

as lead or wet paper. The effect is not due to an increase of temperature in the neighborhood of the skin, as it keeps up when several sheets of aluminium or paper are interposed (separated by layers of air), and thus screen off the heat.

The rays given off by the body are reflected and refracted like the N-rays, and M. Charpentier was able to produce foci, which were indicated by the maximum brightness, by means of glass lenses. The index of refraction of the rays seems to be near that of the N-rays.

It may be thought that the body only receives and stores up the rays during the day, like the bodies which M. Blondlot exposed to the sun. But after remaining for nine hours in complete darkness, the phenomena showed themselves as usual.

The remarkable fact seems to be demonstrated that the human body gives off the N-rays. It is the tissues of the organism whose activity is the strongest which emit the rays in the greatest degree. These phenomena seem to be of capital importance in studying nervous action especially, as the nerves or brain are now found to exert an action on the exterior which remained unknown up to the present.

One striking experiment as to the effect of the muscles is that the area of the heart can be defined by exploring the region with a small test-screen. As this organ is in great muscular activity, its effect is considerable. When the small luminous screen is moved about the surface of the body in the region of the heart, the outline of this organ and its surface are manifested by the variations in brightness. Similar experiments are now being carried on with the brain and the rest of the nervous system, and the results are awaited with interest.

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

BY ARCHIBALD S. HURD, OF LONDON, ENGLAND.

It has not yet been realized seemingly by the world that Russia in the immediate future is determined to be essentially an Asiatic rather than a European power and that Port Arthur and Dalny will be her front doors and not, as was at one time supposed, her back doors. She is turning her face toward the sun, which has been denied to her hitherto in Europe, and her energies will be directed increasingly to the exploitation of the slice of China which she has secured and which it may be accepted as certain that, unless it be wrested from her by Japan, she will give up under no threats by whomsoever made. Plans which have been unfolding for several years past and have swallowed up several hundred millions sterling depend upon the ability of the Muscovite power to retain her nominal hold on Manchuria until the moment comes when she feels strong enough to throw off all reserve and, on one pretext or another, to annex this territory, one of the richest sections of China, wherein lies buried mineral wealth of untold value, with a population of about nine millions near at hand for its recovery.

In reviewing the naval situation it is not without interest to glance back over the course of events in the Far East—surely a unique record. In 1894, when Japan had defeated China, Russia, with the support of Germany and France, intervened and refused to permit Japan to hold Port Arthur, which she had captured from the Chinese after a long and most costly campaign. It was claimed that the integrity of China must be preserved in the interest of the peace of the world. Great Britain, though she did not throw in her lot with the other three powers, found their policy in agreement with that upon which she had insisted, and America stood aloof on similar grounds. Desiring the maintenance of China as an independent power, neither nation could with grace assist Japan to rob it of one of its best *points d'appui*, even by conquest. Not very many years had passed when the world was astonished to learn that two of the protectors of China had obtained "leases" of Chinese territory. Germany, in November, 1897, seized Kiau-Chau, and Russia obtained Port Arthur in the following January, and these examples were imitated by France and Great Britain. This was followed by the announcement that the Tzar had devoted £9,000,000 sterling from the War Chest to the carrying out of a great shipbuilding programme. It was subsequently ascertained that this sum was in addition to the ordinary navy votes, which had been rising for several years. The world heard next that Russia had obtained important concessions in Manchuria and that she planned to bring her trans-Siberian railway down to Port Arthur. In 1900 China proved a useful instrument toward the furtherance of Russian policy. The "Boxer" troubles gave the Russians the opportunity of pouring troops into Manchuria, nominally to guard the railway, then fast creeping down to the long-desired warm water. These troops have not been withdrawn and their number has been increased month by month. Since she first obtained her hold on China, "Russia," in the words of Dr. Morrison, of the Times, "has transformed Manchuria from a Chi-

nese province to a virtually Russian possession."

Diplomacy has been supported at every step by naval power, often more imposing in array than dangerous in warfare. Since 1895 practically every battleship as it has been completed for sea has been commissioned, not for service in the Baltic, but for the Far East. With amazing rapidity Russia, which hitherto has had one fleet in the Baltic, frozen up for six months of the year, another in the Black Sea, nominally at least immured by the provisions of the Treaty of Paris, and a small force in the land-locked Caspian Sea, has created yet another squadron, more powerful than either of the others, and at Vladivostok and Port Arthur naval bases have been equipped, with a large dock at each place, and building facilities for torpedo craft at the latter. Meantime the great shipyards of Russia and of France, Germany, and the United States have been busy building for Russia additional men-of-war of the most powerful types.

A point which is often overlooked is that the development of Russian plans has been so hurried that the work has not yet been rendered sufficiently strong to bear the strain of a contest. In the Russian fleets in the Black Sea and the Far East are embodied pushful diplomacy—diplomacy with a mailed fist; but they are distinct and entirely separate, with over 12,000 miles of sea intervening. The ships which are built in the Black Sea remain in the Black Sea. Ships pass from Europe to the Far East, it is true, but they can travel from the Baltic to the Pacific only with the aid of coal obtained at British coaling stations. At Port Said or Suez, at Aden and at Singapore, Great Britain holds the lines of communication between these two fighting forces of Russia; and France, her ally, can render no assistance after the eastward-bound ships leave the Mediterranean. For the transport of stores and ammunition, Russia has the trans-Siberian railway. Is it realized by those who make much of this wonderful engineering achievement that the distance from Russia's arsenals at Moscow and St. Petersburg to Port Arthur is twice as great as from New York to Liverpool, or again more than twice as great as from Montreal to Vancouver by the Canadian Pacific Railway? Moreover, the trans-Siberian railway has been hastily and not too well laid. Consequently, under the most favorable circumstances stores sent from St. Petersburg or Moscow to Port Arthur take three weeks to reach their destination if sent by the best passenger train shown in the latest time table issued by the Russian government. This line would have to serve, after the commencement of war, for the transport of all stores for the army and navy, and those who are familiar with the difficulties attending the working of a long length of single rail in time of war will appreciate its value under such circumstances. Another point to be borne in mind is that its course through China must be heavily guarded by troops and that thousands of the Chinese would risk a good deal, if Russia were on the defensive, to cripple this line of communication by destroying a portion of the permanent way or blowing up one of the numerous bridges.

When it is said, therefore, that Russia's position as a naval power is unique, it will be admitted that her difficulties are of no ordinary character. Up to the present war she has triumphed. Every step in her programme of empire building in the Far East has been carefully planned years ahead, every preparation made, and only when she has assured herself that everything is in readiness has she, as opportunity has offered, taken the world into her confidence and stood firm by her intentions.

Since she obtained the "lease" of Port Arthur, Russia has made wonderful progress; but the scheme is not complete, and herein lies the explanation of her evasive diplomacy when she has been approached by one or other of the powers seeking assurances that she will withdraw her troops from Manchuria. It is now common knowledge that while these undertakings have been freely given, ships and men have been quietly massed in Far Eastern waters, stores have been accumulated, and every preparation made to hold what she has obtained.

Russia has already unostentatiously assured her military position by drafting something over 100,000 troops into Manchuria, but she clearly realizes that her future in the Far East depends less upon her soldiers than upon her ships and sailors. In the latter respect she is not yet ready. It was reported repeatedly in cablegrams, mostly coming through Shanghai, that Russia had "ninety warships" massed at or near Port Arthur. Though Russia has made the most of resources, this is a gross exaggeration. She has accumulated a large number of non-fighting ships in the Far East because she realizes that the Asiatic judges the menace of naval power less by guns and armor than by the number of funnels and the general impression conveyed by an array of ships of all types. Wise in her knowledge of the eastern mind, Russia has borrowed merchant ships and acquired many of the volunteer fleet to swell the fleet in Far Eastern waters, and she has succeeded not only in impressing the Asiatic, but, what she can

hardly have hoped for, the European as well. What, then, is the strength of the naval forces of Russia in Chinese waters available for action? Below is a list of all the ships which Russia and Japan have ready.

RUSSIA.		JAPAN.	
<i>Battleships</i> (8).		<i>Battleships</i> (6).	
"Peresviet,"		"Fuji,"	
"Poltova,"*		"Yishima,"	
"Petropavlosk,"		"Asahi,"	
"Pobieda,"		"Hatsuse,"	
"Retvisan,"*		"Shikishima,"	
"Sebastopol,"		"Mikasa,"	
"Oslavia,"			
"Czarevitch,"*			
<i>Cruisers</i> (18).		<i>Cruisers</i> (24).	
"Rossia,"†		"Asama,"†	
"Rurik,"†		"Tokiwaka,"†	
"Gromoboi,"†		"Azuma,"†	
"Bayan,"†		"Kasagi,"†	
"Dmitri Donskoi,"†		"Chitose,"	
"Aurora,"		"Kasagi,"	
"Boyarin,"*		"Takasagi,"	
"Pallada,"*		"Yoshino,"	
"Askold,"*		"Akashi,"	
"Bogatyr,"		"Yakumo,"†	
"Novik,"*		"Idsumo,"†	
"Razboynik,"		"Iwate,"†	
"Djigit,"		"Niasin,"†	
"Zabiyaka,"		"Yayeyama,"	
"Diana,"*		"Chiyoda,"	
"Variag,"*		"Hashidate,"	
"Korietz,"*		"Itsukushima,"	
"Yenisei,"*		"Matsushima,"	
		"Suma,"	
		"Akitsushima,"	
		"Isuma,"	
		"Naniwa,"	
		"Takachiho,"	
		"Sai-yen."	
<i>Torpedo Craft.</i>		<i>Torpedo Craft.</i>	
2 gunboats.		4 gunboats.	
19 destroyers.		20 destroyers.	
12 torpedo boats.		38 torpedo boats of the	
		Russia has in addition first class.	
		a number of transports,	39 torpedo boats of the
		gun vessels and non-fighting ships.	second and third classes.
			Japan possesses many
			other non-fighting ships.

(To be continued.)

**SCIENCE NOTES.**

The English Board of Agriculture and Fisheries recently completed an interesting research concerning the swimming powers of fish. On May 8 last year, a number of marked fishes were liberated in the North Sea. On January 28 last a steam trawler landed a plaice, which according to the mark upon it was one of the liberated fishes. It had traveled 136 miles from where it was released to the place where it was caught.

It is said that the Navy Department will establish a branch naval observatory in Samoa, and that \$8,000 has been allotted for this purpose. The justification for such an institution is that it will afford astronomical observation in a field almost undeveloped, such as discovering a list of 500 of the 1,597 stars adopted for publication in the Nautical Almanac of the United States, Great Britain, France and Germany at a conference of the directors in 1896, for the accurate determination of time for the use of navigators in that far distant section of the national domain, and for the determination of the magnetic elements, knowledge of which is so important to navigation.

The late Dr. John Hall Gladstone, before his death, carried out an investigation of fluorescent and phosphorescent diamonds. Chaumet, Dr. Gladstone pointed out in two brief papers read before the British Association, had recently announced that violet light renders diamonds, especially the more valuable stones, phosphorescent; a yellow stone which would not fluoresce, turned brown after an exposure of a few minutes, but was restored to its color and brilliancy in 24 hours. This phenomenon was described by Dr. Gladstone at the Aberdeen meeting of 1859; three stones of a ring which he then exhibited were somewhat fluorescent in daylight and phosphoresced in the dark; exposure to violet and ultra-violet rays produced the strongest phosphorescence. As not one of a collection of other valuable diamonds showed any phosphorescence, Dr. Gladstone was inclined to attribute the peculiarity to some unknown impurity not usually found in stones of the first water. The ring mentioned was exhibited again a few years ago by Prof. Silvanus Thompson at the Royal Institution; it lost its phosphorescent power completely afterward, and regained part of it after having been kept in the dark for a year. An accidental fire has finally put an end to this investigation.

\* Since this article was written by the well-known English authority the ships marked with a star have been either destroyed or disabled. The "Variag," "Askold," and "Korietz" are supposed to be beyond repair. † These ships have armored belts.