### SEA STRENGTH OF THE NAVAL POWERS.

One of the most important items of information, drawn up annually by the United States Office of Naval Intelligence, is a table giving the comparative sea strength of the principal naval powers. Comparisons of this kind are frequently made by writers on naval subjects, and by the various governments that have important naval interests. The basis of comparison adopted varies widely, according to the point of view or method of classification adopted. We consider that the classification used by the Office of Naval Intelligence is, all things considered, the best of these. The system of comparison is based chiefly on displacement and age.

The ships are classified under nine heads. First, battleships of the first class, including those of about 10,000 tons or more displacement; second, coast-defense vessels, including the smaller battleships and monitors; third, armored cruisers; fourth, cruisers above 6,000 tons; fifth, cruisers of from 6,000 to 3,000 tons; sixth, cruisers of from 3,000 to 1,000 tons; seventh, torpedo-boat destroyers; eighth, torpedo boats; and ninth, submarines. Referring to the term cruisers, as used in three of the above classes, it should be noted that all unarmored warships of more than 1,000 tons are classed, according to displacement, as cruisers. Scouts are considered as cruisers in which battery and protection have been sacrificed to secure extreme speed. The term "protective" has been omitted, because all cruisers, except the smallest and oldest, now have protective decks.

It should further be noted that in this comparison the following vessels are not included: Those over twenty years old, unless they have been reconstructed and rearmed; those not actually completed; gunboats and other vessels of less than 1,000 tons, since these vessels have so slight a military value as part of a fleet; and lastly, torpedo craft of less than 50 tons displacement.

The illustration on the front page of this issue is based upon the last table of this kind that was drawn up by the Office of Naval Intelligence, and represents the relative strength of the world's navies on January 1, 1905. The illustration agrees with that document except as regards the gains and losses of the Russian and Japanese navies, which have been introduced into the table to show the relative standing of these two powers as affected by the war. Before the war, or rather after it had been waged for eight months, the order of strength was Great Britain, France, Russia, Germany, United States, Italy, Japan, Austria. As the result of the war, Russia has fallen from third to seventh position, or next to Japan, the order now being Great Britain, France, Germany, United States, Italy, Japan, Russia, Austria.

For the reason that it is the ships actually completed upon which a navy must depend on the opening of a war, we have based our illustrations exclusively upon the tables of ships that are built. Any comparison that includes the ships that are building is apt to be misleading; for the value of ships that are under construction as a military asset depends entirely upon the rapidity with which construction in the particular country concerned is carried on, and the liberality with which the government makes the necessary appropriations for such construction. One nation may take but three years to complete a ship, where another would take five or six. Moreover, a nation might have as much tonnage under construction as is completed, which is the case with the United States, and might yet, at the hands of a superior naval power possessing an overwhelming superiority, suffer such an initial reverse that no amount of activity in completing the other and larger half of the navy, that was upon the stocks, could retrieve the disaster. This was largely the case with Russia, which at the outset of the war possessed a tonnage of ships under construction approximately equal (if we except the Black Sea fleet) to the tonnage of the completed ships of her navy, that were of strictly modern construction.

On the basis of tonnage actually afloat, then, January 1, 1905, Great Britain stood first with 1,595,871 tons; France was second with 603,721 tons; Russia third with 447,315 tons; Germany fourth with 441,249 tons; the United States fifth with 316,523 tons; Italy sixth with 254,510 tons; Japan seventh with 220,755 tons; and Austria eighth with 112,336 tons. Russia has lost, either by destruction, capture, or internment in neutral ports, just one-half of her total, so that now the displacement of all ships in her navy is 224,237 tons. As a matter of fact, she has lost more than this; because the total given includes some few vessels that have been completed in the interim. Japan, remarkable to relate, has come out of the war with about 32,000 tons more than she had at the close of last year, the figures being respectively 220,755 tons on January 1, 1905, and 252,661 tons at the present time. With regard to the Russian totals, it should also be mentioned that, because of treaty restrictions, over 93,000 tons of battleships, being confined to the Black Sea, is excluded from taking part in naval operations on the high seas. This would leave Russia with a total tonnage of 131,237 tons that can be employed in any naval operations that might mark the immediate future of the war. The effect upon the relative strength of the two combatants of the terrific fighting that has taken place in the past eighteen months, is shown in the graphic comparison of the displacement of the two fleets in 1904 and at the present time.

In conclusion it must be noted that the large number of vessels interned in foreign ports will probably be handed over to Japan in lieu of, or as part of, an indemnity. In this case the Japanese navy would be further increased by one battleship, five cruisers, a gunboat, and ten torpedo boats; an addition which would bring its total displacement up to 300,521 tons. This would give Japan a considerable lead over Italy, and would bring her within 16,000 tons of the total of the United States on January 1, 1905.

If Japan secures an indemnity, she will undoubtedly put a large part of it into battleships and armored cruisers; in which case she will become a formidable competitor with the United States or Germany for the third or fourth place among the navies of the world.

### The Current Supplement.

The current SUPPLEMENT, No. 1540, opens with an excellently illustrated article by Dr. Alfred Gradenwitz on the Parsons Steam Turbine on German Warships. While carbon has heretofore been almost exclusively used commercially in both arc and incandescent lamps, the earth oxides have recently been found to possess desirable properties for use as electric illuminants. Mr. Murray C. Beebe takes these rare earths as the subject of a very exhaustive discussion. A highly instructive article is that on stereoscopic projections. There was recently held in London an optical convention which was of considerable scientific moment. It was presided over by Dr. R. T. Glazebrook. His presidential address on the progress of optical science and manufactures is published in full. The remarkable address delivered before the Committee on Military Affairs of the House of Representatives by Major Seaman, M.D., on army sanitation in Manchuria is abstracted. Up in the Lake districts, where the season of open navigation lasts but a few months, the problem of handling coal for current needs, and of storing a sufficient quantity to meet the requirements during the months when coal cannot be transported, is one of great importance. How this problem has been solved at South Lake Linden, Mich., is described by J. A. McIntyre. How unconsidered trifles may be utilized is told in a breezy, entertaining way. The Bakerian lecture delivered before the Royal Society dealt with the reception and utilization of energy by a green leaf. The lecture is abstracted in the SUPPLEMENT. The English correspondent of the SCIENTIFIC AMERICAN tells of some recent developments in the application of liquid fuel to marine boilers.

New Process for the Electrolytic Manufacture of Soda.—The electrolysis of sea-salt for the production of soda has been inaugurated by M. Granier by substituting for anodes of charcoal anodes of copper, so as to obtain a chloride of copper at one of the poles, instead of chlorine. The copper chloride is converted readily into sulphate of copper and hydrochloric acid.

### Electrical Notes.

A hydro-electric plant is in project for supplying the city of Burgos, Spain, and the power is to be taken from a point some thirty miles from the city by a station which will be erected at Quintanilla Escalada. The river Ebro and the Rudron, its affluent, are to furnish the power. Under a head of water of 80 feet and a flow of 2,000 gallons per second, a total of 1,500 to 2,500 horse-power can be secured, according to the season. The central station is to be equipped with three turbine and dynamo groups with Francis turbines made by Escher, Wyss & Co., giving 370 horse-power each, coupled direct to three-phase alternating-current dynamos. The latter will give current at a tension of 3,300 volts. This tension will then be raised by a set of transformers to 30,000 volts, in order to supply the high-voltage overhead line, which goes from the station to Burgos. The transmission line will have three bare copper wires carried on porcelain insulators. Where the line enters the city there will be a sub-station containing apparatus for lowering the tension to 5,000 volts. Other sub-stations at different places in the town will receive this current, and transform it to 120 volts for the usual consumption.

Experiments on the Electrolytic Deposition of Zinc.—The experiments of M. Gabran for obtaining rapid deposits of zinc show that the electrolyte giving the best results is composed of 1,200 parts of zinc sulphate, 60 parts of sulphuric acid of the strength of 24 deg. Baumé, and 6,000 parts of water. With this electrolyte and densities of current varying from 2 to 3 amperes per square decimeter, clear, solid deposits of zinc were obtained. The tension of current was 1.5 to 2.5 volts. In other experiments the tension extended to 6 amperes per square decimeter, without injuring the quality of the deposit, the voltage being from 9 to 10 volts. Crystals of zinc were formed on the borders of the cathode, but this did not prevent its being covered with a very adherent deposit of zinc.

Electrolytic Manufacture of Chlorates and Perchlorates.—The electrolysis of salts of chloride of potassium and of sodium for the production of chlorates was inaugurated by MM. Gall and De Montlam at Villers-sur-Herme in France in 1889 and afterward at Vallorbes in Switzerland in 1890. It has extended until there are at least ten factories in Europe with an aggregate of 30,000 horse-power. There are five different types of elementary or electrolytic cables, but they differ only in the details of construction.—L'Electrochemie.

The Allgemeine Elektricitaets-Gesellschaft, of Berlin, have brought out a new form of electric resistance. It is formed of an insulating and incombustible body having a high thermic capacity, such as a composite clay, upon which the wire forming the resistance is wound. The whole is enveloped in a body which has a great heat-radiating capacity, such as carborundum combined with water-glass. Owing to their high thermic capacity, these resistances may be used to advantage for starting motors, as they can stand a very high overload for a short time, about 100 amperes per square millimeter, for instance. When the resistances are built up in a regulating apparatus, they will take a heavier current than the usual German silver or iron coils, for the black mass of the carborundum increases the radiating surface greatly. In this connection we may mention an improvement which M. Preuss and others have made in the matter of electric resistances composed of powdered material. In this form the degree of resistance to the current is changed by means of a contact plate which plunges into the mass and can be raised and lowered. As it is displaced, this plate produces an uneven disposition of the material and after some use the contact between the powder and the plate becomes insufficient and sparks are apt to be produced. To avoid this the inventors adopt a device which gives a shock to the apparatus after each time of shifting the plate, and thus the powder is restored to its original state. The shock is produced by a striker which comes against the box each time the main lever is shifted.

Of the eight civilized tribes in the Philippines, the largest is that of the Visayans, who occupy most of the islands lying between Luzon and Mindanao, and form nearly one-half of the entire civilized population. Tagalogs occupy the provinces in the vicinity of Manila. They rank second, with a little more than one-fifth of the civilized peoples, and the Ilocanos rank third, with approximately one-eighth. Among the wild tribes the Moros are the most numerous, comprising about two-fifths of the non-Christian population.

Even among the Christian tribes the tribal distinctions are clearly marked. The members of the different tribes rarely mix in villages or intermarry, and, with the exception of the Ilocanos, who have migrated from their original territory and settled in neighboring provinces, the people show little tendency toward expansion or colonization.

COMPARATIVE SEA STRENGTH OF THE NAVAL POWERS ON JUNE 1, 1905.*

NUMBER AND DISPLACEMENT OF COMPLETED WARSHIPS OF 1000 TONS OR MORE, AND OF TORPEDO CRAFT OF MORE THAN 50 TONS.

| Type of Vessel. | Great Britain. | | France. | | Germany. | | United States. | | Italy. | | Japan. | | Russia. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Tons. | No. | Tons. | No. | Tons. | No. | Tons. | No. | Tons. | No. | Tons. | No. | Tons. |
| Battleships, first class | 51 | 682,200 | 19 | 212,589 | 16 | 178,575 | 12 | 137,329 | 13 | 162,314 | 5 | 70,516 | 7 | 82,809 |
| Coast defense vessels | 6 | 49,300 | 17 | 73,368 | 16 | 91,315 | 12 | 47,445 | 1 | 3,913 | 5 | 29,627 | 7 | 43,391 |
| Armored cruisers | 29 | 282,400 | 18 | 145,085 | 4 | 38,047 | 2 | 17,415 | 5 | 31,891 | 8 | 72,738 | 3 | 31,288 |
| Cruisers above 6000 tons | 21 | 201,950 | 4 | 31,513 | .... | ..... | 2 | 14,750 | .... | ..... | .... | ..... | 4 | 25,911 |
| Cruisers 6000 to 3000 tons | 60 | 221,460 | 18 | 74,378 | 9 | 46,749 | 16 | 58,279 | 5 | 17,490 | 11 | 42,596 | 3 | 12,593 |
| Cruisers 3000 to 1000 tons | 56 | 103,960 | 18 | 32,868 | 27 | 58,859 | 21 | 29,497 | 12 | 26,216 | 11 | 21,276 | 7 | 8,760 |
| Torpedo boat destroyers | 126 | 44,565 | 31 | 9,250 | 37 | 12,660 | 16 | 6,695 | 11 | 3,503 | 22 | 7,476 | 33 | 10,000 |
| Torpedo boats | 90 | 8,036 | 238 | 20,735 | 105 | 13,924 | 27 | 4,200 | 101 | 9,076 | 81 | 7,317 | 82 | 8,000 |
| Submarines | 9 | 1,400 | 37 | 3,935 | 1 | 120 | 8 | 913 | 1 | 107 | 11 | 1,265 | 13 | 1,485 |
| Total tons built | ..... | 1,595,871 | ..... | 603,721 | ..... | 441,249 | ..... | 316,523 | ..... | 254,510 | ..... | 252,661 | .... | 224,237 |

* The figures for Russia and Japan have been revised to include the changes brought about by the gains and losses during the war.

# SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second-Class Matter. Copyright, 1905, by Munn & Co.]

Vol. XCIII.—No. 2.
ESTABLISHED 1845.

NEW YORK, JULY 8, 1905.

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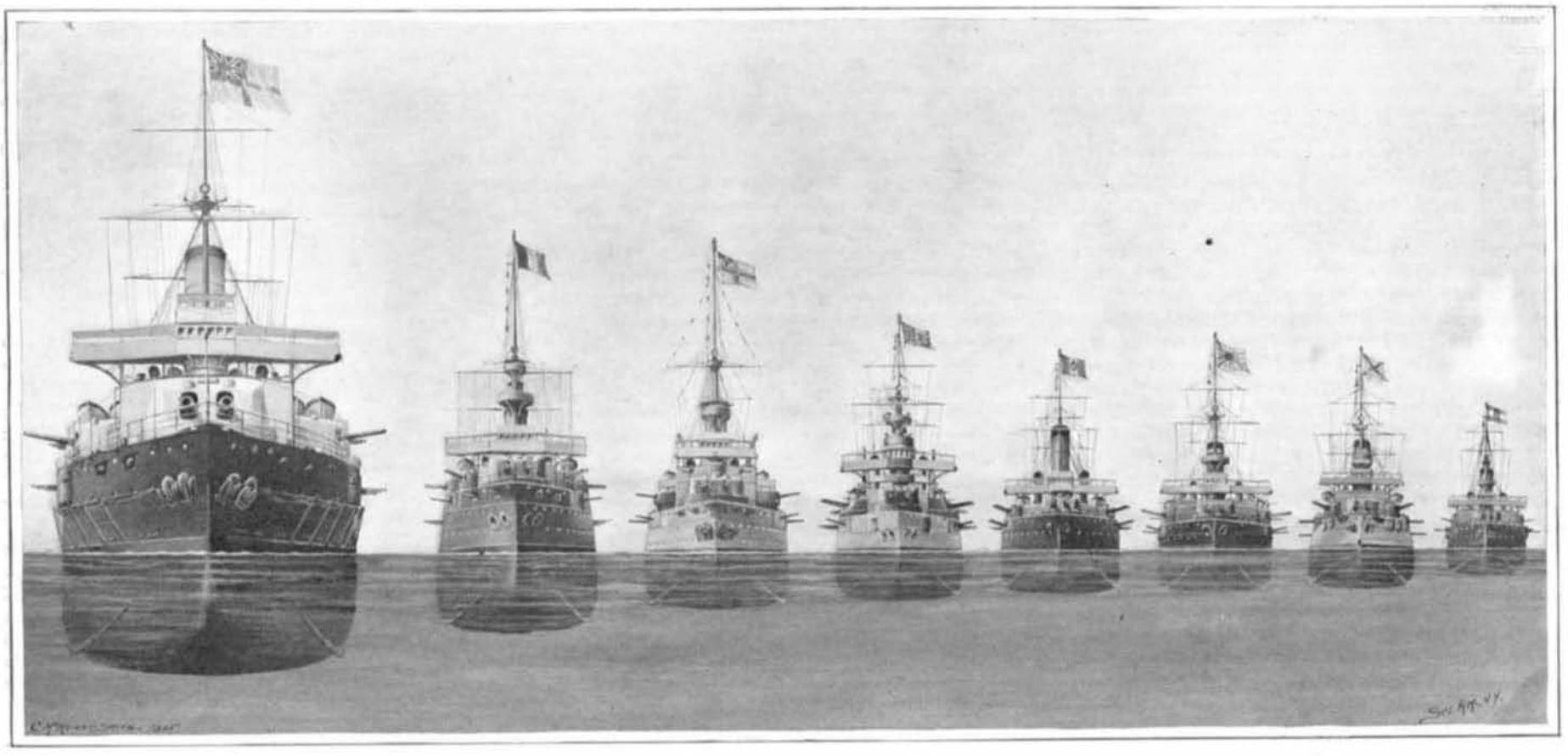
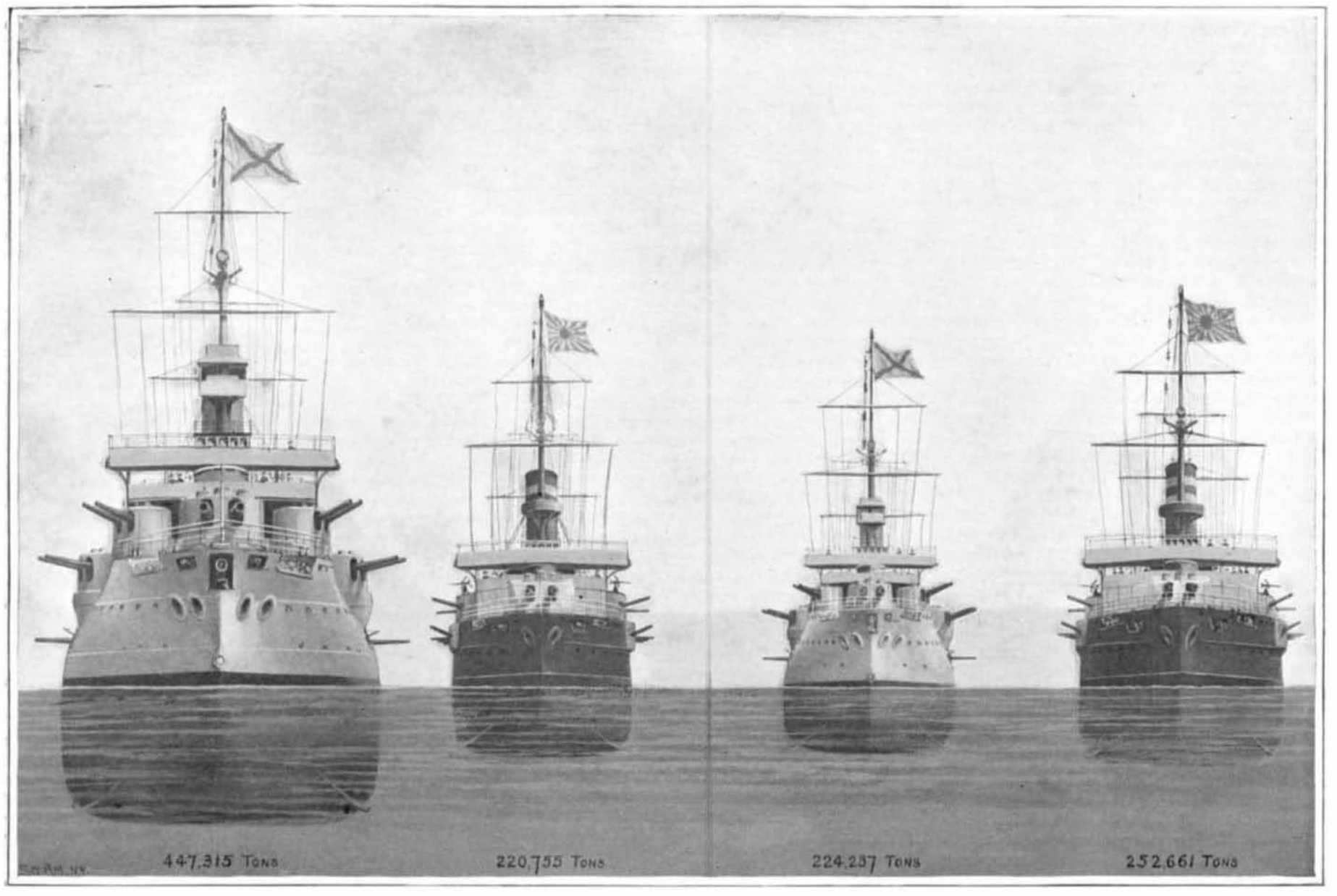



**Comparative Strength of the World's Navies in Completed Ships.**




**Comparative Size of the Russian and Japanese Navies in 1904 and To-Day.**

**COMPARATIVE STRENGTH OF THE NAVAL POWERS.—[See page 26.]**