their first duty to stop the sources of supply whence they derive their income. To prevent disease and suffering is, nevertheless, the highest function of hygiene and one of the noblest aspirations of modern medicine. If we look upon wars as preventable causes of disease and suffering and of death, it would seem to be one of the functions of naval and military hygiene, not only to modify if not altogether to exterminate bullets, as we are trying to annihilate germs, mosquitoes, and other disease-producing agencies, but also to try to devise means for the final abolition of war itself. The gradual reduction in the calibre and the change in shape of the new small-arm projectile seem to be a step in this direction. In the same sense, arbitration may some day fill a chapter in a work on hygiene, and the great peace conference at The Hague, called into being by the august ruler of all the Russias a few years since, would then constitute, historically speaking, the first great international attempt at promoting the fundamental interests and purposes of naval and military hygiene. War undoubtedly is the greatest and most merciless destroyer of the best there is of human life. The history of every war-like nation usually ends in the extinction of the best of that nation. Greece died because the men who had made her glory had all passed away; leaving none of their kin, they left none of their kind. The Greeks of to-day are the sons of those of whom she could make no use in her conquest of Asia. Indeed there is strong ground for the statement that there was more of the old heroic blood of Hellas in the Turkish army of Edhem Pacha than in the soldiers of King George who fled before them five years ago.

The cause of the fall of Rome has been traced to the extinction of the best of her race through her numerous conquests; only cowards remained and from their brood came forward the new generations, and even Cæsar noted the dire scarcity of real men, and "vir," the real man, became "homo," a mere human being.

"Send me the best you have," said Napoleon; "I want men, not boys." Since the time of the French Revolution and the Napoleonic wars, French skulls may be found piled up in Italy, Austria, Germany, Russia, Egypt, and Spain. They are the skulls of the best men that France had sent into the field. It was only after these were gone that the great general began to call for boys, saying, "A boy will stop a bullet as well as a man," and these died without leaving any offspring. From that time onward the men of the hoe became the fathers of the present men of France. M. Legoyt thinks it will take long periods of peace and plenty before France can recover the tall statures mowed down in the wars of the republic and of the first Empire.

Mr. Arthur Knapp, in his work entitled "Feudal and Modern Japan," says: "It is astonishing to find that after more than six generations, or more than two hundred years of peace in which physical courage has not been demanded, these virile powers in the Japanese should be found unimpaired." The student of history, however, finds that this is just what he would expect, for, in times of peace, there is no slaughter of the strong, no sacrifice of the brave and courageous. It is in accordance with the laws of natural history and is proven by all the records of human history that the nation which has seen the least of war always develops the strongest battalions.

Germany, always systematic and thorough, taking advantage of the lessons taught by scientific research, and, guided by the best principles of the times, guards her men and reduces the waste in war to a minimum, by the strictest attention to scientific hygiene. She is military rather than warlike. In modern times, the greatest loss to Germany has occurred through emigration, not through wars. The tendency of all emigration, whether from country districts into towns in the same country or from one country to another, has always been to weaken those left behind. Ammon has shown, for Germany, by measurements, that the average of those who emigrate is superior to the average of those who stay behind. Quetelet has shown that in some towns of Belgium the average stature was a little higher than in the country. Dunant found this to hold good with respect to the inhabitants of Geneva as compared with the country people around. Villermé, Manouvrier, and others have shown that the stature of the Parisian conscript is higher by 8 or 9 mm. than that of the men belonging to the rural arrondissement of the Seine. Germany has long since recognized this, and hence her struggle for colonies, the possession of which alone can save her ever-increasing population to her flag. It is want of room and lack of opportunity that drive her sons to foreign shores, not fear of military service!

Holland has become a nation of old men. Her sons have died in the fields of Java, and Batavia alone is said to have one million of Dutch graves. Dutch armies are to-day recruited elsewhere, Holland will not waste any more of her own blood.

"Spain died of empire years ago. She has never really crossed our path, it was only her ghost which walked at Manila and Santiago. The warlike nation of to-day is the decadent one of to-morrow" (David Starr Jordan, *Forum*, 1901).

As long as the physician cannot prevent the occurrence of disease, he will have to continue trying to do his best to cure it; as long as war will continue to recur, a nation will have to face the foe. Since, however, the most skilful physician for the care and treatment of disease will in the end prove the least expensive to the family, so the best sailor and soldier will invariably prove the more remunerative to the state. To bring a war to a speedy and successful termination, a nation must offer as recruits, and be willing to sacrifice, the best she breeds.

*Henry G. Beyer.*

APPENDIX I. *Requirements for Enlistment in the British Navy.*—The British navy is enlisted upon the Voluntary System. The seaman must have a good physique, though height, apart from a good development, is considered of no advantage. While no physical examination is required for the mercantile marine, none but promising lads are accepted for the training ships of His Majesty's navy, and persons of whatever age or class found to be laboring under any of the undermentioned physical defects or deformities are, by Article 1154 of the Admiralty Instructions, 1899, considered unfit for the service:

(*a*) A weak constitution, imperfect development, or important malformation or physical weakness, either hereditary or acquired.

(*b*) Skin disease, temporary or trivial; extensive marks of cupping, leeching, blistering, or of issues.

(*c*) Malformations of the head, deformity from fracture or depression of the bones of the skull, impaired intellect, epilepsy or paralysis or impediment of the speech.

(*d*) Blindness or defective vision, imperfect perception of colors, or any chronic disease of the eyes or eyelids.

(*e*) Impaired hearing, discharge from or disease of one or both ears.

(*f*) Disease of nasal bones or cartilage and nasal polypus.

(*g*) Disease of throat, palate, tonsils or mouth; cicatrices of neck, whether from scrofula or from suicidal wounds; unsound teeth or seven teeth missing or defective in persons under seventeen years of age; ten defective or deficient teeth in persons above the age of seventeen.

(*h*) Functional or organic disease of the heart or blood-vessels, deformity of chest, phthisis, bronchitis, hæmoptysis, asthma, dyspnœa, chronic cough, or any evidence of lung disease or tendency thereto.

(*i*) Undue swelling or distention of the abdomen; disease of liver, spleen or kidneys, hernia or tendency thereto, incontinence of urine, syphilis or gonorrhœa.

(*j*) Non-descent of either or both testicles, hydrocele, varicocele, or any other serious defect or malformation of the genital organs.

(*k*) Fistula of anus, hemorrhoids, or any disease of stomach and bowels.

(*l*) Paralysis, weakness or impaired motion, or deformity of either extremity, including varicosity of veins, especially of the leg, and distortion or malformation of hands, feet, fingers or toes.

(*m*) Distortion of spine, of the bones of pelvis, no matter whether from injury or disease, or from constitutional defect.

APPENDIX II. *Requirements for Enlistment in the United States Navy.*—Briefly stated, the physical requirements for enlistment in the United States navy are as follows: The candidate must be of good physical proportions, and, if accepted, is required to take oath before enlistment that he is not subject to fits and has no concealed diseases. Any of the following conditions are sufficient to cause the rejection of an applicant: Greatly retarded development; feeble constitution, inherited or acquired; permanently impaired general health; depraved condition of general nutrition; liability to any disease; chronic diseases or results of injuries sufficient permanently to impair efficiency—such as weak or disordered intellect; epilepsy or other convulsions within five years; impaired vision or chronic disease of the ears; chronic or offensive nasal catarrh; tumors of the nasal passages or great enlargement of the tonsils; marked impediment of speech; decided indications of liability to pulmonary disease; chronic heart affections; rupture; non-appearance of testicles; dropsy of testicle or cord; stricture, fistula or hemorrhoids; large varicose veins of lower limbs, scrotum or cord; chronic ulcers; cutaneous and communicable diseases; unnatural curvature of the spine; wryneck or other deformity; permanent disability of either of the extremities or articulation from any cause; defective teeth; the loss or extensive caries of four molar teeth.

In addition to the above, candidates for enlistment as apprentice must at least fulfil the requirements of the following table of minimum measurements:

| Age in years. | Minimum height. | Minimum weight. | Minimum chest circumference. |
|---|---|---|---|
| 14 | 4 feet 9 inches. | 70 pounds. | 26 inches. |
| 15 | 4 feet 11 inches. | 80 pounds. | 27 inches. |
| 16 | 5 feet 1 inches. | 90 pounds. | 28 inches. |





**NAVAL MEDICAL SERVICE.**—I. NAVAL MEDICAL DEPARTMENT.—*Historical Notice.*—"The Marine Committee" of the Continental Congress made provision at an early date for a medical department of the navy, and declared "the care of the sick and wounded to be objects of great solicitude." In the "Rules for the Regulation of the Navy of the United Colonies," adopted November 28th, 1775, this service was defined. After the completion of the revolutionary struggle slow progress was made, until 1794, when the entire naval service was augmented; yet at this time the medical departments of the army and navy were one, under an officer who bore the title of physician-general. Not until 1828 were the medical departments of the army and navy divided. In 1842 the bureau of medicine and surgery of the navy department was created, and W. P. C. Barton was nominated its chief. By the act of 1871 the entire service was reorganized, the grades of medical director, and medical inspector created, and the title of surgeon-general, with the relative rank of commodore, conferred on the chief of bureau. In March, 1898, this officer was given the rank and title of rear-admiral.

The organization of the medical corps of the navy is essentially that created by the act of 1871, and amended by the acts of 1898 and 1900.

The grades, ranks, and titles in the medical corps of the navy, compared with that of the line of the army and navy, is shown in the table prepared by Medical Director Gihon, as modified by existing law.

| U. S. Army. | U. S. Navy. | |
|---|---|---|
| All Officers. | Line. | Medical Officers. |
| ..... | Admiral. | |
| Lieut.-General. | | |
| Major-General ... | Rear-Admiral ..... | Surgeon-General. |
| Brigadier. | | |
| Colonel ..... | Captain ..... | Medical Director. |
| Lieut.-Colonel.... | Commander ..... | Medical Inspector. |
| Major ..... | Lieut.-Commander. | Surgeons (Senior). |
| Captain..... | Lieutenant..... | Surgeons (Junior). Passed Asst. Surgeon (Sr.). |
| 1st Lieutenant.... | Lieutenant (Junior Grade)..... | Passed Asst. Surgeon (Jr.). Assistant Surgeon. |

By the act of 1898 positive rank was conferred on all officers of the medical corps of the navy, and in 1900 assistant surgeons were given the rank of lieutenant (junior grade), corresponding to first lieutenant in the army.

The titles, grades, and numbers in the medical corps of the navy are as follows, viz.: 15 medical directors, 15 medical inspectors, 55 surgeons, and 105 in the combined grades of passed and assistant surgeons.

The number of officers in the grade of passed assistant surgeon is not limited, the law providing for promotion of assistants after three years' service.

The surgeon-general does not constitute an extra number, but is chosen from the grade of director or inspector for a term of four years, being eligible to reappointment. All officers of the navy retire on reaching the age of sixty-two years.

*Examination and Appointment.*—A candidate for entrance into the medical corps of the navy must be between the ages twenty-one (21) and thirty years (30). He appears before a board, which is under oath to report on his physical, mental, moral, and professional qualifications.

Appointments are made in the order of merit reported by the board.

The examination is: (1st) physical; (2d) mental, consisting of (*a*) written, (*b*) oral, (*c*) clinical, (*d*) practical, and embraces about six days.

The board of medical examiners sits permanently at the Naval Hospital, New York. Prior to 1897 no examination was required from the grade of passed assistant to that of surgeon, but under present law examinations occur with each promotion. The examination for the grade of surgeon relates largely to an officer's experience attained in the lower grades. It comprises the following subjects: (*a*) Naval regulations, in so far as they pertain to the medical department; (*b*) thesis on general and naval hygiene; (*c*) thesis on clinical medicine; (*d*) practical bacteriology and chemistry; (*e*) microscopy and microbiology; (*f*) military surgery.

The flow of promotion is dependent upon resignations, dismissals, retirements, and deaths.

Officers reaching the grade of surgeon at this time (1900) have been in the service about ten years. The disposition of officers entering the corps depends upon the exigencies of the service; if these permit, they are ordered to receiving ships, and gain some preliminary knowledge of the duties and life at sea. The percentage of those given permission to appear before the board of examiners, who pass, is small. Thus, of the twenty-two candidates who presented themselves during the fiscal year ending in 1896, four were rejected physically, twelve were rejected professionally, and six were found qualified for the position of assistant surgeon. It cannot be concluded from this statement that the examination is unduly rigorous, but rather it is indicative of insufficient academic study and a lack of thoroughness in the professional equipment, which we fear is far too common a condition among the graduates of a large number of medical schools in the United States.

The compensation of officers of the medical corps is that of their corresponding rank in the line, and is shown as follows:

PAY TABLE.

| | At sea. | On shore. | Allowances per annum.* |
|---|---|---|---|
| Assistant Surgeons: Rank of Lieutenant (Junior Grade)..... | $1,650.00 | $1,402.50 | $288.00 |
| Passed Assistant Surgeons: | | | |
| Rank of Lieutenant (Junior Grade)... | 1,650.00 | 1,402.50 | 288.00 |
| After five years in the service..... | 1,800.00 | 1,530.00 | 288.00 |
| Rank of Lieutenant..... | 1,980.00 | 1,683.00 | 432.00 |
| After five years in the service..... | 2,160.00 | 1,836.00 | 432.00 |
| After ten years in the service..... | 2,340.00 | 1,989.00 | 432.00 |
| Surgeons: | | | |
| Rank of Lieutenant: After ten years in the service..... | 2,340.00 | 1,989.00 | 432.00 |
| After fifteen years in the service..... | 2,520.00 | 2,142.00 | 432.00 |
| Rank of Lieutenant-Commander: After ten years in the service..... | 3,250.00 | 2,762.50 | 576.00 |
| After fifteen years in the service..... | 3,500.00 | 2,975.00 | 576.00 |
| Medical Inspectors, rank of Commander: After fifteen years in the service..... | 4,000.00 | 3,400.00 | 576.00 |
| Medical Directors, rank of Captain: After fifteen years in the service..... | 4,500.00 | 3,825.00 | 720.00 |
| Surgeon-General, rank of Rear-Admiral | 5,500.00 | 5,500.00 | 720.00 |

The hospital corps of the navy was authorized by an act of Congress, June, 1897, thus securing for the service skilled men for the care of the sick and wounded.

The hospital corps consists of the following grades and rates: (*a*) Pharmacists, warrant officers; (*b*) hospital stewards, chief petty officers; (*c*) hospital apprentice, first class; (*d*) hospital apprentice, second class.

* Only when quarters are not furnished by the Government.
Eight cents a mile is the allowance when travelling under orders.

An examination, physical and professional, before a board of medical officers, is required for enlistment and for promotion in each of the above grades.

The naval medical department maintains hospitals at the following places: Widow's Island, Me.; Portsmouth, N. H.; Boston, Mass.; Newport, R. I.; Brooklyn, N. Y.; Philadelphia, Pa.; Washington, D. C.; Annapolis, Md.; Norfolk, Va.; Pensacola, Fla.; Mare Island, Cal.; Yokohama, Japan; Cavité, P. I. The hospitals provided by the original act of Congress were those at Boston, New York, Philadelphia, and Norfolk. That at Philadelphia has been converted into the Naval Asylum, and a fine modern structure has taken its place.

The naval hospitals of the United States and other powers have been fully described by Surgeon J. D. Gatewood, U. S. N.*

At a comparatively recent date most of these hospitals have been modernized in construction, and their equipment has been raised to present requirements.

Although the hospital ship *Maine* has done efficient service in South Africa, the floating hospital of the future will be the *Ambulance Ship*, such as was the *Solace* during the late war with Spain. The object of such a ship is to collect the sick and wounded in a fleet after an engagement, render immediate succor, and transfer the wounded to a base-hospital. While the presence of such a ship amid hostile fleets had been previously proposed, the desirability of such a step was formally advanced, and earnestly advocated by the present chief of bureau, Surgeon-General W. K. Van Reypen, in a paper read before the Twelfth International Medical Congress, held at Moscow in 1897, and in less than a year it was this officer's privilege to commission the *Solace*, a ship such as he had described, which rendered such excellent service in the war with Spain.

The *Solace* had a displacement of thirty-six hundred tons, was three hundred and seventy feet over all, with an average speed of fourteen knots; she carried steam launches and barges for the transfer of the sick and wounded. Hoisting and lowering were accomplished by steam winches. A complete aseptic outfit, formaldehyde generators, disinfecting chambers, laundry, and drying room were provided. The *Solace* accommodated three hundred and fifty patients. Ventilation was accomplished by means of powerful blowers and electric fans. The ship flew the Red Cross, and was under the protection of the Geneva Convention. Indeed everything which could be suggested to make this floating, travelling hospital a success was done. The excellent results accomplished justified all expectations, and established a decided advance in the humanitarian aspect of modern war.

Hospital ships may still serve a useful purpose as before stated, when the base of a fleet is too remote to permit of the transfer of the disabled. When conditions obtain, such as those at Santiago, or such as prevail at present (1900) in Manila and China, the *Ambulance Ship* will be of inestimable value so long as Japan can be used as a base.

*Service at Sea.*—The progress made in the past twenty-five years in the betterment of conditions making for health on shipboard are only equalled by the advance in the sciences of medicine and surgery themselves; yet the former condition is not largely due to the latter, but rather to the improvement of naval construction and a higher appreciation of sanitary principles, which have been so persistently inculcated. Medical Director Gihon has drawn a graphic picture of this change; and since this officer's active service closed, the improvement has continued, the modern man-of-war presenting the most striking object-lessons, showing how an observance of the prime principles, involving a supply of fresh air, good lighting, and scrupulous cleanliness, has so far succeeded as to render a most unnatural life and environment a comparatively healthy one. In this connection, it must be borne in mind what a radical change has been wrought in the life of a man-of-war's crew by the change from sail to steam power; and to overcome the deleterious effect thus brought about has been the most important problem which the naval medical officer has been called upon to consider; and the splendid results obtained in our service during the late war are most creditable alike to commanding and to medical officers. We have every reasonable hope that the lessons of the past are now heeded, and that the inutility of a ship, however powerful, with a crew living in unhealthy conditions, has been amply demonstrated. Such was Admiral Vernon's expedition against Carthagena, in which the crew were crowded into dark, ill-ventilated sleeping quarters, and were fed upon salt and often decomposing food with bad water. Surgeon-General Tryon has pointed out that when iron and wood supplanted steel as the material for the construction of ships, a destructible organic substance was substituted by an indestructible, inorganic substance, and this change worked the most important reform in naval hygiene. The sequels of this change were broad inlets for the admission of air, and light, systematic ventilation, the distillation of water, its preservation in iron tanks, and the improvement of the rations by the art of preserving foods. Thus were accomplished the conditions which have made prolonged life at sea not only possible, but one closely approaching the natural. A discussion of such questions belongs to the domain of naval hygiene; they have been alluded to here, and give the reader an idea of the broader lines of duty which will engage the attention of a medical officer at sea. The details and daily rounds are soon mastered, and are important or unimportant, much more in the way in which the sanitarian of the ship conceives of his duty than in any other. The naval medical officer will soon learn that it is in the broad realm of preventive medicine that he will find his sphere of greatest utility; that to ameliorate the effects of environment and to reduce the potency of pathological factors should be his chiefest aim.

The daily duties are defined by regulation; and besides attention to and report upon the condition of the sick, they embrace an inquiry into that of the living spaces, cells, closets, pantries, and an examination of food and water issued or coming on board. A duty peculiar to army and naval medical service is that of determining whether in a given case of disease or injury it is the result of causes incident to service; on this decision rights to pension are based, and in it also are involved the rights of the individual and the Government alike, both of which are to be respected.

The facilities of the medical department on shipboard have in late years been greatly improved, involving a comfortable hospital, or sick-bay, usually supplied with bath and closet. When we consider that the primal object of a battleship is the destruction of life, we must admit that the humanitarian side of the question has had as a rule fair treatment. Medical officers at times complain of an insufficiency of accommodation, yet a generous consideration is accorded, and any agencies seriously affecting the interest of the department are, if possible, remedied. The medical supplies, including hospital stores, furnished by the naval laboratory located at New York, are usually of good quality; and this held good during the stress of the Spanish-American war. The supply table is varied and the allowance liberal. Complete antiseptic outfits are supplied, and the instrument cases are now so complete that when hospitals are inaccessible, major operations can be performed with confidence.

Inasmuch as the naval medical officer visits all climates, he should be an authority on climatic diseases, and consequently the reports of the bureau of medicine and surgery contain frequent descriptions of such maladies. Indeed, since the late acquisition of territory by the United States, the great need of more exact knowledge of diseases foreign to our own nomenclature has been greatly emphasized.

The accompanying table exhibits the amount of disease in the naval service for the years 1893–94.

* "Naval Hospitals, Medical Schools and Training School for Nurses." Press of the Friedenwald Co., Baltimore, 1898.





| | 1893. | 1894. |
|---|---|---|
| Mean strength | 10,193 | 10,482 |
| Daily average number of sick | 161.35 | 172.50 |
| Average number of days of each case under treatment | 6.10 | 7.31 |
| Admissions, per 1,000 | 821.24 | 821.31 |
| Invalided, per 1,000 | 80.36 | 97.50 |
| Deaths, per 1,000 | 3.82 | 4.57 |

Recruiting for the naval service is a matter of the greatest importance, as we have here an opportunity to shut out predisposing and hereditary tendencies as well as existing disease. This work for the navy is usually done on shipboard (receiving ships) and for the marine corps at a rendezvous located in our large cities. As far as possible examination for entering the naval service should be discouraged on shipboard.

It is to-day incumbent on the naval medical officer to be familiar with the duties involved with bluejackets and marines landed to co-operate with the army. This service is becoming more than occasional, especially in the operations in the Orient.

The number of medical officers detailed for a ship of war depends principally upon her size, third and fourth rates carrying one, second and first rates two, the flag-ship as a rule carrying but three officers, the senior being the fleet-surgeon, who is on the staff of the commander-in-chief, and is by the regulations entrusted with duties largely supervisory in character.

The disposition of the medical department on a ship in action is provided for only in a general way by the regulations. The type of the ships varies to such an extent that the matter is wisely left to the discretion of the commanding and medical officers. The care of the wounded in action will be considered in the next section.

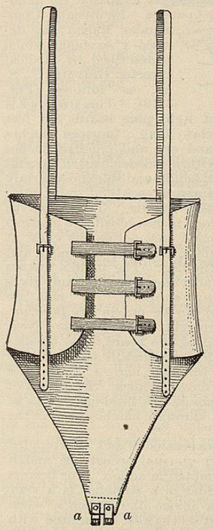

FIG. 3510.—Lowmoor Jacket.

*Service on Shore.*—Medical officers of the navy serving on shore are detailed, according to their rank, as members of boards, in charge of hospitals, at navy yards, recruiting rendezvous, on receiving ships, or on some form of special duty. The length of a shore detail is from one to three years (usually the latter), according to the requirements of the service. Recent law makes retired officers eligible for duty on shore and at sea.

Not since the Civil War has the lowest grade of the naval medical corps had the full number allowed by law. This condition has been attributed to various causes, such as the fact that an assistant surgeon, upon entering the service, is ranked as a steerage officer and is not admitted into the ward-room, and the further fact that he has entered a grade lower than in the army. Doubtless these facts may have exerted an influence in some cases, but they cannot, in the opinion of the writer, have operated to any considerable extent. The standard of the examining board has been a strong factor, as is evidenced by the percentage of rejections. The first two objections have been removed by recent law.

The life of a naval medical officer at sea is one of practical isolation; and, despite the literature so liberally supplied, he inevitably gets out of touch with the great mass of the profession. In discharge of the duties required of him by the regulations he may have been fully occupied, but this fortunately does not occur in so far as strictly medical or surgical work is concerned. The greatest need of the medical service of the navy is an opportunity to avail of post-graduate instruction, and it is much better, with the present numbers of the army and navy, that such instruction be followed in a civil school.

It may be that in the future the importance of the interests involved will justify an army and navy medical school, such as that at Netley in England; but until then the medical officers of the two services must look to the great metropolitan hospitals for advance in the more strictly professional aspects of their duty, and some plan by which this can be more systematically accomplished will greatly enhance the efficiency of the naval medical service.

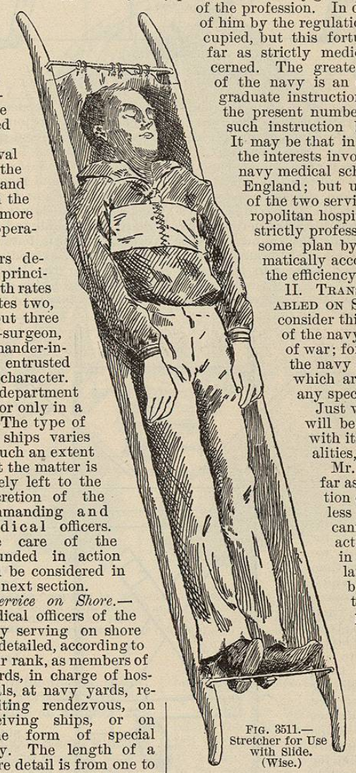

FIG. 3511.—Stretcher for Use with Slide. (Wise.)

II. TRANSPORTATION OF THE DISABLED ON SHIPBOARD.—It is proposed to consider this question as it relates to ships of the navy, and more especially in time of war; for in the merchant service and in the navy in time of peace the difficulties which are encountered do not call for any special consideration in this place.

Just what the fate of the wounded will be in a maintained naval action, with its inevitable high rate of casualities, no one can foretell.

Mr. Archibald Forbes has gone so far as to say that since the introduction of modern firearms and smokeless powder the wounded will not, cannot, be cared for until after the action (this statement was made in reference to engagements on land), or on the succeeding day; but the war in South Africa and the Philippines has totally disproved this position, as never before has the medical department been so much exposed or the wounded more scrupulously cared for.

In the old style man-of-war we had, in all ships, to deal with the same general type, —we had broad hatches, wide ladders, easily removed, and flush decks. To-day the decks are cut up and subdivided indefinitely. There is such a demand for space that great ingenuity is necessary to get the requisite equipment and all the quarters within the hull. This state of affairs is greatly accentuated in the battleship. The turrets, tops, and fire-rooms are practically isolated.

For the care and transport of the wounded on a ship like the *Brooklyn*, an armored cruiser, or the *Oregon*, a battleship, there are from two to three medical officers, an apothecary or hospital steward, and two or three hospital apprentices—an average of five persons. From each gun-crew two men are detailed as aids, numbering from eight to twelve ordinarily. With this force the wounded in a crew of six hundred must be relieved.

A most conservative estimate of the number of wounded in naval actions of the future is thirty-three per cent; in the action between the *Bonne-Homme Richard* and the *Serapis* it reached fifty per cent. on each side.

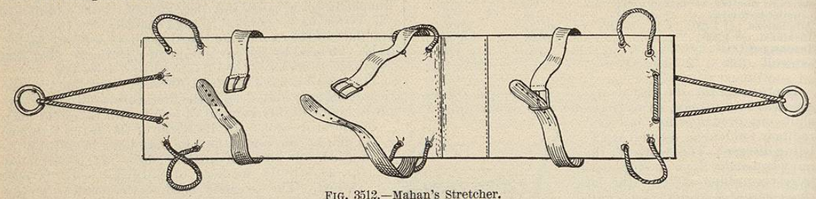

FIG. 3512.—Mahan's Stretcher.

Long before thirty-three per cent. of a crew are placed *hors de combat*, no aid will be available from the guns.

The careful medical officer, before an action, will have studied this question as applying to his own ship. He will have established the stations for the wounded and the base of supplies. He will have indicated points of temporary shelter about the decks and will have distributed first-aid packages. In all probability there will be no systematic transport of the wounded during an action at sea. In the turrets, tops, and fire-rooms the wounded will be given emergent aid, and will be allowed to remain where they fall, or they will be pushed aside into temporary shelter.

For the dark, narrow, acute-angled passages hand portage is alone available; and this method will prevail in those heated contests in which time cannot be taken or aid secured to send all the wounded below.

During the late war with Spain the navy gained little experience in this respect, for the number of casualties on the American ships was insignificant, while on the vessels of the enemy the destruction of life was so great and the conditions were so frightful that no systematic relief could be attempted.

For the removal of the sick or injured from the hold or fire-room, or for sending them down from the tops, we can conceive of no better device than the Lowmoor jacket (Fig. 3510), which may be briefly described as follows:

This jacket is **T**-shaped, and adapts itself to men of different sizes. The arms of the **T** surround the body, and extend from the axillæ to the waist, fastening in front by three leather buckles and straps; the leg of the **T**, passing down behind the body and over the perineum, comes up and fastens in front by two straps and buckles. Two leather straps are stitched to the back of the jacket for its whole length, and their free ends are then brought high up above the shoulders (in the form of loops) and carried down to points where they can be fastened by buckles to the front of the jacket. The ends which extend beyond these first buckles are to be passed through two other buckles which are fastened to the ends of the two perineal straps (cut off at *a*, *a*, in Fig. 3510).

The transportation of the disabled along the deck, or between decks, from above below, can be accomplished by by several different stretchers. The writer devised a stretcher and slide for this purpose, which has been favorably reported upon by a board of officers for use in the naval service (Fig. 3511). This stretcher consists of two poles seven feet eight inches in length, and a piece of canvas six feet two inches long, into the sleeves of which the poles run. Two steel stretcher-bars, three-quarters of an inch in diameter, join the poles (at points where the canvas terminates), and passing through them are secured by nut and screw. Two canvas bands are fastened to the frame on either side so as to cross the chest of the occupant at the axillæ and fasten in front with hooks and lacing. When the patient is put upon the stretcher, his insteps take upon the lower bar, preventing his slipping downward. The slide to be used with this stretcher is made of ordinary boards, battened together, and may be placed in a hatchway, extending from the coaming to the deck below, over the ladder, or it can be used without the ladder. Upon this slide the stretcher is sent below.

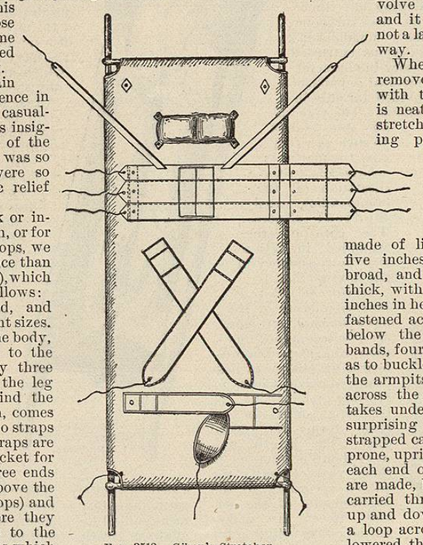

FIG. 3513.—Gihon's Stretcher.

The advantage of this stretcher is, that it does not involve suspension of the body; and it is immaterial whether or not a ladder is in place in a hatchway.

When not in use the bars are removed at one end, laid parallel with the poles, and the whole is neatly rolled. This form of stretcher is available for landing parties. Lieutenant-Commander Mahan has devised a stretcher which is described by Medical Director Gravatt, U. S. N., as follows (Fig. 3512): "This stretcher is made of light pine boards, six feet five inches long, fourteen inches broad, and one and one-half inches thick, with a wooden batten several inches in height and thickness, firmly fastened across each end and a little below the middle. Three canvas bands, four inches broad, are made so as to buckle just across the chest at the armpits, over the abdomen, and across the leg. The middle batten takes under the buttock, 'and gives surprising support.' A man so strapped can be put in any position, prone, upright, or at any angle. Near each end of the board, rope handles are made, by which it can easily be carried through narrow doors and up and down ladders. By means of a loop across the head-end it can be lowered through hatches or over the side."

The suspension of sick or wounded men on shipboard is a very unusual occurrence, and it will probably never be attempted in action. For bearers to carry a man down a ladder in a stretcher is a very awkward procedure; and a device like Mahan's, when sending below, will be most serviceable when used with a slide.





Objections urged against this stretcher are, that it would be injurious in case of thigh fracture, and that it cannot be availed of for landing parties. Medical Inspector Gravatt, U. S. N., reports that he has used Mahan's device in cases of thigh fracture without detriment.

There are many other forms of stretcher available for the purpose under consideration. Wells' ambulance cot is in use in the United States naval service, but, as is true of other devices of this kind, men cannot be sent below upon it conveniently without the slide. This is an excellent form of stretcher for landing parties. "The improved cot" of Gorgas, or the "ambulance lift" of McDonald are seldom used. Gihon's "naval ambulance cot" is a secure and excellent device (Fig. 3513) and adapted to any ordinary need of transportation. Most of the stretchers devised for the old type of ship contemplate the suspension of the wounded, with hoisting or lowering; but, as hitherto remarked, this is a rare procedure. During an action at sea, if a hatchway is cleared, it will, as a rule, be used for militant purposes, and it is only where the ladder is taken away that suspension can be practised. If the ladder remain, one of the forms of stretcher already described, and with a slide, will be found the simplest and best procedure when hand-portage is not desirable.

For an improvised stretcher Lieutenant Mason, U. S. N., suggested the use of a ship's hammock, which is stretched and laced to a wooden frame, made of poles and cross-bars.

*John C. Wise.*

**NECK, SURGICAL ANATOMY OF THE.**—By the neck we usually mean the space between the occipital bone and lower jaw, above, and the upper aperture of the thorax, below. For convenience of description it is advisable to divide the neck into regions, viz., two lateral, an anterior median, and a posterior.

The *lateral* region represents a quadrilateral which is divided diagonally by the great sterno-mastoid muscle into two triangles, the anterior (carotid) and the posterior. Each of these is again subdivided into two by the omohyoid muscle. The anterior triangle is subdivided into a superior and an inferior carotid triangle, and the posterior into an occipital and a subclavian triangle.

The *anterior median* region is divided into two spaces by the hyoid bone, the upper being called the suprahyoid or submaxillary, and the lower the infrahyoid or hyosternal region.

The *submaxillary* region is bounded posteriorly by the posterior belly of the digastric and stylohyoid muscles, and contains the submaxillary gland.

The *posterior region* includes the portion commonly known as the nape of the neck.

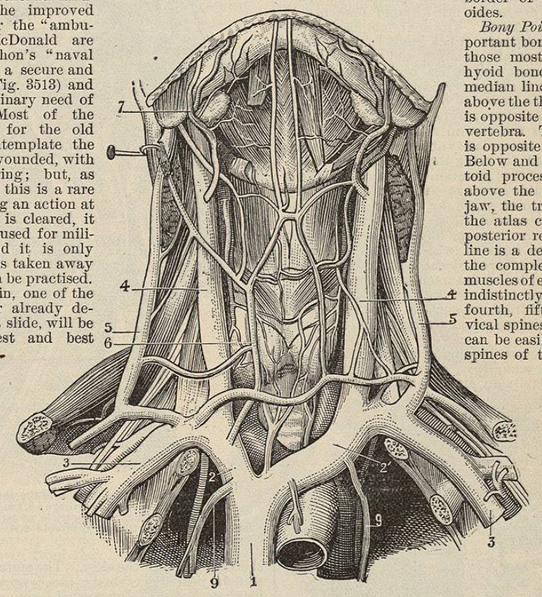


FIG. 3514.—Superior Vena Cava and Its Affluents. (From Testut.) 1, Superior vena cava; 2, trunk formed by the union of the brachial and cephalic veins on the right side; 2', the corresponding venous trunk on the left side; 3, 3, subclavian veins; 4, internal jugular vein; 5, external jugular vein; 6, anterior jugular vein; 7, facial vein; 8, thyroid veins; 9, internal mammary vein.

SURFACE ANATOMY.—The outline of the neck varies much in different people; in stout individuals it is round and full, and the various landmarks are not easily distinguished; in thin people, on the other hand, every landmark stands out prominently, and can be made out by even the most inexperienced. The neck is, as a rule, fuller and rounder in women and children, and the *pomum Adami* is less marked. In muscular males the prominences are well seen; in old people who are thin the sterno-mastoid muscles and superficial veins stand out well, as does also the internal border of the platysma myoides.

*Bony Points.*—The most important bony point, and one of those most easily felt, is the hyoid bone, which is in the median line, a finger's breadth above the thyroid cartilage. It is opposite the fourth cervical vertebra. The cricoid cartilage is opposite the sixth cervical. Below and in front of the mastoid process, and behind and above the angle of the lower jaw, the transverse process of the atlas can be felt. In the posterior region in the middle line is a depression formed by the complexus and trapezius muscles of each side; here can be indistinctly made out the third, fourth, fifth, and sixth cervical spines, while the seventh can be easily felt, and also the spines of the first two dorsal vertebræ. These become more prominent when the head is bent forward; occasionally, when the spine of the sixth cervical vertebra is well developed, it is quite as prominent as the seventh. The transverse process of the sixth cervical vertebra can be felt on deep pressure opposite the cricoid cartilage, in the course of the carotid vessels. This is called the "carotid tubercle," and here the carotid may be easily compressed against it.

*Anterior or Median Region.*—In the receding angle below the chin is the hyoid bone, which can be easily felt in the fattest necks, it divides the anterior part of the neck into the suprahyoid and infrahyoid regions. In the median line of the suprahyoid region the anterior bellies and the digastric muscles cause a slight convexity; on the outer side of each anterior belly of the digastric muscle is felt the submaxillary gland lying on the mylohyoid muscle, which helps to form the floor of the mouth. This region is commonly cut into in self-inflicted wounds of the throat. About half an inch below the hyoid bone is the prominent thyroid cartilage (pomum Adami). This cartilage is prominent in deep-voiced men and people with thin necks, but in women and children it is not so distinctly seen; the notch at its upper border can be easily felt, and is commonly situated to one side of the median line. The superior cornua of the thyroid cartilage can be traced with the finger.