus. Mos tamen ille manet."

—Fasti vi., 395-414.

TRANSLATION.

"I happened to be returning from the festival of Vesta by that road which the New Street takes toward the Forum of Rome. I saw a woman here walking along barefooted. I was naturally astonished, and stopped to watch her. An old woman of the neighborhood noticed me, and bidding me be seated, addressed me thus, her wizened head shaking with a convulsive cough: This spot, where now you see the markets, was once occupied by marsh lands; a ditch used to pass this way full of water from the river's overflow. Yonder was the Curtian Lake, where now the churches stand on dry ground. It is now a firm foundation, but formerly it was nothing but a lake. At the point where the two Velabran streets pass into the Circus, there was nothing at that time but willows and coarse reeds. Often the reveler on his way home through the waterways of the outskirts would sing to himself and bandy drunken jokes with the watermen. The god who assumes different forms occasionally—Vertumnus—had not yet been christened after the river's diversion. Here too was a cemetery with bulrushes and osiers on one side and a swamp not to be crossed with shoes on. The stagnant pools have been drained, the river's bank now confines the stream, and the ground is dry; but the custom of taking off the shoes is still kept up." T. F.

Philadelphia, June 9, 1906.

The Recent Earthquake in California.

Dr. J. C. Branner, vice-president of the Leland Stanford, Jr., University, made an interesting address on the above subject at the late special summer Ithaca meeting of the American Association for the Advancement of Science.

As to the relation of earthquakes to the interior of the earth, he stated that the old idea that the earth has a fluid interior has now been entirely abandoned. It is now believed that the earth is solid throughout, with the exception of scattered local pockets of molten matter; hence it does not seem as if there could be any direct connection between earthquakes and volcanoes. All the geological strata (meaning, of course, those of plastic origin) were originally deposited horizontally, but they have been squeezed together, and thus compressed so as to tilt them and fold and break them at the surface. This tilting diminishes as we descend, till at a certain depth, probably about six miles, the superincumbent pressure is so great that the strata cannot bend and the pressure is taken up in plasticity. A good illustration of this is found in the coal fields of Pennsylvania, where the seams of coal run more and more nearly horizontal as we descend. Faults and displacements are near the surface—and faults imply earthquakes.

There are two classes of disturbances—volcanic and tectonic, i. e., produced by pressure. When you overload a portion of the earth's surface it cracks, and the resulting shock is not conveyed in circles, but in irregular curves according to the conductivity of the rocks and the length of the line of fracture along which slipping occurs.

Faults occur in the Coast Range between the Santa Clara Valley and the Pacific Coast, which indicate a displacement of 3,000 feet, i.e., the strata on one side of the fault line are of a geological depth of 3,000 feet below those on the other.

Soon after the earthquake, Dr. Branner went out and looked at this crack. It could be traced 185 miles in a northwesterly and southeasterly direction from Point Arena on the coast northerly from San Francisco down through Tomales Bay, passing eight miles west of San Francisco, thence coming ashore again, proceeding along the coast and partly going inland, following nearly a straight line. The trouble came from this crack. The waves radiating out from it constituted the earthquake.

California is characterized by many parallel ranges of valleys near the coast, produced by overturning or faulting of nearly flat strata. These faults when made must all have caused earthquakes. The principal movement in the last earthquake was not vertical, but lateral, and varied from a few inches up to sixteen feet, while the vertical displacement was generally only a few inches, and nowhere more than two or three feet. The slightness of this vertical displacement explains the absence of a tidal wave.

He admitted his inability to explain the records of the seismograph. He characterized them as a higgledy-piggledy set of curves.

Fortunately, most people were in bed at the time of the earthquake; otherwise, the mortality would have been much greater. Among the singular effects of the earthquake, was that it turned pictures completely around in some cases, so as to face the wall where they were hanging. There were many landslides in the country where the soil was moist. No well-built house was shaken down except those on made land.

Dr. Branner accompanied his remarks with numerous lantern illustrations showing the effects of the earthquake. Views of the crack in many different localities showed it stretching clear across the scene, in many places clear and distinct, in others only traceable by an expert. Its course was indicated usually by a slight elevated ridge of earth. Where it intersected fences, they were broken, and the fence on one side of the crack was carried in some cases fourteen to sixteen feet away from that on the opposite side.

Where trees lay in the path of dislocation, they were shown in some cases fallen because of the loosening of the roots, in others split in two.

Bridges were removed from their piers. One picture showed a bridge the piers of which had been severed horizontally, and the upper portion moved a short distance, but still resting dislocated on the lower portion.

The pushing aside and breaking of the water pipes at their joints, as they lay in a direction parallel with the earthquake crack, affected the pipes as they crossed the line of fracture in such a way that one portion of them were squeezed together and telescoped, while another portion of them were drawn apart, giving the line a zigzag appearance, resulting in such utter destruction as to render repair impossible, and thus to deprive San Francisco of its water supply and thereby render the fight with fire hopeless at the critical period.

The effect on buildings was very different in different locations and with different structures, ranging from entire demolition to slight dislocation. Several views were given of buildings on the line of fracture which had been partly split, and the portions on opposite sides of the crack moved away from each other. A stable had been moved a few feet leaving a pile of manure standing beside it several feet distant from the window out of which it had been thrown, while the discolored wall against which it had rested was still seen underneath the window from which it had been thrown out. In a brick building the entire upper story had been shaken down and out from under the roof, the latter having settled evenly upon the story below.

Lantern views illustrated many instances of the great damage done at Dr. Branner's own university—the Leland Stanford, Jr. It may be worth mentioning, though the speaker did not refer to it, that the striking difference in the effect of the earthquake on this university and on the University of California was due to the fact that the latter was founded on a rocky locality, and the former on softer ground. The earthquake commission appointed by the Governor of California in their preliminary report state that waves transmitted through rock were more rapid but less dangerous than those through less solid formations.

The reported engulfing of a herd of cattle was explained as a misapprehension. The cattle were involved in a landslide caused by the earthquake, and were all extricated.

The lecturer concluded by stating that earthquakes were natural phenomena; and if it were not for the resulting damage, he would like to see more of them in order to study them. Despite the earthquake, he regarded California as an ideal place of residence.

THE NEW JAPANESE BATTLESHIPS "KATORI" AND "KISHIMA."

BY J. B. VAN BRUSSEL.

The new first-class Japanese battleship which terminated her official trials on June 1 last, and is now steaming in company with her sister ship, the "Kishima," represents the most advanced ideas of Japanese naval authorities and of her builders, Messrs. Vickers, Sons & Maxim, Ltd. The armament and armor surpass those of any ship now in commission.

The main dimensions of the vessels are the following: Length between perpendiculars, 420 feet; length over all, 455 feet 9 inches; breadth, 78 feet; depth to upper deck, 44 feet; draft, 27 feet; displacement in tons, 15,950.

The propelling machinery of each ship consists of two sets of four-cylinder triple-expansion engines balanced on the Yarrow-Schlick-Tweedy system, each set having one high, one intermediate, and two low-pressure cylinders. The diameters of the cylinders are respectively 35½ inches, 56 inches, and 63 inches for each of the low-pressure cylinders, with a stroke of 48 inches. The steam pressure at the boilers is 230 pounds per square inch, and at the engines 200 pounds per square inch. The engines are designed to turn the propellers inward when going ahead, so that the starting platform is in the center of the ship. Wrought-steel columns form the supports of the cylinders, which are independent castings, and the back supports are of the ordinary cast-iron "A" framing, with ample slipper-guide surface. The condensers, four in number, are placed in the wings of the ship. The total cooling surface is 17,000 square feet. Each crank-shaft is in two interchangeable pieces, and the propeller shaft is 18 inches in diameter, with a 10-inch hole, while the propellers have four blades, the diameter being 17 feet 3 inches.

The boilers are of the latest Niclausse type, twenty in number, disposed in 3 separate boiler rooms, 5 with 16 sections, and 15 with 15 sections, each section consisting of 24 tubes. The total heating surface is 44,000 square feet, and the total grate area 1,334 square feet. There are two funnels, the forward one being 12 feet 9 inches in diameter over the casings, and the after one 12 feet 9 inches by 8 feet 1 inch over the casings, the height from the fire-grate being 90 feet.

The armament consists of four 12-inch, four 10-inch, twelve 6-inch, twelve 12-pounders, three 3-pounders, six Maxim rifle-caliber guns, five submerged torpedo tubes.

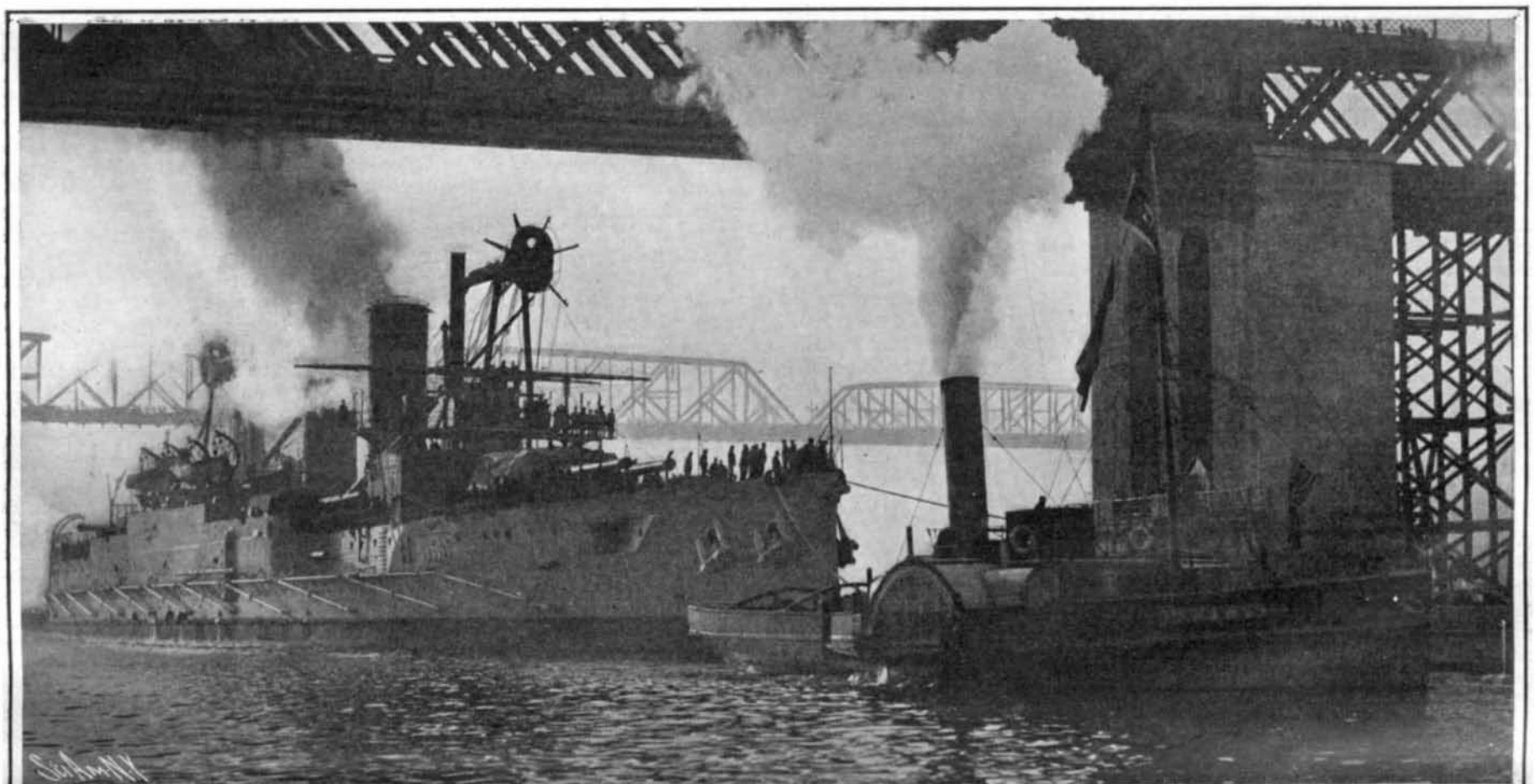
The four 12-inch 45-caliber breech-loading guns are mounted in pairs in barbettes, two forward and two aft, behind 10-inch armor. These guns have a total length of 556.5 inches, a length of bore of 540 inches, and a diameter of bore of 12 inches. The total weight of these guns, including the breech mechanism, is of 57 tons 9 hundredweight, 2 quarters, and the weight of each projectile 850 pounds. The muzzle velocity is 2,860 feet per second, the muzzle energy 48,210 foot-tons, and the energy at four miles range is 18,950 foot-tons. The 12-inch guns are wire-wound. Their breech mechanism is of a new and improved type, and is arranged to be operated either by hydraulic gear or by hand. The hydraulic gear consists of an hydraulic ram mounted in suitable brackets on the end frame above the breech mechanism. The ram gears, by means of a rack, with pinion and clutch gear on the top of the hinge-bolt. This clutch is thrown out of action at any time by a hand-wheel mounted at the bottom end of the carrier hinge-bolt, and is so arranged that it is impossible to have both gears in operation at the same time. The hand gear for operating the mechanism consists of a hand-wheel, with worm and worm-wheel gear, mounted in a bracket at the lower end of the hinge-bolt, and secured to the frame of the gun. The worm and wheel gear are arranged so that 17 turns are required to operate the breech mechanism; 12.2 turns to unlock the breech; and 4.8 turns to swing the mechanism out to the "fully open" position. One of the chief features of the new mechanism consists in the application of a "couple" for rotating the breech-screw. In breech mechanisms as at present generally constructed, the breech-screw is rotated by a turning moment, which has been found to set up considerable friction, owing to the tendency of such moment to occasion axial displacement of the breech-screw. By applying a "couple" for this purpose this difficulty is obviated, so that the whole of the available turning force applied to the breech-screw is utilized in seating the obturator.

The mountings for the 12-inch guns are operated hydraulically, but most of the operations can also be performed electrically. Protection is afforded to the gun crew, and to the upper parts of the mountings, by a heavily armored shield, securely attached to the upper surface of the turntable.

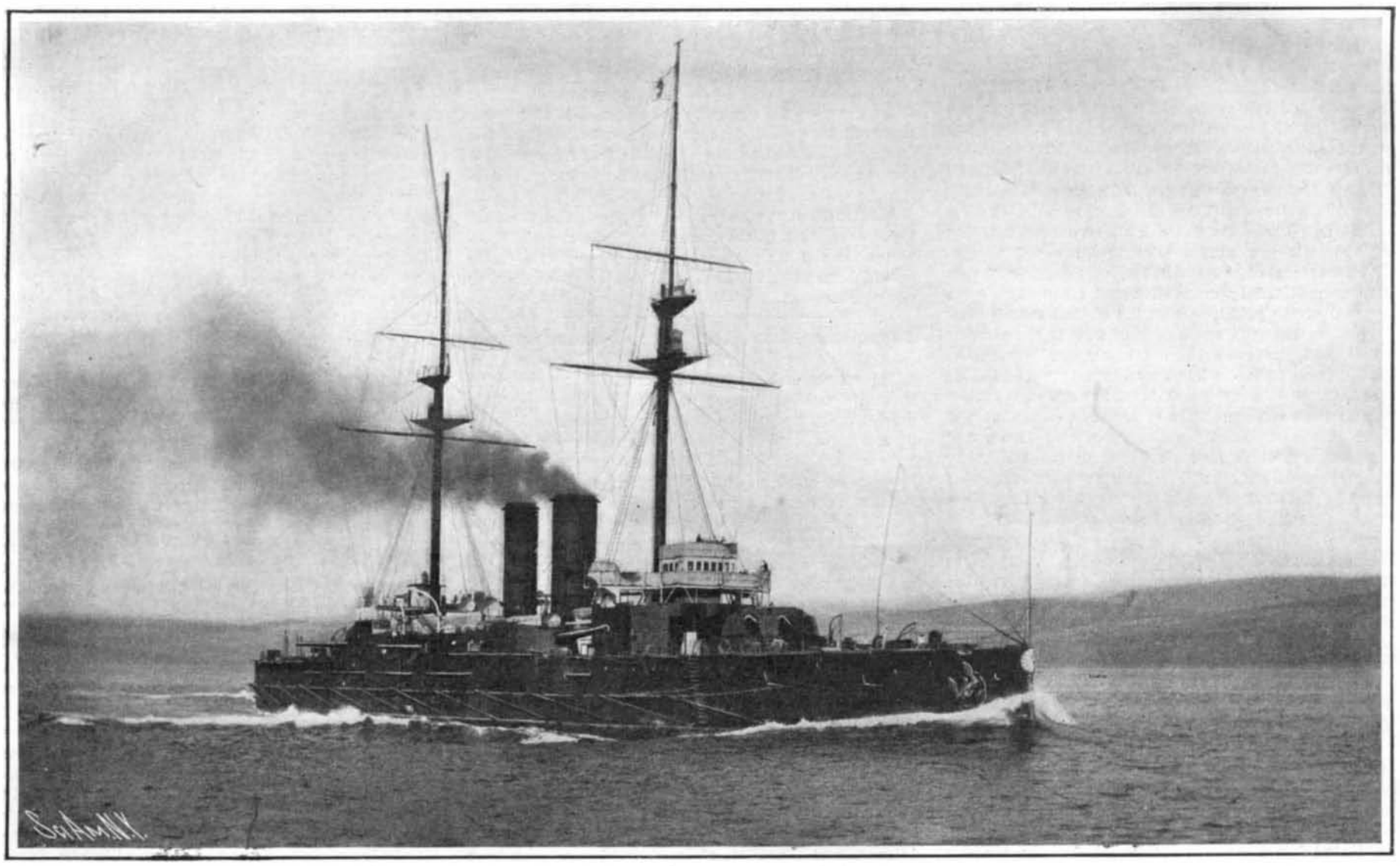
No less interesting are the ammunition hoist and loading devices. The projectile is lifted from the bins by an overhead carrier. Two jaws on the carrier drop on each side of the projectile, and the pulling forward of a handle operates toggle levers, which close the jaws around the shot. The carrier is then raised by

SCIENTIFIC AMERICAN

Vol. XCV.—No. 3. ESTABLISHED 1845.] NEW YORK, JULY 21, 1906. [10 CENTS A COPY $3.00 A YEAR.



The Japanese Battleship "Kishima," Sister Ship of the "Katori," Steaming Out to Sea for Her Trial Trip.



The New Japanese Battleship "Katori" on Her Trial Trip. Contract Speed, 18.5 Knots.

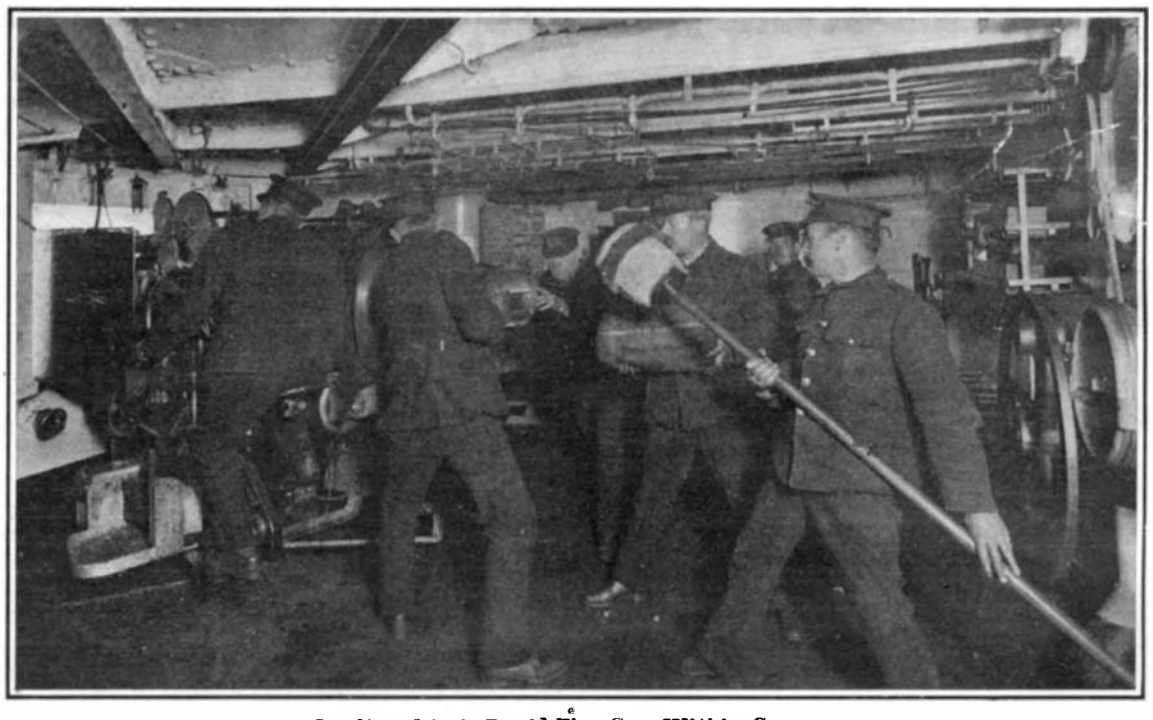
The "Katori" and the "Kishima" are the two most powerful battleships thus far built. They are armed with four 12-inch, four 10-inch, and twelve 6-inch guns, besides twelve 12-pounders, three 3-pounders, and 6 pompons. Their armor consists primarily of a 7½-foot belt varying in thickness from 9 inches to 6½ inches and extending 5 feet below the water line.

THE NEW JAPANESE BATTLESHIPS "KATORI" AND "KISHIMA."—[See page 47.]

its hydraulic press, and is traversed to the base of the trunk on joist rails by means of an hydraulic ram working through cables and pulleys. The shot is deposited on a receiver, and is there held in position by stops on the top, which is inclined so that when the stops are lowered the projectile rolls on to a corresponding receiver or bogie, which can follow the rotation of the ammunition trunk by the turning of pinions engaging in the toothed rack round the base of the trunk. The traversing pinion within this bogie is operated at considerable speed by a hand-wheel and worm-gear. The introduction of this intermediate bogie serves to bring the shot to the base of the hoist, when the latter is revolving with the guns; the fixed receiver at the same time enables additional projectiles to travel on their way to the gun. Thus there may be one shot on the carrier, another on the fixed receiver, a third in the bogie, a fourth in the hoist to the shell chamber, where the ammunition is transferred to another hoist communicating with the charging platform, so that there may be a fifth in the upper hoist and a sixth in the gun. The increase in the number of shots between the shot-bins and the gun chamber renders it possible to maintain a greater rapidity of fire for a short period, notwithstanding the great weight of projectile and powder charge.

The charge is loaded up in quarters, within silk bags, on a level above the shell chamber, and the hoist for the charge, while within the same trunk, is independent of that for the projectiles.

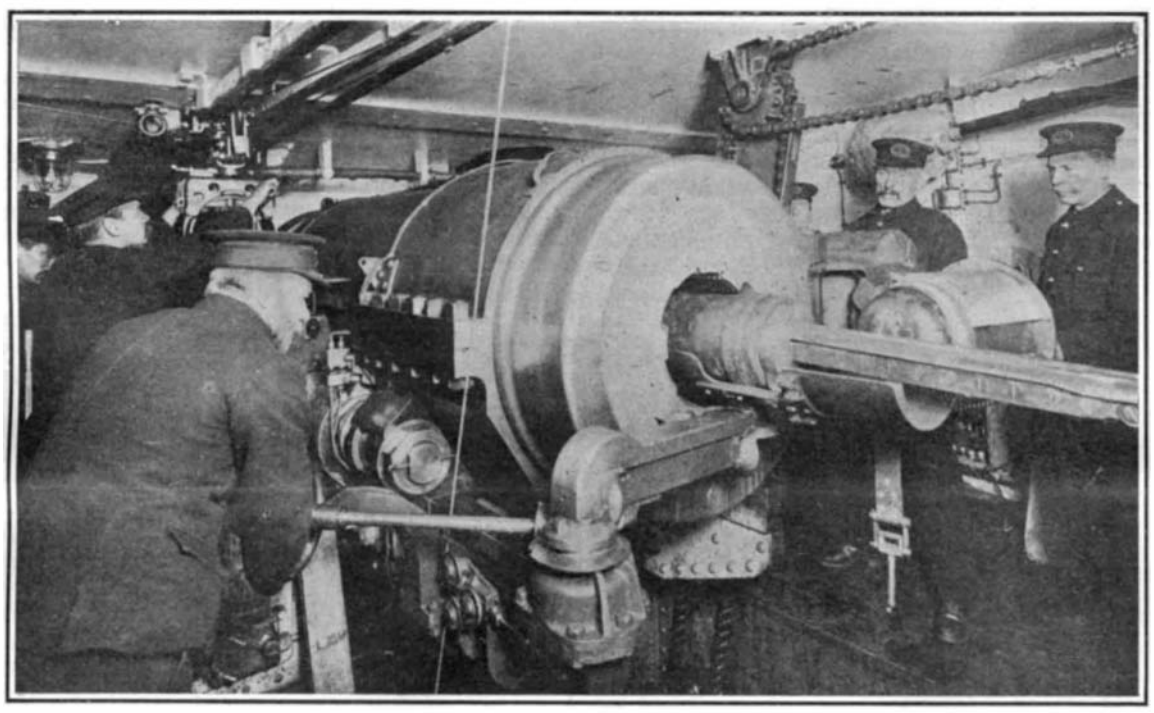
In the working chamber both projectiles and powder charges are arranged to come into position at the top of their respective hoists in this working chamber for direct hydraulically-operated transference to the gun-



Loading 6-inch Rapid-Fire Gun Within Casemate.

elevation or depression, and even with the guns moving during training operations.

In the 12-inch turret three sighting positions are provided, one center position between the guns being fitted with two sights, with a single sight at each side position.



Loading a 10-inch Gun in Barbette, Showing the Loading-tray.

loading cages, which rise from this level to the loading trays behind each gun. The two gun-loading hoist-cages which serve the guns are arranged to work on curved rails passing from the shell-room up into the turntable at the rear of the guns, the arrangements being such that the guns can be loaded at any angle of

The four 10-inch 45-caliber breech-loading guns are mounted single at each corner of the citadel in barbettes, with armor 6 inches thick. The breech mechanism for these guns is very similar in principle to that of the 12-inch gun, except that it is operated by a hand-lever, pivoted so as to swing in a horizontal plane.

Furthermore, whereas the 12-inch weapons are run out by hydraulic power to the firing position, the mounting of the 10-inch guns includes recuperative springs, which effect the return to that position.

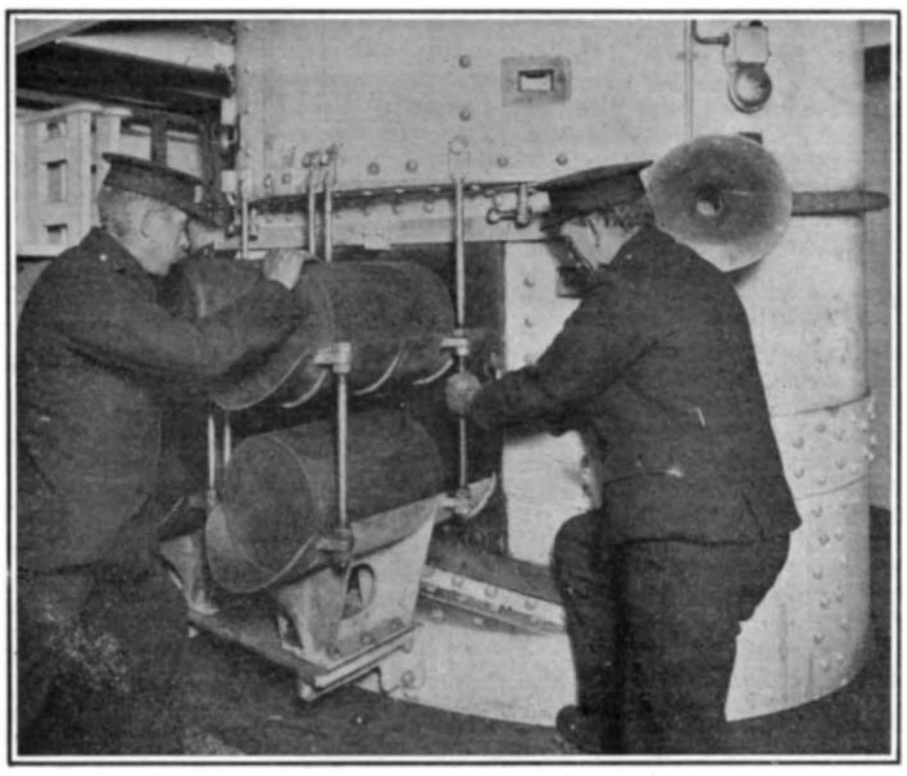
The twelve 6-inch 45-caliber breech-loading guns are carried on pedestal mountings, ten placed on the main deck and two on the upper deck. A special feature of the mountings of these guns is the sighting gear, which is telescopic and arranged for use with a separate sight setter, so that the gun-layer is enabled to concentrate his attention on the object.

The main armor-belt of each ship has a depth of 7 feet 9 inches, of which 5 feet 3 inches is below the water-line, and extends from end to end of the vessel, its thickness being 9 inches for a length of 240 feet amidships, reduced gradually to 4 inches at the stem. Armor bulkheads 9 inches thick are carried across the ship at the forward and after ends of the 9-inch belt, extending in depth from the lower to the middle armored decks.

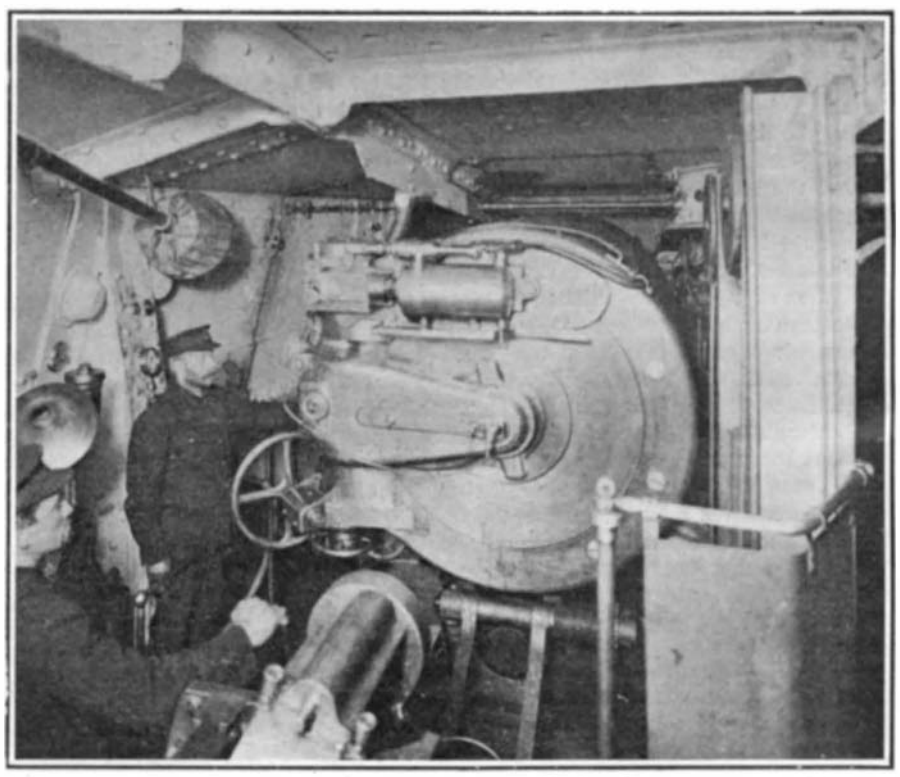
The armor protecting the citadel containing the 6-inch guns is 6 inches thick. The armor on the barbettes inclosing the 12-inch guns is 10 inches in thickness generally, but reduced to 5½ inches thick where protected by the belt and battery armor.

The 10-inch guns are mounted in barbettes, the upper portion of the armor being 6 inches thick and the lower portion 2 inches. The armor of the conning tower is 9 inches thick, and the observer tower 5 inches thick, the tubes for communication from these being 8 inches and 4 inches thick respectively. As in recent ships of the British navy, entrance to the conning tower is from the wheel-house through a hatchway in the armored roof.

The vessel, which will have a total complement of 980 officers and men, gave during the official trials a mean speed of 20.22 knots, with the engines developing their full power, and making about 130 revolutions per minute. As to the coal consumption, when the speed was 17.8 knots, it worked out at 1.6 pound per indicated horse-power.



Placing Charge on the Ammunition Hoist for the 12-inch Guns.



Interior of 12-inch Gun Barbette, Showing Hydraulic Gear with Loaded Gun.

THE NEW JAPANESE BATTLESHIPS "KATORI" AND "KISHIMA."