JAPANESE MILITARY SANITATION AND HYGIENE.

BY BARON K. TAKAKI, SURGEON-GENERAL (RESERVE) OF THE IMPERIAL JAPANESE NAVY; FORMERLY DIRECTOR OF THE MEDICAL BUREAU OF JAPAN.

Because an army is a fighting machine, it is obvious that its efficiency must depend primarily on the men of whom it is composed. For that reason the selection of recruits at the time of enlistment is a matter of considerable importance with us in Japan. A high standard of physical health and strength has been adopted, with which every enlisted man must conform. A weak man is not much better than a sick man. Sooner or later he will fill a cot in a military hospital, and that probably at a time when he is most needed in the field, and when hospital accommodations are taxed to their utmost.

Next to the soldier himself the most important factor of an army's efficiency is the food which is supplied. How vitally important in military hygiene is the regulation of diet, may be gathered from the single circumstance that during my period of service as surgeon-general of the Japanese navy, I succeeded in all but totally extinguishing kahke or beri-beri from the navy, merely by introducing a new diet. For thirty-three years or more the disease had wrought fearful havoc in the army and navy. As a result of considerable experiment, I discovered that the food of the average Japanese soldier and sailor contained too much carbohydrate and too little nitrogenous material. Instead of containing 1 part of nitrogen to 15.5 parts of carbohydrate, as it nominally should have contained, the food of the Japanese army and navy comprised about 1 part of nitrogen to 18 to 28 parts of carbohydrates. After much opposition I succeeded in introducing a new regimen, in which a better proportion was observed. Kahke almost immediately disappeared, and has been practically unknown in the navy for twenty-two years.

During the recent war the problem of serving rations was one of the most difficult with which we had to cope. Food was sent to the front under strict superintendence. Victuals were also bought in the field; but the utmost precautions were taken in the purchase for fear of poison. During the severe winter the men were ordered to wrap their provision boxes in flannel and to strap them beneath their overcoats, in order to prevent the freezing of moist foods. Whenever rice was eaten it was previously cooked—a standing order. In the heat of summer a small amount of acetic acid was added to the rice or barley, in order to prevent its decomposition. Besides eating the rations which the commissary department supplied, the men were permitted to buy eatables, following, however, the strict letter of the regulations. No soldier was permitted to purchase directly from the natives. Saké was served by the medical officers to the amount of about two ounces. The men who cared nothing for saké were given sweets. In general, it may be said that the food supply was scientifically distributed in accordance with the recommendations of the medical staff. Army surgeons inspected whatever was eaten, both before and after cooking. Rations were never served to fatigued men, because of the possible harm which might have been done. Unripe fruit was disbarred. Tea and tobacco were used in moderation as stimulants after hard marches.

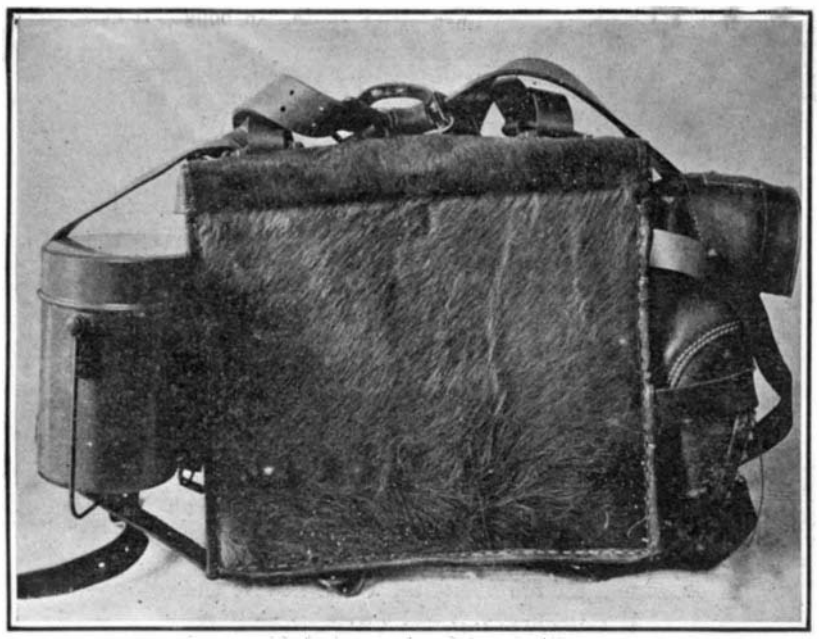
Extreme indeed were the precautions taken to supply potable water, and successful because they were extreme. Water was transported in special wagons drawn by four horses. A boiler cart drawn by one horse provided the necessary means of distillation. In addition the men were instructed to boil their drinking water in their provision pans, when they were unable to supply themselves from the boiled-water wagon of the company. At every mess each soldier filled his canteen with boiled water. Whenever a stream was resorted to, the men were instructed to take only the water in the center of the stream, so that the impurities which cling to the bank were avoided. Even this water was boiled.

To the medical staff was assigned the duty of locating suitable water supplies along the line of march. Medical scouts were sent out to test wells and springs. If the water of a well was unfit to drink, a signpost was erected at the spot giving timely warning of the dangers that lurked in the well. If it were advisable to boil the water, a conspicuous notice was also posted. Guards were sometimes stationed about springs of impure water; for a weary, hot soldier, thirsting for a cool draft, is not apt to be over-nice in his selection of drinking water.

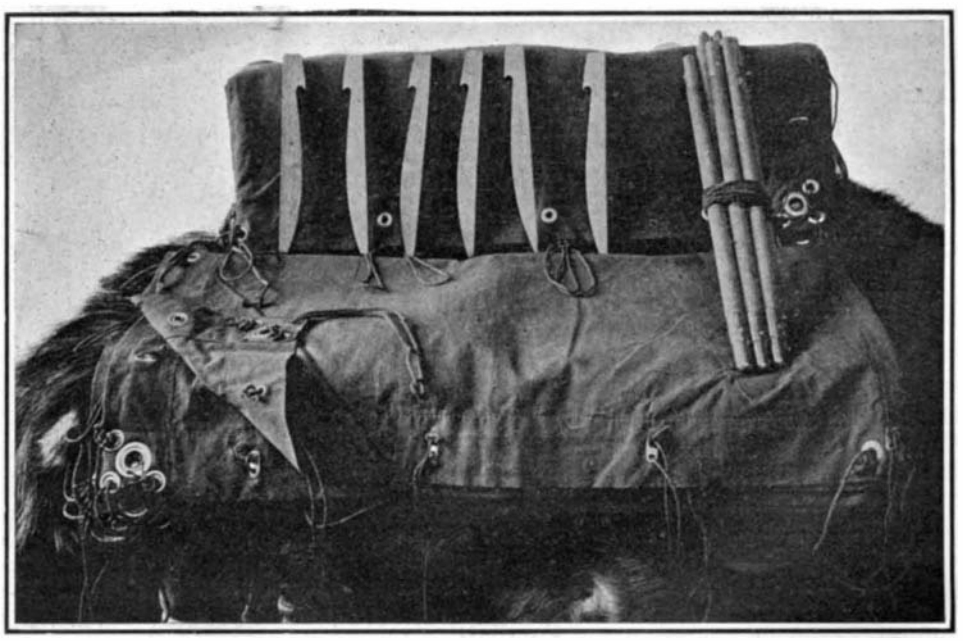
Next in importance to good food and pure water comes the matter of bodily cleanliness. Clothes, shirts, blankets, and the like were washed with scrupulous care whenever the opportunity presented itself. The character of the clothing, too, received not a little attention. Too much clothing causes excessive perspiration, and is therefore injurious; too little clothing is manifestly a poor protective against cold. During rest or while on sentinel duty, the men were warmly clad. When undergoing much bodily exertion, they rid themselves of all that was superfluous.

The overcoat was perhaps the Japanese soldier's most indispensable article of wearing apparel, serving him as it did not merely for keeping him warm, but also often as a bed. After a severe rain it was dried on reaching quarters. Shirts and socks were washed very frequently. In very cold weather the feet were swathed in bandages of flannel. Bootsores are caused by stiff, unyielding shoes. For that reason the soldiers softened their boots, first by soaking them in water, and then by treating them with melted lard. Wet shoes were not allowed to dry quickly; they were bound in straw or cloth, and dried out gradually. When shoes and boots were so badly torn that they became useless, and no shoes were available, the men were instructed to bind their feet in dried grass or straw, and to cover this first wrapping with cloth. Straw shoes were also worn in such emergencies.

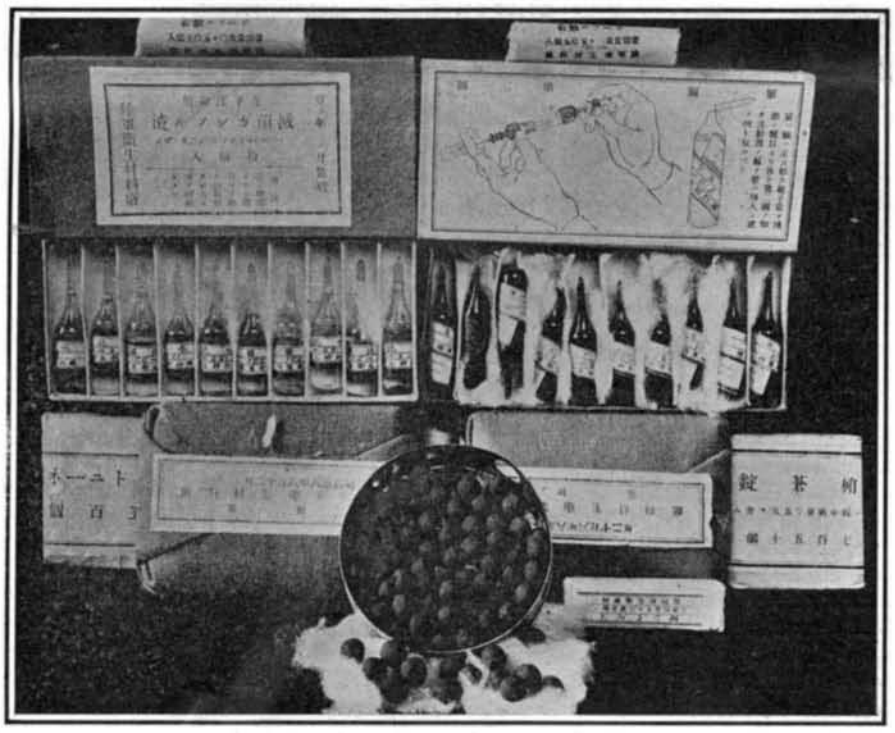
Before a long march was undertaken, or before going into battle, the soldiers were made to bathe, to arrange shoes and socks properly, to repair broken strings and laces, and to fill their canteens with boiled water or tea. Cloths were disinfected at frequent intervals by special apparatus. During the march excessive drinking of water was forbidden, because thirst is thus not assuaged. Water was permitted only in quantities necessary for the preservation of bodily strength. The eating of ice or snow was likewise forbidden. In win-



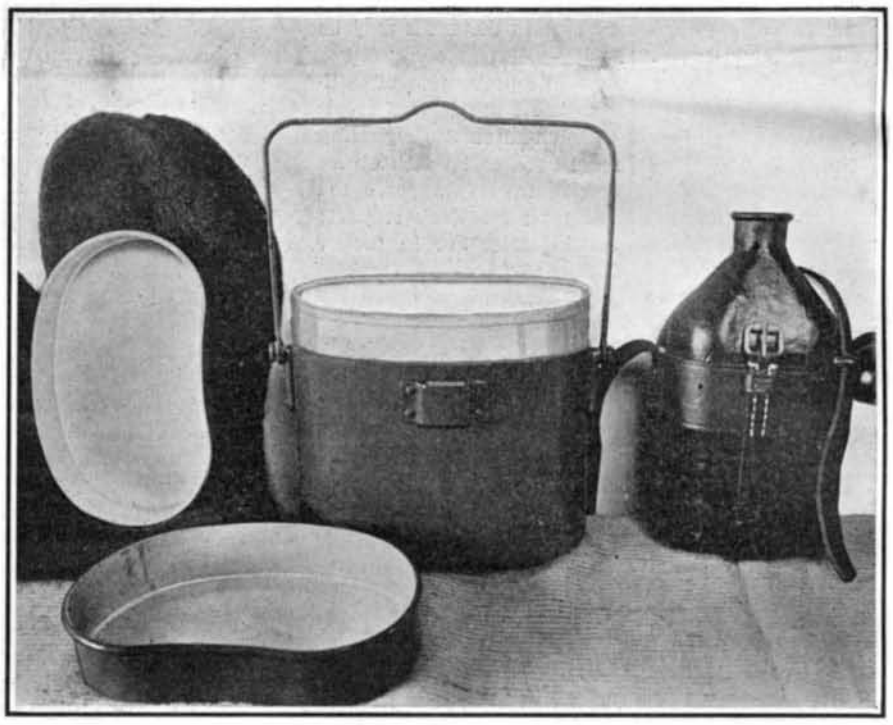
Waterproof Horsehair Knapsack.



A Tent and Its Stakes.



How Medical Supplies Were Packed.



Aluminium Water Flask and Cooking Utensil; Implements Used for Boiling Water and Cooking Rice.

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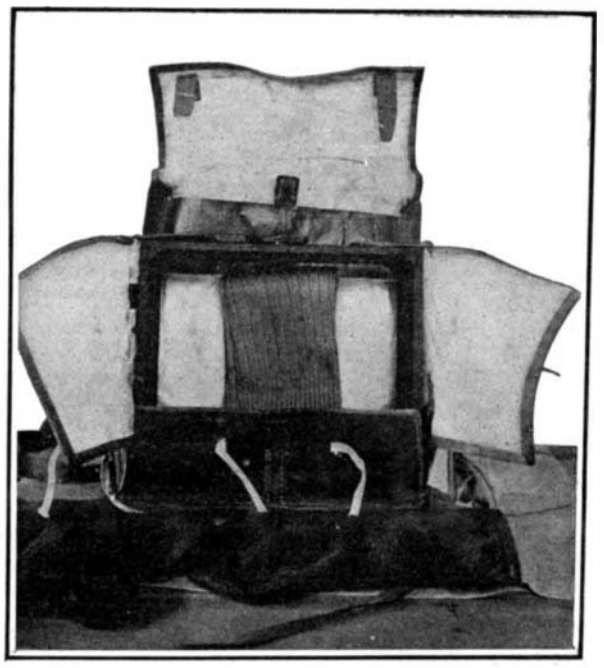
ter barracks the men were prone to use the Japanese charcoal pot. Inasmuch as there was much danger of asphyxiation, the use of these pots was sanctioned only when proper ventilation was possible. Summer insect pests, however, gave us more trouble than winter ventilation. In Korea and China flies are annoyingly numerous, and consequently a splendid means of carrying infectious diseases. We took special precautions to dispose of all refuse and manure, and succeeded in reducing the number of flies considerably. In order to guard against infection as much as possible, the soldiers were made to wash their hands before eating.

The drinking of boiled water and the eating only of cooked food made typhoid, dysentery, and cholera almost an impossibility. To be sure, we did lose men by disease, but in all human history there has never been a record like ours. We established a record of four deaths from bullets to one from disease. In the Spanish-American war fourteen men died of preventable sickness to one man killed on the field of battle. The following table gives a comparison of the mortality from disease per 1,000 men in the Japanese-Chinese war and the Japanese-Russian war:

JAPANESE-CHINESE WAR.		JAPANESE-RUSSIAN WAR.	
Cholera.		Cholera.	
Cases.	Deaths.	Cases.	Deaths.
82.77	50.86	None.	None.
Typhoid.		Typhoid.	
Cases.	Deaths.	Cases.	Deaths.
37.14	10.98	9.26	5.16
Malaria.		Malaria.	
Cases.	Deaths.	Cases.	Deaths.
102.58	5.29	1.96	0.07

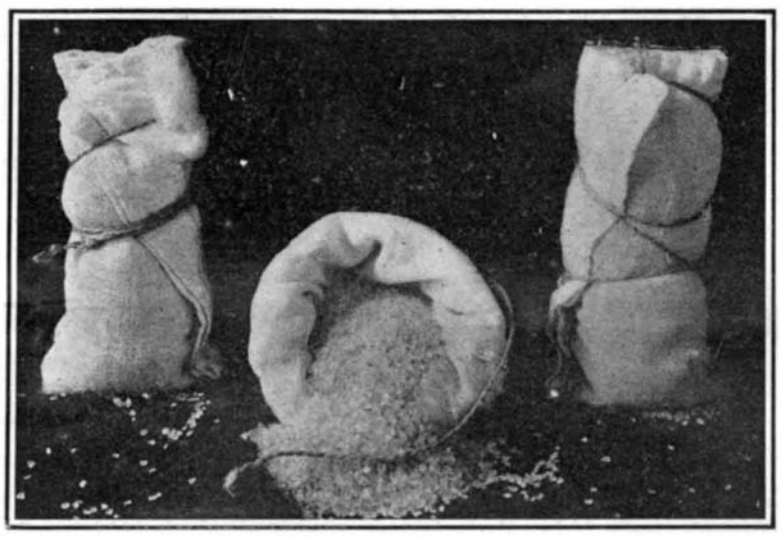
Some difficulty was experienced from smallpox, prevalent to a certain extent among native Chinese and Koreans. Still, out of 347 cases only 33 resulted in death, due probably to the fact that the medical staff carefully inspected all houses and camp sites before their occupation by the troops. Of typhoid fever there were in all 9,722 cases, resulting in 4,073 deaths. Of dysentery there were 7,642 cases and 1,804 deaths. The actual number of officers who were killed outright was 1,657; of petty officers and soldiers, 41,562. The rate of instant death in the navy was 51 per cent, in the army 28 per cent. The discrepancy is due no doubt to the high explosives used in naval shells. To the strict medical precautions which were taken may be attributed the good health of the army and its comparative freedom from infectious diseases. Our invasion of Manchuria was an antiseptic invasion. Disinfecting apparatus played as big a part as cannon in our ultimate victory.

This course of disinfection began even before the men set foot in Manchuria. Men who had the slightest taint of epidemic disease were rejected. The transports were disinfected and quarantined before and after they had disposed of their consignments of troops. Three quarantine stations were utilized. The main station was that of Ninoshima, where 6,000 men could be disinfected in twenty-four hours. The chief means of treatment were baths, steam sterilization, and steam mingled with formalin. Army medical officers were supplied with textbooks, which were used in the instruction of the men; and this instruction played just as important a part in their daily life as their drill.

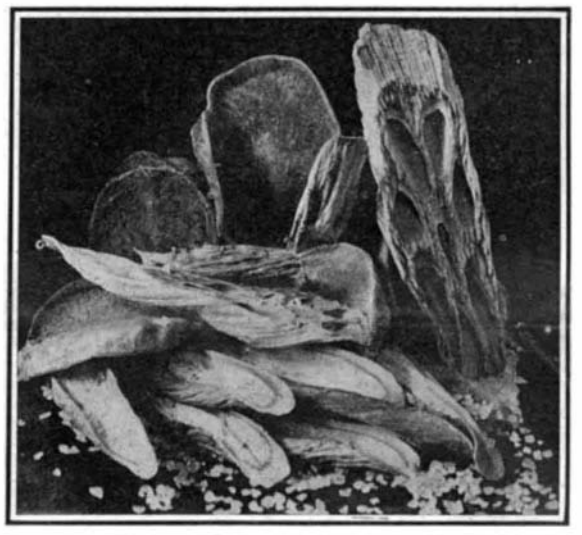


Interior of Soldier's Horsehair Knapsack.

We had a surgically clean army, all but immune from disease; a body of men who fought well because they were physically perfect.

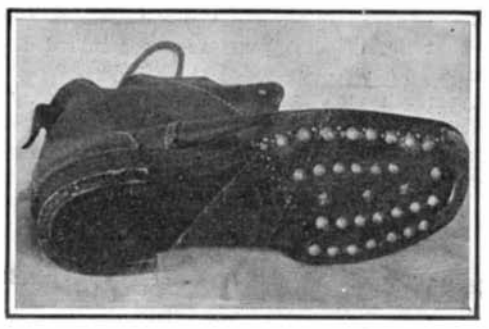


How Emergency Rations of Barley and Rice Are Packed.



Dried Japanese Vegetables Used as Army Rations.

Tent Used as a Rain-Coat on Picket Duty.



Sole of the Army Shoe.

The Army Shoe.

Winter Marching Equipment.

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A French company has commenced the manufacture of a product called hydrolithe. It is obtained by the reaction of metallic calcium on a metallic salt. This hydride of calcium gives, under the action of water, pure hydrogen, just as calcium carbide gives acetylene. The industrial product gives 1,000 liters per kilo.

A Repeating Gun of 1688.

BY ABBÉ J. ROUQUETTE.

In the course of researches among the archives of the ancient province of Languedoc, at Montpellier, I have found some curious and interesting documents, of which the following is a summary:

On the 21st of August, 1688, a prisoner who called himself Abraham Soyer was brought before the Abbé Du Chayla, arch-priest and inspector of the missions of the Cévennes. Among this man's luggage the arch-priest found and recorded in his inventory " a small arm that could be taken apart, which he (the prisoner) had carried to St. Estienne to have several others made like it, which the most skillful workmen to whom he showed it were not willing to attempt. Yet it was loaded with powder and about a dozen balls."

The prisoner was therefore taken to Montpellier and examined by the intendant of the province, the "small arm" being brought into court as evidence. The examination is reported as follows:

"We showed to the prisoner the breech of a gun of a new invention, which was loaded through the end of the stock, and asked him if he did not have it when he was arrested.

"He answered that he had bought it at Lyons from a peddler for thirty livres.

"Asked if he had not taken this weapon to St. Estienne to have others made like it, he replied that he had.

"Asked if he had loaded it, he replied that it was loaded by the St. Estienne gunsmiths."

In this deposition the prisoner appears to have contradicted some of his previous statements, a circumstance not surprising in the case of a man who was acting as a guide to Protestants endeavoring to escape from France, and who assumed three names, two nationalities, and two religions within the next fortnight. The governor of Languedoc was puzzled and very much interested, for it would be a serious matter if the Protestants were armed with this gun "of a new invention." He wrote to every town through which the prisoner said he had passed. Of the numerous documents relating to the case, only two, besides those already quoted, make particular mention of the gun itself. These are letters signed De Bérulle, without address, but evidently sent from Lyons. In the first, dated September 5, 1688, occurs this passage:

"I have written to St. Estienne to inquire if he was there, if he showed his gun which fires two shots, if he ordered others like it, and how many."

The second letter, dated September 7, 1688, says:

"I have written to St. Estienne to inquire if it is true that he showed the best gunsmiths a gun which fires twenty shots, and if his name is known."

In the first letter the gun is called a *"fusil à deux coups,"* the word *deux* (two) being written out in full; in the second it is called a *"fusil à 20 coups,"* with the 20 in figures.

The gun contained two new inventions: a breech-loading device and a mechanism permitting the discharge of "several" shots. How many? Two or twenty? For two, it would only be necessary to have two barrels. This alone would have been a great improvement; but there is every reason to believe that Abraham Soyer's gun had a special mechanism which made a profound impression on the governor of Languedoc because it enabled "several" shots to be fired. In other words, it was a repeating gun.

THE BRITISH BATTLESHIP "DREADNOUGHT."

The construction of the new British battleship "Dreadnought," of which so much has been said and written during the past few months, has progressed to a point at which it has become possible to make a drawing of the ship which is essentially accurate. The accompanying engraving is reproduced from a wash drawing of the "Dreadnought" which appeared in a recent issue of our esteemed contemporary, The Engineer.

Perhaps the most striking feature in this battleship is her extraordinary length; for her over-all length of 520 feet renders her longer even than the biggest of the armored cruisers, and longer by 70 feet than any battleship afloat. Another striking feature in the outboard profile is the long, unbroken sweep of the topsides, which to the level of the upper deck are unpierced by a single gun port, the usual secondary battery of 6-inch guns being entirely absent from the ship. The two funnels appear to be very stunted, but in reality are not so, their apparent lowness being due to the fact that they are elliptical in section, being very narrow in a transverse direction and of unusual length on the major axis parallel with the ship. The masting, also, has an extremely odd appearance, the foremast being removed from the neighborhood of the conning tower to a position abaft the forward smokestack. It is of tripod construction, consisting of a vertical hollow steel mast, and a pair of forwardly-inclined and diverging struts, one object of which construction is to prevent the mast being brought down by a single well-placed shot. At the top of the foremast, and immediately over the forward smokestack, is the fire-control platform, upon which will be placed the range-finders. It is probable that on this platform and in the turrets will be installed a new automatic system of range finding and gun elevating, by which the range will be electrically transmitted to each gun position, where by means of synchronized motors, the elevation of the guns will be steadily changed to correspond with the decreasing or increasing range as recorded by the range-finder on the platform. This method removes all possibility of error in the transmission of the ranges or the manual elevation of the guns, and leaves to the gun crew the duty of merely traversing the guns and keeping them fixed upon the enemy. It will be noticed that because of the lofty foretopmast the total height of the fore truck must be fully 200 feet above the water line. A short mainmast is carried in the usual position, mainly for the support of the antennæ of the wireless telegraph.

COMPARISON OF SOUTH CAROLINA AND DREADNOUGHT.

	SOUTH CAROLINA.	DREADNOUGHT.
Length	450 ft.	520 ft.
Beam	80 ft. 2½ in.	82 ft.
Draft	24½ ft.	26½ ft.
Displacement	16,000 tons.	18,000 tons.
Horse-power	16,500	23,000
Speed	18½ knots	21 knots
Coal supply	2,200 tons	2,700 tons
Maximum freeboard	30 ft.	28 ft.
Minimum freeboard	12 ft.	20 ft.
Belt armor	12 in.	11 in.
Main armament	Eight 12-in.	Ten 12-in.
Number of guns ahead	Four 12-in.	Six 12-in.
Number of guns astern	Four 12-in.	Six 12-in.
Number of guns broadside	Eight 12-in.	Eight 12-in.
Minimum distance between centers of gun positions	35 ft.	110 ft.

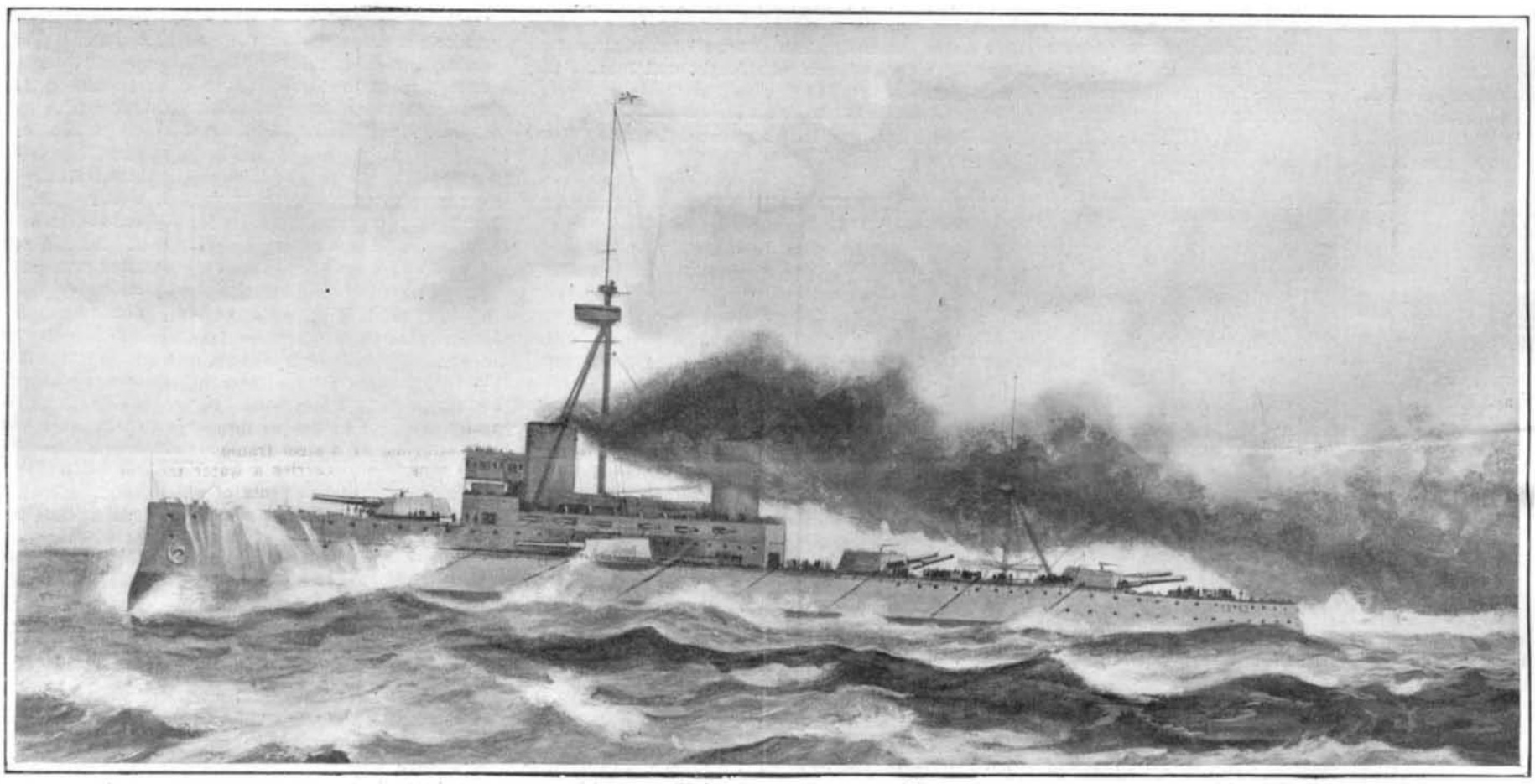
Taken altogether, the appearance of the "Dreadnought" is about as wide a departure from previous battleships as can well be imagined. With her high forecastle, wide smokestacks, and lofty foremast, she might well be mistaken at a great distance for a torpedo-boat destroyer—a delusion which would be greatly helped by the comparative absence of yards and general top hamper. She should prove to be a fine sea boat, her freeboard being nowhere less than 20 feet, and her forecastle deck, upon which the forward pair of 12-inch guns is mounted, having a clear freeboard of 28 feet. The forecastle deck extends for about one-half of the length of the ship, and on its after portion is carried a superstructure deck, upon which is mounted a numerous battery of small rapid-fire guns for defense against torpedo attack. Another novelty is that the officers' quarters are forward instead of aft.

The great length and beam of the "Dreadnought," the latter being 82 feet, render it possible to give the heavy battery of ten 12-inch guns both a lofty command and a wide distribution. In addition to the pair of 12-inch guns on the forecastle deck, the ship carries eight 12-inch guns in four turrets mounted on the upper deck, the axes of these guns being 24 feet above the water. Two of the turrets are mounted on the center line of the ship aft of the superstructure in widely-separated positions, the aftermost pair being about 125 feet (center to center) astern of the forward pair. The other two turrets are mounted, one on each side of the superstructure, about 110 feet distant from the forward turrets. This wide distribution of the armament is one of the excellent military features of the "Dreadnought"; for it reduces the amount of damage which may be effected by a single heavy shell. Moreover, it complicates the work of the enemy's gunners by offering several widely-distributed centers of attack in place of a single position, such as the conning tower with its adjacent military mast, forward 12-inch turret and flanking 6-inch turrets, which formed such a favorite and successful point of attack for the Japanese in their engagements with the Russian battleships. In this respect the "Dreadnought" also has a decided advantage over our own "South Carolina" and "Michigan," in which the turrets are placed in pairs, with only sufficient distance between them for clearance in turning. This feature in the "Dreadnought" is a striking evidence of the advantages that come from large displacement and great size; for such a separation of gun positions would not be possible on a smaller ship. It has the further advantage, moreover, from the naval architect's point of view, that the weights are more evenly distributed throughout the ship, and that it is not necessary to introduce material into the hull merely for the purpose of counteracting the excessive bending strains which would come from the concentration of the heavy armament near the ends of the vessel.

The guns appear to be admirably placed with regard to the two important features, first of securing a maximum concentration of fire in every direction, and second of avoiding the disastrous consequences of "blast," or the disturbance of the crews of one gun position by the blast of other guns that are placed too contiguous to them. The two turrets which are carried on either beam abreast of the superstructure are sponsoned out beyond the side line of the ship, and the superstructure itself is cut away in the forward and aft direction sufficiently to allow the guns of each turret to be fired either dead ahead or dead astern. This enables the "Dreadnought" to concentrate six 12-inch guns ahead, six astern, and eight on either broadside. When these guns are firing dead ahead, there can be no blast interference with the guns on the forecastle deck, which are shielded by the vertical walls of the superstructure, and, moreover, are about 110 feet distant, nor when firing dead astern will there be any interference with the crews of the aftermost turret, which is fully 250 feet distant, and furthermore, is shielded by the after wall of the superstructure. To enable the broadside guns to be fired parallel with the superstructure, the walls of the latter will be specially strengthened.

The "Dreadnought" will be driven by triple turbine engines at an estimated speed of 21 knots an hour. She will carry 2,700 tons of coal, and will be protected by a continuous belt of 11-inch armor, while as a protection against torpedoes a new system of subdivision of the hull of the ship has been adopted which, it is believed, will render her unsinkable by any weapon except a ram.

Since the announcement of the general features of the "Dreadnought" there have been many rumors of ships being built to "beat her," and various statements of the size, speed, and armament of these ships have been published. The only reliable figures of battleships that are comparable to the "Dreadnought" are those of our own "South Carolina" and "Michigan," an illustrated description of which appeared in our issue of August 4. These ships, however, were not built with any idea of surpassing the "Dreadnought," which, because of her much larger displacement, must naturally be a more formidable vessel; for the fighting efficiency of the modern battleship (so well are the principles of design understood the world over) must be directly in proportion to her displacement, however. The tabular comparison which we have made of the military elements of the two ships will, we think, be found to be decidedly interesting.



Length, 520 feet. **Beam,** 82 feet. **Draft,** 26½ feet. **Displacement,** 18,000 tons. **Speed,** 21 knots. **Armor:** belt, 11 inches; turrets, 11 inches. **Guns:** ten 12-inch, eighteen 3-inch.

THE NEW BRITISH BATTLESHIP "DREADNOUGHT."