

CARE OF THE WOUNDED IN SEA FIGHTS.

The requirements of modern naval warfare make it impossible to pass easily from one section of the ship to another during an engagement. This has caused the medical service in some navies, notably the French, to be decentralized as much as possible on each ship, centralization being left for the hospital ships and shore hospitals. In the old days of wooden ships with flush gun and spar-decks, it was comparatively easy to transport the wounded to where they could receive every surgical attention. The surgical staff was a unit, and its work was brought to it; but now all this has been changed, and they must seek it. A modern battleship is practically an aggregation of steel cells, each containing its quota of the crew, all working harmoniously and in concert toward the destruction of the adversary.

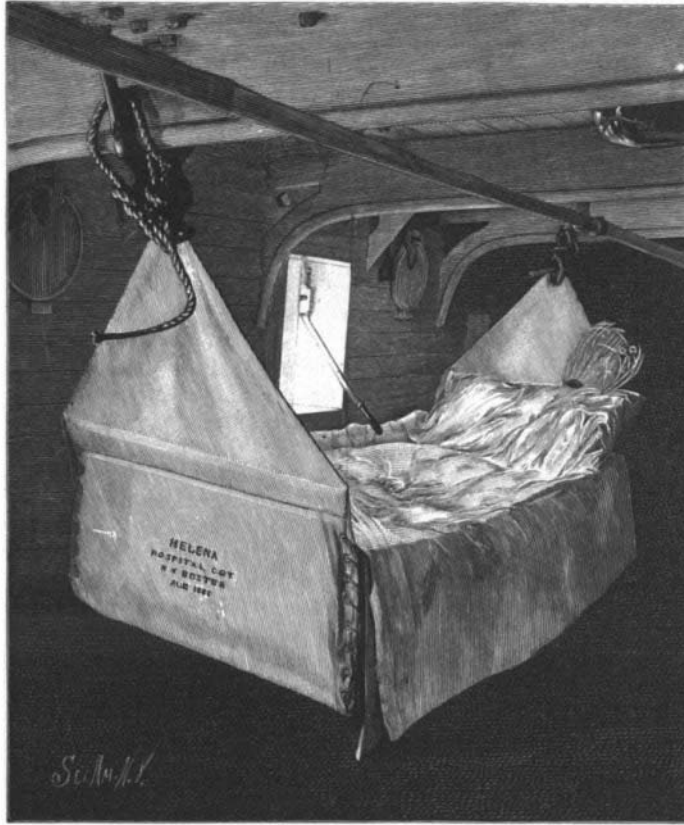
Anyone familiar with the construction of a modern battleship will readily see the impossibility of caring for wounded men as in the days of wooden ships; for, of course, the object of making closed compartments is to utilize them in this form when in action, for when a ship clears for battle the bulkhead doors are closed, and the men isolated in groups, as much so in fact as if they were in separate ships; so that it will be seen that it is manifestly impossible to carry the wounded men to a sick bay until the fight has ended; but everything is done to save life until those injured can be carried where they may be properly attended to. The fighting space in modern war vessels is so limited, especially in the turrets, that the immediate removal of disabled or wounded men is of the utmost importance, for there are no unoccupied spaces in which they can be placed out of the way of the actives. The only practicable method of caring for the injured is to lower them to the partially cleared space at the base of the turret, either by the ammunition hoist or lashed in a hammock. Here the unfortunate must remain,

after receiving temporary aid, as the space is too limited for the performance of any operation, and it is doubtful if a surgeon could even reach him. But at the first favorable opportunity he is transferred to the sick ward, where proper medical attention is given, and he will be relegated to a cot, something similar to that in our illustration; but as soon as possible the wounded are transferred to a place where they can be still better cared for, such as is afforded by the ambulance ship "Solace," now with the fleet at Santiago, and which has already furnished efficient aid for many soldiers and sailors, ill or wounded.

As far as possible, each compartment of the ship is provided with emergency surgical appliances, and men rated as "nurses," under the direction of a surgeon's steward, do all possible to relieve the sufferings of the injured. The temporary surgical ward is usually a space especially set apart for this purpose. It may lie at the forward end of the berth deck, or in such other place as the exigencies of the situation may demand. Formerly the old operating room was the cockpit, which was considered the safest place on the ship; but now the table in the wardroom is usually assigned to the surgeons, as on Dewey's squadron during the battle of Manila. When there is a lull in the tide of battle, the wounded are brought as quickly as possible to the surgical table, where the necessary operations are taken in hand. Of course capital operations are only performed when delay would be fatal, and whenever possible those injured are transferred to a hospital ship or to a hospital on land, where they may receive plenty of light and air and proper nursing. With modern aseptic surgery, injuries which in the Civil War would have been fatal are now treated successfully.

Our engraving represents what is known as a hospital cot, and the cots which are used in the sick bays of war vessels usually partake of the characteristics of both a cot and a hammock. Of course, a cot of this kind would be used during cruises by those who became injured, so that the ordinary hammock would not answer. The cot consists of a frame covered with a mattress, and triangular pieces of canvas serve to attach it to the hammock hooks through the medium of ropes. Flaps hang down at the ends to prevent a draught from striking the patient. The blankets are placed on the cots in such a way that they may be thrown over the patient from each side, and are not used in the ordinary way. The peculiar form of cot shown in our engraving has been somewhat criticised

by medical men, who say that it embodies none of the advantages of either the true naval hammock or cot, since here the equilibrium of the patient is constantly endangered, which is not the case in either of the latter. The ordinary ship's hammock is suspended in such a way as to gather it about the body of the individual resting therein. The danger of falling out is infinitesimal,



A HOSPITAL COT ON A MAN-OF-WAR.

except, perhaps, to those suffering from delirium. The true naval cot is suspended from four corners, and a web of canvas protects the occupant, regardless of the changes of gravity. It is feared that the cot hammock here illustrated will tip at any disturbance of the center of gravity; hence it would be materially improved by providing two more points of suspension.

The "Solace" was formerly the "Creole," of the Cromwell line. She has a displacement of 3,600 tons, is 350 feet long on the load line, and has a speed of 14 knots. The ship carries powerful launches and barges for transferring the sick and wounded at sea. The idea is to have the "Solace" remain near the fleet while in action, and as soon as any ship withdraws, or at the close of the engagement, to take all the wounded on board and steam away for a naval hospital. Thus it will be seen that she is more properly an ambulance ship rather than a hospital ship. The injured are lowered into the steam launches and barges, and immediately on being received on board those requiring operation at once will be placed on the tables and then sent later to the wards.

infesting chamber for clothing. An ice machine and cold storage plant have also been supplied, as well as a large water distilling plant. The ship is equipped with three formaldehyd generators for disinfecting purposes. There are separate rooms for wounded officers, and the men are berthed in spacious wards in the forward and after part of the ship. There are four medical officers attached to the ship, three apothecaries, eight graduated nurses, laundrymen, cook, etc. The ship flies the Red Cross flag and is protected by the articles of the Geneva convention. She is painted white with a green stripe, as are each of her steam launches. It is the first war in which surgeons have had an opportunity to practice aseptic military surgery. There are seven hospital ships attached to the French navy, which has paid particular attention to this subject.

A Literary Treasure House.

The Genizah or treasurehouse of an ancient synagogue in Cairo is a windowless and doorless room at the end of a gallery, with an entrance through a big shapeless hole, reached by a ladder, says Biblia. Here, in obedience to the injunction upon the Jews not to destroy any of their sacred books, which finally came to include the preservation of all writings in the Hebrew characters, have been deposited, during the past two thousand years, worn-out and defective copies of such books, sound copies of "disgraced" books (that is, such as have once pretended to the rank of Scriptures, but have been authoritatively condemned as uninspired) and various Hebrew documents. Some parts of the immense mass, which includes books printed during the last four hundred years, are in a fair state of preservation; others are squeezed into unshapely lumps, while still others are "literally ground to dust in the terrible struggle for space." Dr. Schechter, of Cambridge, England, was able to rescue about forty thousand fragments of manuscripts, which have been placed in the library of the University of Cambridge, and are now being carefully examined. They consist mainly of parts of the Old Testament, some going as far back as the tenth century, of Jewish liturgical works, of the two Talmuds, very many hymns, legal documents, letters, prescriptions, amulets, and fragments of miscellaneous works.

ROMAN WINE CASKS DISCOVERED AT SILCHESTER.

In the rooms of the Society of Antiquaries, Burlington House, may just now be seen, says The St. James's Budget, some of the finds made last year by the explorers on the site of the Romano-British town of Calleva, in the parish of Silchester, which is about ten miles from Reading. The archaeological value of the relics is great. At Burlington House one sees three venerable casks. Fifteen hundred years ago they held Italian wine. Some probes and other surgical instruments show that ancient Roman ideas on the form of such things were very like those of modern Englishmen. Then there are a fine bronze necklet and an eagle's head of the same metal from the top of a Romano-British staff. There are a few fragments of Samian pottery. The value of these potsherds lies in the clearness with which the maker's name still appears on them. There is a piece of imitation Samian "marble" which formerly decorated a mantelpiece. A stone jar, standing conspicuously in the middle of the room, is supposed to have been used as a store pot. It was found unbroken, built into the wall of a house. The collection also includes well preserved portions of querns, fragments of flint glass, pestles, and mortars.



ROMAN WINE CASKS DISCOVERED AT SILCHESTER ENGLAND.

The operating room measures 30 by 30 feet and is well lighted and equipped with aseptic hospital furniture of the best pattern, and the outfit of instruments, sterilizers, etc., is complete in every detail. The floor of the operating room has even been paved with tiling. On the engine room deck is a fully equipped steam laundry and drying room and a dis-

work was let in two sections, one from 155th Street to High Bridge and the other from High Bridge to Dyckman Street. The second or upper section was finished first. The total cost of the driveway is \$3,075,000. We have already described the speedway. See SCIENTIFIC AMERICAN for March 31, 1894, October 27, 1894, February 6, 1897, February 13, 1897.

Opening of the Harlem Speedway.

The new Harlem Speedway, which extends along the Harlem River from 155th Street to Dyckman Street, was opened to the public on July 2, without public ceremony of any kind. The driveway was opened last fall, but the speedway was closed again, as it was not completed and the road was in a bad condition. Plans for the construction of the speedway were approved in February, 1894. The

"The Engineer's" Analysis of American and Spanish Warships.

The SCIENTIFIC AMERICAN not unnaturally criticises an analysis made by us a few weeks ago bringing out certain features in American and Spanish warships. Some of its observations are fair and reasonable, and we are always obliged for any corrections in matters of fact. On such questions as the nationality of the crews of the United States vessels, the best information must come from America. We admit also that for blockade work even the slow monitors have their value. On the leading feature of our article, however, namely, gun power, we feel we must reply, the more especially as our contemporary remarks: "The fiction that our ships do not carry rapid-fire batteries is an old one with The Engineer, and, judging from the persistence with which it appears, it is as popular as it is abiding."

On this subject we may explain that, while we think that we never said that no quick-fire guns were carried, we have had in view a very definite deficiency, namely, want of power of serious fighting with quick-fire armaments. Originally light quick-firing guns were introduced in warships to defeat torpedo attack; then, as the power of larger quick-firing guns became apparent, came in batteries of pieces from about 4 inches to 6 inches in caliber, mounted behind medium or thin armor, intended to attack the unarmored or lightly armored parts of ships. So great a power was thus developed that, as we showed in our article in the end of 1895, ships deliver an enormous amount of energy of fire from quick-firing guns, and in a shape on which they can reckon more certainly than the few heavy blows delivered by the primary guns. It has been deliberately concluded by some of our highest authorities that our light unprotected quick-firing pieces, whose energy, moreover, is but small, could not be manned in close action unless circumstances specially favored it, so that their main function remains what it originally was, the defeat of torpedo attack or of men in boats.

The power of really heavy quick-firing batteries is not merely a very distinct feature, it is the main characteristic feature of new construction. Originated at Elswick, it quickly came into British armaments, then France, Germany, Russia, and other powers took up the question so keenly that, as shown in our article in 1895, England, in the actual amount of energy of quick-firers in occasional instances, does not now compare well with these powers. If, however, we take into account that the 6-inch quick-firing batteries in the most important types of British ships are mounted behind 6-inch Harvey plates, and the pieces of most other powers behind 3 inches to 5 inches of ordinary steel, so that our own guns are secure while easily able to perforate most enemy's shields, it may be admitted that our quick-firing batteries ought not only to hold their own, but to have the best of it in a fight. Strange to say, the United States were slow to recognize the power of quick-firers used in the way we now speak of. This is now what we have to show, and we at once give our main facts. These are the strange deficiency of powerful quick-firing guns in all existing American battleships and armored cruisers, and the fact that last year for the first time a 6-inch quick-firing piece was introduced. For some reason which we do not attempt to account for, quick-firing guns were introduced in unarmored American ships, but while some of these are no doubt specially protected, no one can maintain that these vessels can take the place in close action that we are considering. The fact remains that this element of quick-fire was remarkably deficient in battleships and armored cruisers, and continues to be so to this day in ships afloat. For though at last the United States authorities have awakened to their need, it has been too late to get the benefit they would have had, had they not been behindhand.

We give herewith a list of battleships now afloat of the principal powers, with their quick-firing guns of the class we refer to, that is, from 3.9-inch (10-cm.) upward. We have taken ships approaching 10,000 tons displacement, and built between about 1891 and 1897—that is the time when this class of quick-fire was coming in. It will be seen that America has four battleships, of which only one has any quick-firing guns of the class we are dealing with, and these are only six in number and 4-inch in caliber. Spain has only one such battleship, the "Pelayo," who carries nine 5.5-inch quick-firing guns; that is, Spain's one ship carries 50 per cent more guns than the whole of the four Americans, and they are of much heavier caliber. Germany comes next with five battleships carrying twenty-four 4.1-inch quick-firing guns and eighteen 5.9-inch, besides four 9.4-inch, which last are of so heavy caliber that their rapid character might be questioned. Then follow Russia with six ships carrying eight 3.9-inch, thirty-six 5.9-inch, and eighteen 6-inch quick-firing guns; France with nine ships mounting eight 3.9-inch, seventy 5.5-inch, and ten 6.4-inch quick-firing guns; and lastly England with nineteen ships mounting twenty 4.7-inch and one hundred and eighty-six 6-inch quick-firing guns.

Our object is, however, not so much to take our

stand on the total quick-fire gun power as on the extent of its recognition, which is represented by the average per ship. If, then, we take the energy per minute, and if, to be liberal, we allow the light 4-inch guns of America ten rounds per minute, and cut all heavier guns down to five per minute, the result is still absurd as a matter of comparison, the average 13,730 foot-tons energy of fire being less than $\frac{1}{4}$ of Germany, $\frac{1}{11}$ of Spain, about $\frac{1}{4}$ of France, less than $\frac{1}{15}$ of England, and hardly more than $\frac{1}{2}$ of Russia. Our American critic objects to the omission of coast defenders. Were we to throw them in in this comparison, however, America would suffer, as they are old-fashioned vessels, which among them all could only muster ten 4-inch quick-firing guns. Were we to take ships building and not afloat, we admit the matter would be greatly changed, and this will be the case next year. We, however, are at present answering the charge of running our head against a fallacy in articles written in the past: we are not charged with doing so in articles which we are going to write next year.

Being, however, brought to book, we are anxious to make good our so-called "fiction." First, then, as to battleships, we offer our figures and ask that they should be shown to be wrong. Failing this, is it a fiction to say that with a proportion on the most liberal allowance of rate of fire of from $\frac{1}{4}$ to $\frac{1}{15}$ the energy of fire of the average ship of the various powers mentioned, American ships are decidedly deficient in quick fire? "Do not carry quick-firing batteries" is not, we think, an expression we ever used, although three out of four battleships have none at all of the class we are dealing with. Next we come to armored cruisers. Of these we give lists of England, Germany, Spain and the United States, with an average showing the United States ships behind all the others, though not at all to the same extent as in the battleships.

With regard to unarmored ships, we admit that commencing in 1892, American ships appear to be well provided with powerful quick-fire guns. It is to armored battleships and cruisers our statement was made, and holds good. Our disregard of the small quick-firing pieces may be objected to. We can perhaps best meet this objection substantially by explaining to our readers exactly how the question of this element in armored ships came prominently to our notice. Near the end of 1895, as above said, we published diagrams showing energy of fire per minute of various British and foreign ships, taking "Excellent" rates for all as far as possible. An article in the "Naval Annual" in 1896 reproduced these figures, further carried out and corrected, and with several additional ships. In these were included the fire both of heavy guns and of all the light quick-firing pieces; but as the whole of the guns were given on both broadsides, so that the heavy guns did not carry the weight that should be assigned them in action, and as the light quick-firing pieces have insignificant energy, the figures shown chiefly depended on the heavy quick-firing batteries. In the shape in which they appeared, the rectangles showed actual facts and figures without the application of any judgment which might involve personal prejudice. The guns were simply entered as they stood; the energies were taken from tables and the rates from the "Excellent." The simplest application of service conditions would cut down the quick-fire by half, because as a rule a ship would only be able to use half her broadside batteries. Thus, the differences shown would decrease, but they would still exist. It happened that the energy per minute of the "New York" was then worked out and found to be very poor; in fact, only 119,904 foot-tons, as compared with 509,091 foot-tons for the "Esmeralda," of 500 tons less displacement. The rectangle for the "Brooklyn," with 247,940 foot-tons, which, though much better, was still very poor, was shown, but the reason that the "New York" was omitted was that our relations with the United States had been so very unsettled, and the aspect of matters had been sufficiently threatening, for it to seem undesirable to call attention to a fault which appeared so easy of correction.

We have always regarded the possibility of fighting with the United States with dismay. Nothing has been more opposite to our wishes; but American officers, as fully as our own, would consider that we were right in keeping such a point as this to ourselves at such a time. It was not necessary to take an extreme view in the way of caution, and, as said, the rectangle for the "Brooklyn" was shown in the "Naval Annual," but she had the largest quick-firing guns in the American service, and could not quickly get a heavier armament. The want of power of the 4-inch pieces could not, it is true, long escape the notice of such keen men as are to be found in the States, and was indeed mentioned elsewhere in the "Annual," but it seemed right to refrain from thrusting forward at the moment the great gain that would follow from substituting 5-inch for 4-inch guns. It is not always remembered that caliber tells as the cube. A 4-inch and 6-inch gun in a secondary armament are, of course, seen to be different things, but it is not grasped till tested that if their velocities are equal, the blows delivered are in the ratios of four cubed and six cubed, or 64 and 216.

That this, as we say, has only been latterly appreciated in the States is surely apparent from the fact that only a few months ago was the 6-inch quick-firing gun adopted by the United States government. That it is now appreciated, however, is equally clearly seen in the armament laid down for the "Illinois" and "Wisconsin," two of the very class we have instanced as hitherto almost wholly deficient in powerful quick-firing guns, for each of these are to have fourteen 6-inch quick-firing guns. We have said nothing concerning the arrangements for "feeding" the guns; that is to say, supplying them with ammunition. This is, however, a most important point, and we are not at all clear that it has been fully worked out in the United States navy. Possibly our contemporary can supply information on this subject.

BATTLESHIPS.

United States.			
Name.	Displacement in tons.	Q.F. guns of 3.9 in. calibre and over.	Date of launch.
Indiana ...	10,288	none	1893
Iowa ...	11,410	6 4 in.	1896
Massachusetts ...	10,288	none	1893
Oregon ...	10,288	none	1893
Germany.			
Brandenburg ...	10,100	6 4 in.	1891
Kurfurst Friedrich Wilhelm ...	10,100	6 4 in.	1891
Weissenburg ...	10,100	6 4 in.	1891
Wurth ...	10,100	6 4 in.	1892
Kaiser Friedrich III. ...	11,130	{ 4 9 in. } { 18 5 in. }	1896
Russia.			
Georgi Pobiedonosetz ...	10,280	8 3 in.	1892
Petropavlovsk ...	10,960	12 5 in.	1894
Poltava ...	10,960	12 5 in.	1894
Sevastopol ...	10,960	12 5 in.	1894
Tri Sviatitelia ...	12,480	12 6 in.	1893
Sisoi Veliki ...	8,880	6 6 in.	1894
France.			
Bouvet ...	12,200	8 5 in.	1896
Brennus ...	11,395	10 6 in.	1891
Carnot ...	12,008	8 5 in.	1894
Charlemagne ...	11,275	10 5 in.	1895
Chas. Martel ...	11,880	8 5 in.	1893
Gaulois ...	11,275	10 5 in.	1896
Jaureguibery ...	11,824	8 5 in.	1893
Massena ...	11,924	8 5 in.	1895
St. Louis ...	11,275	10 5 in.	1896
England.			
Barfleur ...	10,500	10 4 in.	1894
Cæsar ...	14,900	12 6 in.	1897
Centurion ...	10,500	10 4 in.	1893
Empress of India ...	14,150	10 6 in.	1893
Hannibal ...	14,900	12 6 in.	1897
Hood ...	14,150	10 6 in.	1893
Jupiter ...	14,900	12 6 in.	1897
Magnificent ...	14,900	12 6 in.	1895
Majestic ...	14,900	12 6 in.	1895
Mars ...	14,900	12 6 in.	1897
Prince George ...	14,900	12 6 in.	1896
Renown ...	12,350	10 6 in.	1896
Ramilles ...	14,900	12 6 in.	1893
Repulse ...	14,900	12 6 in.	1894
Resolution ...	14,150	10 6 in.	1897
Revenge ...	14,150	10 6 in.	1895
Royal Oak ...	14,150	10 6 in.	1894
Royal Sovereign ...	14,150	10 6 in.	1892
Victorious ...	14,900	12 6 in.	1897
Spain.			
Pelayo ...	9,900	9 5 in.	{ 1887 } { 1897 }

MEAN OF LINE-OF-BATTLE SHIPS.

	Displacement, tons.	Q.F. gun energy per min.	Average date.
England ...	13,987	172,131	1894.7
Germany ...	10,306	97,760	1892.7
Russia ...	10,753	198,620	1893.7
France ...	11,673	164,101	1894.7
United States ...	10,564	13,730	1893.4
Spain ...	9,900	151,695	1897

Allowing the United States guns ten rounds per minute and all others five rounds per minute.

ARMORED CRUISERS.

Spain.			
Name.	Displacement, tons.	Q.F. guns of 3.9 in. and over.	Date of launch.
Almirante Oquendo ...	7000	nil	1891
Cardenal Cisneros ...	7000	10 5 in.	1896
Cristobal Colon ...	6840	10 6 in.	1896
Emperador Carlos V. ...	9235	8 5 in.	1895
Infanta Maria Teresa ...	7000	nil	1891
Numancia ...	7305	6 6 in.	{ 1863 } { 1897 }
(New armament 1897)			
Princesa de Asturias ...	7000	10 5 in.	1896
Vizcaya ...	7000	10 5 in.	1891
United States.			
Brooklyn ...	9215	12 5 in.	1895
New York ...	8200	12 4 in.	1891
England.			
Aurora ...	5600	each 10 6 in.	1889
Australia ...	5600		1888
Galatea ...	5600		1889
Immortalité ...	5600		1889
Impérieuse ...	8400		1886
Narcissus ...	5600		1889
Orlando ...	5600		1888
Undaunted ...	5600		1889
Warspite ...	8400		1888
Germany.			
König Wilhelm ...	9757	20 5 in.	{ 1868 } { 1896 }

The energy of fire per minute, allowing the United States 5 in. guns six rounds and the 4 in. ten rounds, and the English, German, and Spanish guns five rounds, gives the following average:—

	foot-tons.
German ships ...	370,300
British ...	167,800
Spain ...	128,484
United States ...	120,924

—The Engineer.