SCIENTIFIC AMERICAN

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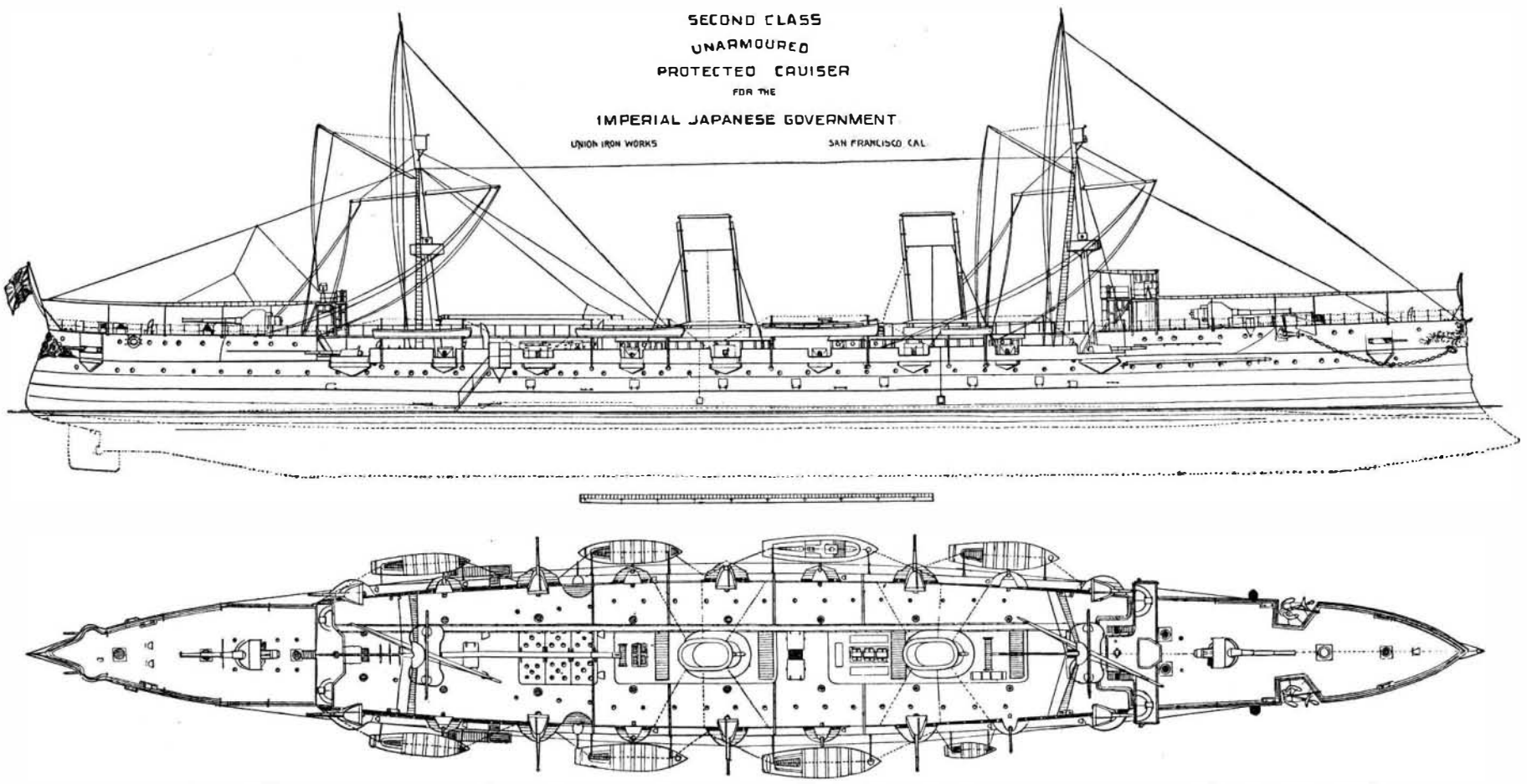
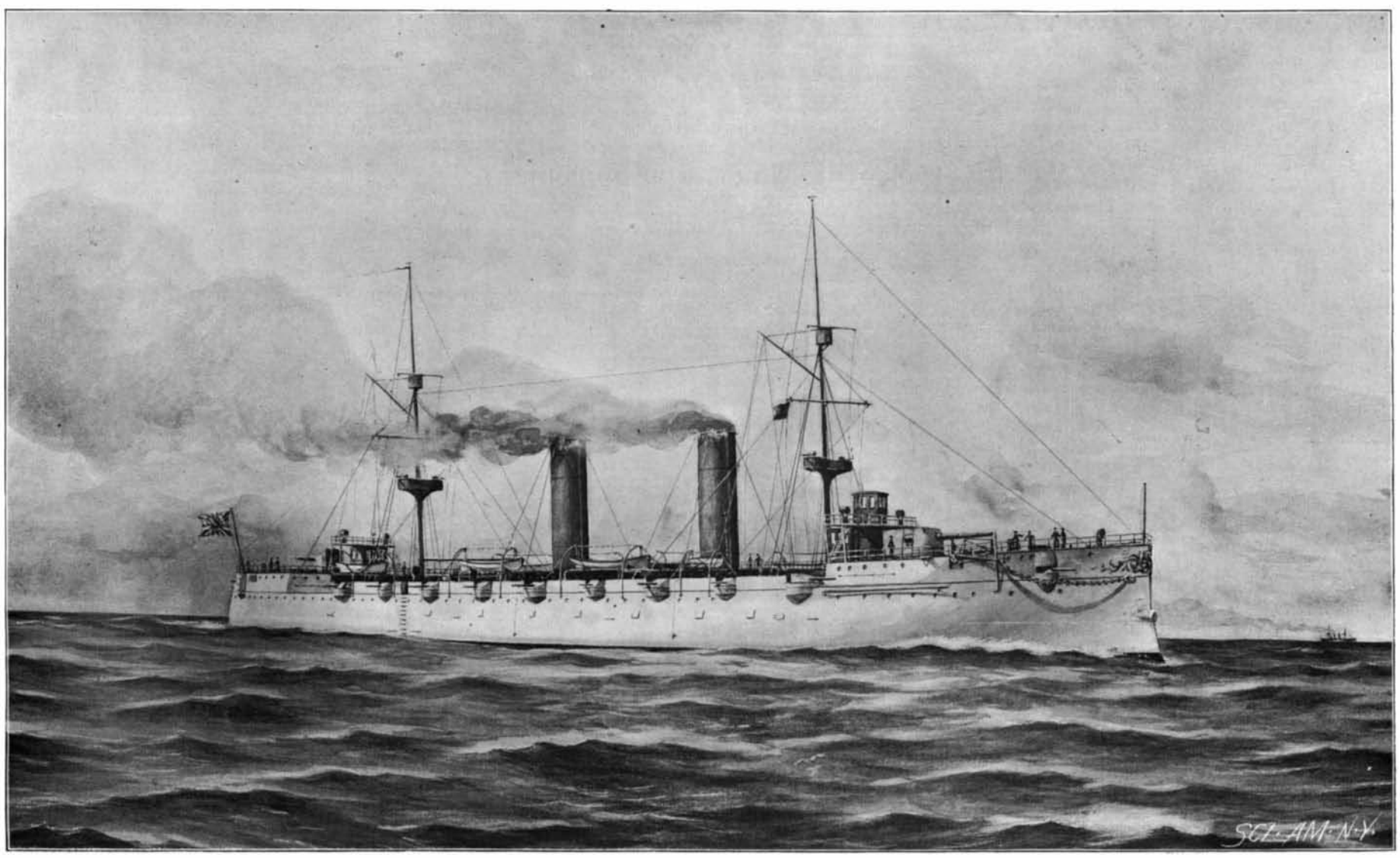
AMERICAN BUILT CRUISERS FOR JAPAN.

There is good reason to hope that the recent placing of orders for the construction of two foreign warships in American yards will prove the first step toward building up an extensive foreign business in this particular line. The unfortunate decadence of our merchant marine has left our shipbuilding yards with small prospects of securing many orders for ocean freight and passenger ships; but if we can only secure a reasonable share of the warship construction which is being done by England and France for foreign governments, it would keep our leading shipbuilding yards in steady employment, and the trade being once established, it would be certain to increase in volume.

The good work of the Union Iron Works, of San



SHEER AND DECK PLANS OF JAPANESE CRUISER BUILDING AT THE UNION IRON WORKS, SAN FRANCISCO.



JAPANESE UNARMORED CRUISER BUILDING IN AMERICAN YARDS.

Water line length, 396 feet; beam, 49 feet; draught, 17 feet 7 inches; displacement, 4,760 tons; speed, 22½ knots.

Francisco—the leading shipbuilding plant on the Pacific coast—has borne fruit; and the firm is to build a craft for the imperial Japanese government in substantial token of the impression made in the East by the Charleston and the Olympia, the fabrications of that yard. An order for a duplicate vessel was placed at the same time with William Cramp & Sons, of Philadelphia.

The new vessel, designated by the Japanese as a second class, unarmored, protected cruiser, is unlike any vessel in our service; and is modeled after several swift cruisers of English build constructed for other nations, the best of which boats is the Japanese Yoshino, which took a very active part in the late Chino-Japanese war, and during her wide service proved herself an exceptionally effective craft.

The cruiser to be built by the Union Iron Works is an enlarged and bettered Yoshino; and it is no small credit to the Pacific yard that it is willing to trust its standing upon the development of lines peculiarly English and to start afresh where the patient practice of its rival has halted.

The new ship will have a load water line length of 396 feet; an extreme beam of 49 feet; and upon a normal displacement of 4,760 tons will draw 17 feet 7¼ inches of water.

There will be twin screws, each screw being driven by a triple expansion engine. These engines, which are in separate compartments, are of the four cylinder type; and each will have a high pressure cylinder of 40 inches, an intermediate pressure cylinder of 60 inches, and two low pressure cylinders of 66 inches in diameter. The common stroke is three feet, and when they work at their maximum power the engines will develop 15,000 indicated horse power, and will induce a speed of quite 23½ knots an hour. The probability is that this speed will be exceeded.

Steam will be supplied by four double-ended and four single-ended boilers, in four separate watertight compartments; and forced draught will be induced by large blowers exhausting directly into the closed fire rooms. The normal coal supply will be 350 tons, but the bunker capacity will be for 1,000 tons; and upon this liberal allowance the vessel will have an exceptionally wide radius of action. The coal will be stowed abreast the boilers and the engines for the sake of added protection; and to lessen the tax of handling, it will be arranged to fall right in upon the fire room floors.

There is a double bottom from stem to stern, and a cellular form of structure prevails along the water line region. This arrangement, in conjunction with the disposition of coal, and a protective deck, 4½ inches thick on the slopes and 1¾ inches thick on the flat portion, extending from bow to stern and generally about the level of the water line, offers excellent protection against high explosive shell fire, and guarantees shelter for the vitals and the preservation of stability.

The Japanese know only too well the danger of conflagration in action and its vital menace to efficiency, and with a view to protection, every bit of woodwork will be fireproofed. The ship will be lighted by electricity and ventilated by natural and artificial means; and comfortable and healthful accommodations are planned for the complement of 405 persons.

The armament will consist, in the main battery, of two 8 inch quick-firing rifles and ten 4·7 inch quick-firing rifles, and, in the secondary battery, of twelve 12 pounders and six 2½ pounders. The 8 inch guns are mounted one on the forecastle and one on the poop deck, and each will have an arc of fire of 270°. These guns are protected by steel shields, and, in their rapid-fire mechanisms, are beautiful evidences of skill. Each projectile weighs 210 pounds, and a speed of fire of four aimed shots in sixty-four seconds has been attained by a well trained crew. While our own 8 inch guns fire a shell of 250 pounds, our best practice has been one shot in a minute and a half. The 4·7 inch guns are mounted on the main deck, in 3 inch armored sponsons, and are further protected by shields. The forward and aft 4·7 inch guns fire dead ahead and dead astern, respectively, and have a total arc of fire, each, of 130°. The rest of these guns, in broadside, have a radius of fire of about 100°.

The 12 pounder guns are mounted on the main deck amidships and one at the bow and one at the stern, on each side, in sponsons. These guns likewise have effective arcs of fire. The 2½ pounders are carried on the hammock berthing and in the military tops.

The whole armament is capable of great rapidity of fire, and all the guns will be manufactured by the celebrated Armstrong firm, of Newcastle, England. The ammunition for the heavier guns is raised by electrical hoists, while that for the secondary battery will be raised by hand. There are five torpedo tubes, one in the stem and two on each broadside, for the discharge of 14 inch Whitehead torpedoes.

The new ship will have the characteristic handiness of maneuvering common to the Yoshino and her type, and will form, with her sister ship, a valuable addition to the new Japanese navy.

We are indebted to the Union Iron Works, of San Francisco, for plans and particulars.

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(Illustrated articles are marked with an asterisk.)

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Scientific American Supplement

No. 1122.

For the Week Ending July 3, 1897.

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PROPOSED BRIDGE ACROSS THE ST. LAWRENCE AT QUEBEC.

We have received from Mr. Charles Baillairgé a sketch of a design which was made by him some forty years ago, for a proposed trussed railway suspension bridge across the St. Lawrence River, opposite Quebec. Our correspondent points out that the question of a bridge of this kind at Quebec is by no means a new one, and that this design, which we now have before us, was submitted as being the best solution of the problem of conveying the railroad and highway traffic across the river. Attention is called to the fact that this sketch of over forty years ago embodies the best features of modern practice for long span railway bridges. The distance across the river, opposite Dufferin Terrace, from cliff to cliff, is 4,800 feet, and this was to be spanned by three 1,200 foot river spans and two 600 foot shore spans. The bridge was to have been built on the trussed suspension system and was to have a double deck, the lower deck being used for railroad traffic and the upper deck for highway and pedestrian traffic. The foundations were to have been carried down more than 150 feet below high water, the piers being built of solid first-class masonry up to the level of the lower floor or deck of the bridge.

The plan view shows an arrangement of five cables. The center cable was to hang in a vertical plane, the four outer cables being considerably "cradled." Mr. Baillairgé points out that this old design is quite applicable in its broad features to the conditions of modern bridge building, and that it would merely be necessary to make such changes in the details as would be called for by modern developments in the manufacture of steel and general bridge material. It is pointed out that the deep foundations could be constructed on the principle of the Hawkesbury River piers erected a few years ago in Australia by the Union Bridge Company, of New York, in which some of the piers were carried down through mud and sand to a depth of 180 feet.

THE NEW RULES OF PRACTICE OF THE PATENT OFFICE ABROGATED.

The revised rules of practice of the Patent Office, which were promulgated by the late Commissioner of Patents, were abrogated Saturday, June 19, by Secretary Bliss on the recommendation of Commissioner Butterworth, and the original rules of practice, which were in force April 1, 1892, have been reinstated. The original rules referred to numbered in all two hundred and twenty-nine, and they were condensed by the late Commissioner to eighty-eight.

In abrogating the revised rules of his predecessor, Mr. Butterworth has incorporated several amendments bearing upon the practice of the Patent Office. Of these, rule 17 reads as follows:

"An applicant or assignee of an entire interest may prosecute his own case, but he is advised, unless familiar with such matters, to employ a patent attorney, as the value of a patent depends largely upon the skillful preparation of the specification or claims.

"An applicant may be represented by

"(a) Any person who, at the date of approval of this rule, is in good standing as a practitioner before the Patent Office.

"(b) Any attorney-at-law in good standing in any court of record in the United States or in any of the States or Territories thereof.

"(c) Any person of good moral character who shall show to the satisfaction of the Commissioner of Patents that he is duly qualified to act as attorney in the prosecution of cases before the office."

THE FATIGUE OF METALS.

An investigation of the fracture of a steel rail on the Great Northern Railway, in England, has brought out some interesting facts bearing upon the question of the fatigue of metals. On the occasion in question a Bessemer steel rail, which had been in use for about twenty-two years, broke into nearly a score of pieces beneath the wheels of a Great Northern express train, causing a serious wreck. An examination was carried out by Mr. Thomas Andrews, M. Inst. C.E., and in a paper on microscopic observation on the deterioration by fatigue in steel rails, he gives some very interesting particulars regarding the appearance of the broken fragments of the rail. The composition of the rail was as follows: Carbon 0·53 per cent, silicon 0·12 per cent, phosphorus 0·08 per cent, sulphur 0·09 per cent. The microscopic examination revealed a large number of fine hair cracks, and Mr. Andrews concludes that the continual hammering of the wheels had developed these minute fractures throughout the body of the metal and produced the remarkable simultaneous failure which occurred at many points of the rail. The occurrence of such hair-like cracks in manufactured steel is not uncommon, and just what it is that causes them is an open question. It is possible they occur in the process of rolling, and that in the case of steel rails they are to be traced to this origin more than to the severe concussion of the traffic which passes over them. This supposition is borne out by the fact that such cracks are to be found in the newly finished output of the mills,