coherers being in closed circuit. The operative coherer is next put in open circuit by insulating one of its electrodes, when another emission of waves is caused to act on the coherer left in closed circuit. After putting this second coherer in open circuit, the same process is continued until all the coherers to be classified have been dealt with. Experiment goes to show that the sensitiveness of each coherer is the same when used both separately and in connection with neighboring coherers experimented on at the same time. As regards, in the second place, coherers connected in series, if all the coherers be decohered, the circuit (coherers-battery-galvanometer-coherers) will include as many breaks as coherers. In order to ascertain the sensitiveness of each of the coherers, waves are produced by establishing conductive bridges connecting the mercury vessels, the distribution of which may easily be imagined, when each of the coherers taken apart is connected to the circuit (battery-galvanometer), the degree of cohesion produced by the emission of waves being thus ascertained. The connection of an antenna with a coherer electrode will augment the sensitiveness of the latter. The point of contact between the antenna and a circuit, comprising several series-connected coherers, being varied, the sensitiveness of the coherer system is thus found to undergo material alterations. The results of this experimental investigation are applied first to constructing an apparatus for recording the course of thunder storms; and, second, to designing sensitive instruments which may be utilized both in wireless telegraphy and in Hertzian wave telegraphy with conductors.

FLEETS IN THE FAR EAST—AN ENGLISH REVIEW OF THE POSITION OF RUSSIA AND JAPAN.

BY ARCHIBALD S. HURD, OF LONDON, ENGLAND.

(*Concluded from page* 171.)

As the two powers are at present, Japan had the advantage at the opening of the war, and this has been greatly enhanced by her initial success. She possesses more ships, such as her six battleships and her eight armored cruisers, of first-class fighting power, while the value of one or two of the Russian battleships and armored cruisers is problematical. Moreover, the Japanese ships are well manned with officers and men of the highest intelligence and training, while Russia has hurried her ships out to the Far East inadequately manned, especially as to mechanical ratings, which are of supreme importance. This is the present situation.

What will be the position six or eight months hence? Unless the present war is to be an unbroken succession of disasters, which is scarcely probable, Russia should at least hold her own on land, until the arrival of the five powerful battleships which are nearing completion in the Baltic yards. Her programme of shipbuilding of 1898 included seven first-class battleships. At present only two of these ships have been completed and sent to the Pacific, the "Retvisan" and the "Czarevitch," together with several armored cruisers. The five other battleships are nearly ready for sea. It is officially announced that they will be finished this year (1904) and unless the early disasters have caused a change in the Russian plans, all these vessels are to be dispatched at the earliest moment to strengthen the Far Eastern squadron. According to the official programme the following reinforcements will be sent from the Baltic to Port Arthur to join Admiral Alexieff's command in the course of this year:

Five battleships—"Imperator Alexander III." "Borodino," "Orel," "Slava," and "Kniaz Souvarow."

Two cruisers of the second class—"Jemtchug" and "Izumrud," of 3,200 tons displacement and 22½ knots speed.

Eleven torpedo boats.

The five battleships are of a most powerful type, displacing 13,500 tons of water, well armored, and armed with the following weapons of the latest manufacture:

20 12-inch breechloaders.
60 6-inch quickfirers.
100 3-inch quickfirers.
100 3 pounders.
40 1 pounders.
20 torpedo tubes.

These fine ships are improvements upon the "Czarevitch," which was illustrated recently in the SCIENTIFIC AMERICAN. It must be confessed that these ships represent most substantial reinforcements. Stated in the fewest possible words, their arrival at Port Arthur will signify that if she can repair her damaged battleships Russia has won, on paper, at least, the game she has played so skillfully for the past eight years. The "Imperator Alexander III." will be completed this spring and the others during the year. It is officially announced that the three battleships and most of the cruisers injured at Port Arthur can be repaired; and the damages as detailed in Alexieff's report are not necessarily irreparable. If Port Arthur and Vladivostock can hold out and the fleets remain under their guns until the five battleships arrive Russia will have an overwhelming superiority in battleships.

But it may be asked what will be Japan's position six or eight months hence. As she is to-day, so she will be then. Her shipbuilding programme, undertaken at the close of the war with China, has been completed, and she has commenced the construction of no more armored ships. A project has been under discussion for two years, but financial difficulties have interposed to cause its postponement. Time can render this newest member of the concert of the powers no aid, and meantime Russia will be reaping the full advantage of the colossal naval expenditure on which she embarked in 1898.

Should the Russian reinforcements succeed in reaching Port Arthur, she would have at least eleven and possibly thirteen battleships, and five armored cruisers to oppose the six battleships and eight armored cruisers of Japan, and against such odds, unless the Russian personnel is hopelessly incapable, Japan could not fight with any hope of success. The Russian fleet will be far superior numerically at this date to the British Mediterranean squadron in armored ships, though not equal to it in fighting power.

Other powers do not maintain their navies for the express purpose of guarding their interests in the Far East, and it is unlikely that any of them will make any considerable additions to their squadrons in the Pacific in the next few months. Great Britain, it is true, has sent out an additional battleship, the "Centurion," but it is impossible that with the claims on her resources for the defense of the Mediterranean, the English Channel, and the North Sea, she can strengthen her squadron in the Far East much more. There is also little likelihood that either the United States, Germany, or France will materially weaken their position at vital points nearer home to add to the squadrons they now maintain in Chinese waters. It may be taken for granted that six or eight months hence the naval representation of the other great powers will be much the same as to-day. The strength of the several fleets is set out below in summary, the British and Russian reinforcements being included:

	Russia.	Great Britain.	Japan.	U. S.	Germany.	France.
Battleships	13*	5	6	3	..	1
Cruisers—						
Armored	5	2	8	2†	1	2
Protected....	11‡	8	16	4	6	5
Torpedo craft...	40	13	97	..	1	14

* Three of these battleships are temporarily disabled.
†These two ships are coast service monitors.
‡ This is exclusive of the four cruisers sunk; but includes four that are temporarily disabled.

These brief details indicate inadequately the relative strength of the squadrons, but they serve to bring into relief the strong position which Russia will hold should she be able to maintain her position until her fleet has been reinforced. In St. Petersburg it is realized that while in Europe Russia must continue to be at considerable disadvantage, she can dominate Chinese waters with little fear of any other power interfering with her designs. Whatever the outcome of the present war, the eventual result of Russia's action cannot be prevented by the Island Kingdom because it has not the requisite staying and financial power and natural resources which will enable it to continue indefinitely its opposition to Russian designs.

It may be of interest to append a complete list of the fleets of the great powers in the Far East.

GREAT BRITAIN.

Glory, Albion, Ocean, Vengeance — (Admiral Sir Gerard Noel) / (Rear Admiral the Hon. A. G. Curzon-Howe) — Sister battleships of 12,950 tons.
Centurion — Battleship, 10,500 tons.
Cressy — Armored cruiser, 12,000 tons.
Leviathan — Armored cruiser, 14,100 tons.
Amphitrite, Argonaut — First class cruiser, 11,000 tons.
Blenheim — First class cruiser, 9,000 tons.
Eclipse, Talbot — Second class cruiser, 5,600 tons.
Sirius — Second class cruiser, 3,600 tons.
Thetis — Second class cruiser, 3,400 tons.
Fearless — Third class cruiser, 1,580 tons.
Phœnix, Algerine, Esplegle — Sloop, 1,050 tons.
Rinaldo, Rosario, Vestal, Mutine — Sloop, 980 tons.
Bramble, Britomart — First class gunboat, 710 tons.
Kinsha — River steamer, 331 tons.
Moorhen, Teal — Second class gunboat, 180 tons.
Robin, Snipe — Second class gunboat, 85 tons.
Sandpiper — River gunboat, 85 tons.
Woodcock, Woo dirk — Second class gunboat, 150 tons.
Six torpedo boat destroyers.

UNITED STATES.

Kentucky — (Rear-Admiral R. D. Evans, commander-in-chief), battleship, 11,540 tons.
Wisconsin — (Rear-Admiral P. H. Cooper, commanding Northern Squadron), battleship, 11,565 tons.
Oregon — Battleship, 10,288 tons.
Monadnock, Monterey — Monitor, 4,005 tons.
Albany, New Orleans, Raleigh, Cincinnati — Second class cruiser, 3,769 tons.
Isla de Cuba — Gunboat, 1,125 tons.
Wilmington, Helena — Gunboat, 1,397 tons.
Annapolis, Vicksburg — Gunboat, 1,000 tons.
Don Juan of Austria — Gunboat, 1,130 tons.
Villabos — Gunboat, 347 tons.
Callao — Gunboat, 250 tons.
El Cano — Gunboat, 600 tons.
Alhoy — Gunboat, 51 tons.
Samar — Gunboat, 210 tons.
Frolic — Converted yacht, 607 tons.
Rainbow — (At Cavite, Rear Admiral Yates Stirling), distilling ship.

In addition there are two colliers, the Justin and Pompey; two tugs, the Piacalagua and Wompatuck, and the supply ships Zaffro and Nanshan.

FRANCE.

Redoubtable — Battleship, old, 8,767 tons.
Vauban — Armored cruiser, old, 6,150 tons.
Montcalm — (Vice-Admiral Marechal), armored cruiser, 9,516 tons.
Chateaurenault — First class cruiser, 8,018 tons.
Bugeaud — Second class cruiser, 3,722 tons.
Pascal — Second class cruiser, 3,985 tons.
Styx, Acheron — Armored gunboat, 1,640 tons.
Surprise — Gunboat, 627 tons.
Vigilant — Gunboat, 123 tons.
Decidee — Gunboat, 646 tons.
Argus — Gunboat, 123 tons.
Comete — Gunboat, 473 tons.
Caronade — Gunboat, 140 tons.
Bengali — Dispatch vessel, 547 tons.
Alouette — Dispatch vessel, 506 tons.

GERMANY.

Furst Bismarck — (Rear-Admiral von Prittwitz), armored cruiser, 10,650 tons.
Hansa — (Rear-Admiral Graf Baudissin), second class cruiser, 6,100 tons.
Bertha — Second class cruiser, 6,100 tons.
Thetis — Third class cruiser, 2,645 tons.
Grier — Third class cruiser, 1,776 tons.
Bussard, Seeadler — Third class cruiser, 1,580 tons.

ITALY.

Vettor Pisani — Armored cruiser, 6,500 tons.
Elba — Second class cruiser, 2,730 tons.

SCIENCE NOTES.

A Russian naturalist has made a series of measurements, by a thermo-electric method, of the temperature of insects. A few of his results are noticed below. The temperature of the human body, it will be remembered, is essentially the same in the tropics and in the polar zones. Insects at rest have a temperature essentially the same as that of the surrounding air in ordinary conditions of heat and of humidity. Under usual conditions the temperature of an insect rises with that of the surrounding air, only more slowly. When the air is very moist the insect's temperature may rise more rapidly than that of the air. When the insect begins to move, its temperature rises and continues to rise until the motion ceases. This rise of temperature continues till at about 38 deg. C. (102.2 deg. F.) a heat paralysis sets in. The paralysis is only temporary; it ceases as the temperature falls once more. Below —0.5 deg. C. (31 deg. F.) insects are perfectly without motion. The temperature must, in general, be raised to 12 deg. C. (53.6 deg. F.) before the wings are moved. For one species—*Saturnia pyri*—the highest temperature compatible with life is 115 deg. F. This is about the temperature that is fatal to vegetable life.

For some time past prussic acid has been considered to be the most deadly poison extant. Mr. Lascelles Scott, of Little Ilford, England, however, has now discovered a far more deadly poison—the substance scientifically known as di-methylarsine cyanide, or more familiarly as cyanide of cacodyl. Three grains of this substance diffused in a room full of people would kill all present, so powerful is it. So deadly is this poison, that it is highly dangerous to handle it. It is a white powder melting at 33 deg. and boiling at 140 deg. When exposed to the air it emits a slight vapor, to inhale which is death. Mr. Lascelles Scott has experienced the deadly nature of this poison, for while he was assisting Sir B. W. Richardson in the compilation of his work "On the Causes of the Coagulation of the Blood," he tried its effect upon animals. One-millionth part of cyanide of cacodyl in the atmosphere of an air-tight cage killed a dog almost instantaneously, and then its power was by no means exhausted, for a second, third, and fourth dog placed in the same cage, instantaneously died from the effect of that single infinitesimal dose. Although so little of the properties of this poison are known, it was first made many years ago. Cadet, the famous French chemist, by combining acetate of potassium with white arsenic, produced a fuming liquid which, although he did not know it, was oxide of cacodyl. The German chemist Bunsen combined this with cyanogen, a radical of prussic acid, and made cyanide of cacodyl, the formula of which is $AsMe_2Cy$.