tries. England and the United States produce it abundantly, and of excellent quality.

The medicinal consumption of hops is comparatively small, and an unimportant item of the immense demand

FIG. 2706.—Hop Plant in Fruit. (Baillon.)

for them, mainly for flavoring ales and beers, which consumes many millions of pounds annually.

COMPOSITION.—The entire hop, that is, inclusive of the *lupulin*, contains the following substances: Nearly one per cent. of volatile oil, of a greenish-yellow color, becoming brownish with age, and of a specific gravity of .855 to .880. It becomes at least partly converted into isovaleric acid. A very small amount of the intensely bitter *lupamaric acid* ($C_{28}H_{38}O_4$), which is soluble in alcohol or a mixture of alcohol and water. Resin, up to fifteen or eighteen per cent.; tannin two to four per cent. Small amounts of asparagin and cholin. Not more than ten per cent. of ash is allowable upon incineration. According to their staleness, more or less *phlobaphene* may be present, at the expense of the disappearing tannin.

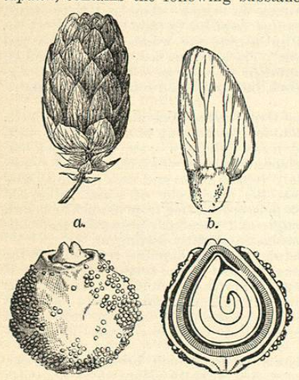


FIG. 2707.—Hop Plant. *a*, Cone; *b*, fructiferous bractlet; *c*, fruit enlarged; *d*, the same in longitudinal section.

ACTION AND USE.—Although used in many diseases with asserted benefit, but little can be said of hops more than that they are a mild bitter tonic and (especially lupulin) a feeble hypnotic and antispasmodic. In infusion they allay the pain and spasm of vesical catarrh, and improve the appetite and digestion. As an ingredient of beers they add a tonic, and perhaps diuretic, effect to that of the alcohol in those beverages. The dose is 1 to 4 gm. (gr. xv.–lx.). The Pharmacopœia provides, besides lupulin and its preparations, a twenty-per-cent. tincture, the dose of which is 4 to 8 c.c. (fl ʒ i.–ij.) and which is probably the best form of administration.

Henry H. Rusby.

HOREHOUND.—MARRUBIUM. "The dried leaves and tops of *Marrubium vulgare* L. (fam. *Labiatæ*)" (U.S. P.), but will probably be dropped from the next edition.

DESCRIPTION.—Leaves opposite, exstipulate, shortly and broadly petioled, the blades 2 to 4 cm. (1 to 1½ in.) long, roundish-ovate, truncate or subcordate at the base, obtuse, strongly rugose-veiny, more or less white-hairy, especially underneath; stems quadrangular, densely white-hairy; flowers in dense, axillary, white-wooly whorls; calyx tubular, five- to ten-nerved, with ten almost equal, erect-spreading, pungent teeth; corolla whitish, bilabiate; stamens didynamous; fruit of four ovoid, obtuse, smooth nutlets; aromatic and bitter.

A spurious marrubium is sometimes sold, having leaves of about half the size, thinner, less rugose and five of the calyx teeth much smaller or wanting.

Horehound is a European herb which has been introduced into this country, and in many places has escaped from old-fashioned country gardens to meadows and moist waste-places. Its woolly aspect and bitter odor and taste, combined with its characteristic labiate flowers and quadrangular stems, make it easily recognizable. It is also a native of Western Asia and Northern Africa.

The use of horehound dates from the ancient Romans, or even farther back. It has been a popular febrifuge and aromatic bitter tonic in many countries. The leaves and tops of the plant should be collected for use when it is in full bloom, and before the former have become old and dry; they are dried without heat, and should be preserved in dry boxes or drawers.

The most important constituent is the crystalline, neutral, bitter substance, *marrubiin*. There are, besides, a little *resin*, a little *essential oil*, *tannin*, and a considerable amount of alkaline and earthy salts.

Horehound was formerly prized as a febrifuge and antispasmodic, and used in numerous obscure diseases (hepatic, uterine, etc.), and in intermittent fever. It was also used for the only conditions for which it can be said to have any value, and for which it is still a little employed, viz., dyspepsia and debility. When a stomachic and bitter tonic is indicated, a tablespoonful or two (15 to 30 gm. = ʒ ss. ad ʒ i.) of an infusion, made in the usual way, strength one-tenth, is a tonic dose.

W. P. Bolles.

HORN'S SPRING.—Wilson County, Tennessee.

POST-OFFICE.—Lebanon. Hotel.

ACCESS.—Viâ Nashville, Chattanooga and St. Louis, or Nashville and Knoxville Railroad, to Lebanon, thirty miles northeast of Nashville; thence five miles west to springs. Conveyances meet all trains. The location of Horn's Springs is somewhat elevated and characterized during the summer months by refreshing breezes. A comfortable new hotel has recently been built, and is kept open all the year round. The springs are eight in number. According to an analysis made by Professors Safford and Summers, of Vanderbilt University, one of the springs contains the following chemical ingredients:

Calcium carbonate.	Sodium chloride.
Magnesium carbonate.	Phosphoric acid.
Iron carbonate.	Silicic acid.
Potassium carbonate.	Carbonic acid.
Sodium sulphate.	Sulphureted hydrogen.
Magnesium sulphate.	Organic matter (trace).
Calcium sulphate.	

This may be taken as a type of all the springs, which, as we are informed, contain much iron and have decidedly purgative effects, resembling to some extent the water of the Crab Orchard Springs of Kentucky. The waters of Horn's Springs have an extensive reputation in Tennessee, and the contents show that they may be useful in conditions of the system requiring an alkaline regimen, a ferruginous tonic, or a mildly stimulating cathartic.

James K. Crook.

HORSERADISH.—ARMORACIA. The root of *Roripa Armoracia* (L.) Hitchcock (*Cochlearia Armoracia* L., *Nasturtium Armoracia* Fries., fam. *Cruciferæ*). As a drug, the fresh root is always understood, and is official

FIG. 2708.—Horseradish Plant and Root.

in the British Pharmacopœia. The fresh leaves and herb are official in Germany and France. This well-known plant is a native of Eastern and Northern Europe, but it has been cultivated so long in other parts of the world that it occurs in a half wild state in many temperate countries. Its truly wild form is not known with certainty, and it does not readily perfect its seeds; but its roots are very tenacious of life, and make it, in localities favorable to its growth, difficult to eradicate.

Horseradish root is from 1 to 3 cm. or more (½ to 1½ in.) in diameter, and from 0.5 to 1 metre or more long; it is in cylindrical or slightly tapering pieces, with a large annulated and sometimes branched crown, generally broken in digging while still thick, 20 or 30 cm. from the top, but sometimes much longer and then dividing into three or four long, tapering branches, or else arising from a thick horizontal axis nearly or quite as large as the vertical one. Other pieces are of the smaller branches, or of the sucker-like horizontal portion. It is brownish-yellow outside and white within, rather too hard to be easily cut with a table-knife, but soft enough to be rapidly rasped or grated. When cut or grated, a pungent, peculiar odor is developed, which disappears upon drying or by heat; taste sharp and peppery, also disappearing with age and desiccation. Horseradish root and aconite root have more than once been stupidly confounded with each other, even with fatal result. They have no resemblance whatever excepting their pungent taste. (See *Aconite*.)

The deadly poke-root has also been fatally mistaken for horseradish.

COMPOSITION.—The root appears to contain *sinigrin* (*myronate of potassium*) and a ferment, *myrosin* (?), capable of forming with the sinigrin an oil identical with that of mustard, viz., sulphocyanide of allyl. The odor and taste of this oil are not developed until the root has been crushed or grated, or treated with water. By these means these substances, which are prevented from reacting upon each other in the whole or dry tissues, are brought together. If the root is extracted with alcohol, or if it is dried, no oil is obtained; but it can then even be produced by adding the ferment of white mustard and water. The composition is thus essentially that of black mustard. The leaves also contain a sulphureted oil said to be milder than, and not identical with, that of mustard.

ACTION AND USE.—Essentially that of mustard, to which the reader is referred. Locally it is rubefacient, and even vesicant; internally, an aromatic and stomachic; in concentrated form, an irritant. Its long-continued use as a condiment and flavor is justified by these properties. In former times it was used in scurvy, for which it is valuable, and for gout, rheumatism, asthma, etc., for which it is useless.

ADMINISTRATION.—Horseradish is rarely used as a medicine in this country, but if desired as an aromatic the British compound spirit offers it in an acceptable form:

"Horseradish root, scraped	20 ounces.
Bitter orange-peel	20 ounces.
Nutmeg	½ ounce.
Proof spirit	1 gallon.
Water	3 pints.

"Mix and distil a gallon. Dose, 1 to 2 fluidrachms."

W. P. Bolles.

HOSPITAL SHIPS OF THE UNITED STATES ARMY.—It was appreciated very early in the spring of 1898, by the Medical Department of the Army, in anticipation of the casualties to be expected in the war with Spain, that provision must be made for moving the sick and disabled at sea.

Of the many ships chartered or purchased for the transport service of the army none was considered suitable for hospital purposes.

On April 15th, 1898, the Surgeon-General of the Army applied for a ship to be used as a hospital ship. After many vessels had been inspected, cattle ships, transports, and others, he recommended the purchase of the *John Englis* as being a suitable vessel for the purpose in view. It was his intention to fit her up as a floating hospital for the care of disabled soldiers at any point on the Cuban coast, to transport them to our own coast, and to serve as a medical supply depot for troops in the field.

By direction of the President, after considerable delay, the vessel was purchased for this purpose, and was turned over to the Quartermaster Department of the Army to be altered and fitted up for the service required. Many changes were found necessary and it was not until July 2d, 1898, that she sailed from New York for Cuba, named the *Relief*. This vessel was built by Roach Bros., in 1896, was owned by the Maine Steamship Company, and was in passenger service from New York to Portland, Me. She is built of steel to her main deck, her superstructure being of wood. She is 306 feet in

length, 46 feet beam, 29 feet from keel to main deck, 17 feet draft, single screw, and of 13- to 16-knot speed depending on conditions. Her hull is divided by four water-tight bulkheads, she is well lighted throughout

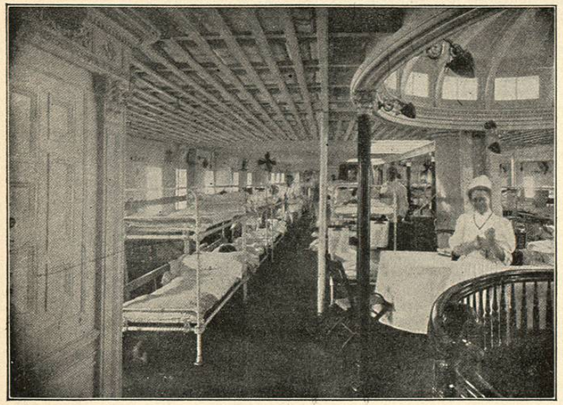


FIG. 2709.—After Ward on Upper Deck of Hospital Ship *Relief*.

with electricity and heated by steam. In converting her into a hospital ship her superstructure was in the main the only portion taken for hospital purposes. All, or nearly all, of the staterooms were torn out of the upper and main decks, thus making wards in the fore and after parts of the ship extending across the whole vessel. Ward 1, upper deck, forward, was 68 feet long, 32 feet wide aft, and 24 feet wide forward, containing 76 beds. Ward 2, aft, on same deck, was 68 feet long, 32 feet wide forward, and 24 feet wide aft, and contained 62 beds. In the centre of this ward was a well or opening through the deck to the ward below. The midship space on this deck contained the engine and boiler enclosures, and the pantry and galley for the sick. On the port side were staterooms for nurses, messroom, water-closet, and wardmaster's rooms. On the starboard were the dispensary and rooms for the engineers, pantry, etc.

On the main deck, aft, was ward 3, containing 76 beds. This ward was 79 feet long, 28 feet wide aft, and 38 feet wide forward. On the starboard side of this ward was set off the operating-room, 24 by 12 feet. The midship space was given up to messrooms, galley, bakery, engine and boiler enclosures, office-rooms, laboratory, dark room, and washrooms. Forward of this was a small ward of 30 beds for officers, 38 by 24 feet. A portion of this space was set aside and enclosed as the record office where all records, etc., were made and kept. Just forward of this ward were the quarters of the ship's medical officers, messroom, pantry, staterooms, bath, etc., and on this deck in the forecastle, the crew space.

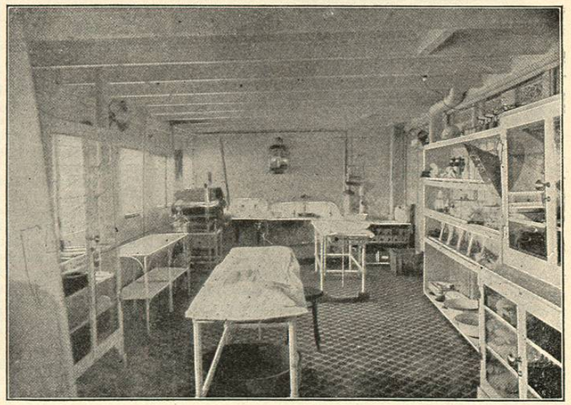


FIG. 2710.—Operating Room, Hospital Ship *Relief*.

On the lower deck was a ward of 46 beds aft, just forward of the "glory hole," which was given up to the ship's steward's crew. Midships were coal bunkers on either side of boiler and engine-room enclosures, store-rooms and steam laundry. Farther forward space was given up to machinery for the refrigerating plant, carbonating apparatus, disinfecting apparatus, staterooms, washrooms, and space for the crew, with elevator and steering and windlass engines.

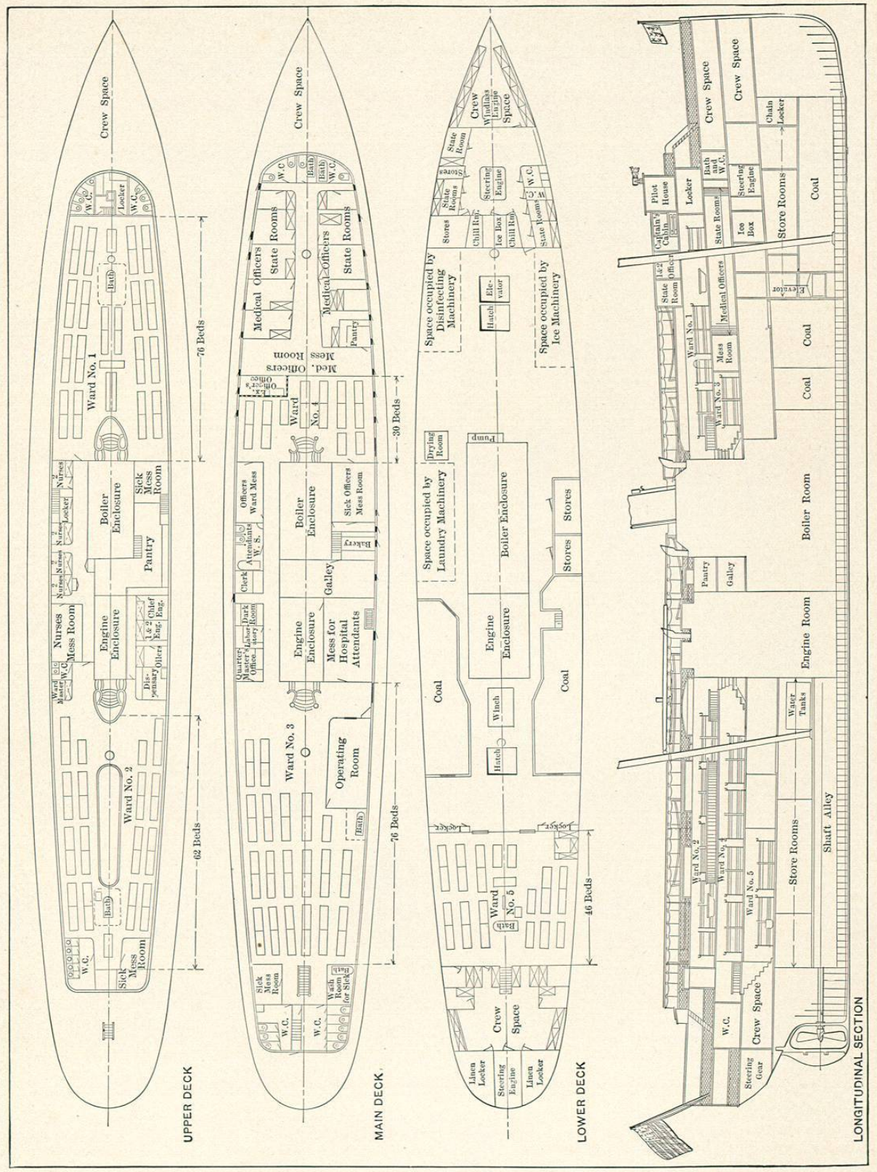
On the orlop deck were the main store-rooms for medical, quartermaster, subsistence, and ship's stores, and bunkers for coal.

On the hurricane deck were rooms for the master and other ship's officers, eight life boats, two steam launches, and four life rafts.

The vessel was painted white with a green strake as is required by the articles of the Geneva Convention.

For her plans and general arrangements see Plate XXXII. and Figs. 2709 and 2710.

The *Missouri* was a steamship of the Atlantic Transport line, and in July, 1898, her services with her crew were offered the Government. The offer was accepted and the vessel was refitted for hospital work. She is 320 feet long, 40 feet beam, and 29 feet 6 inches in depth, and has a speed of about 11 knots. In fitting her for hospital purposes she received a steam laundry, a steam sterilizing apparatus, an ice and a carbonating plant. This outfitting may be said to have been of a temporary nature, though her equipment was excellent. After doing much good work in relieving the hospitals of Cuba and Porto Rico, and later as a floating hospital at Havana, Cuba, she was finally purchased by the Government and thoroughly overhauled for duty in the Philippines. She sailed for Manila in September, 1899, with a medical staff of four medi-



UNITED STATES ARMY HOSPITAL SHIP "RELIEF"

cal officers, two acting assistant surgeons, two hospital stewards, seven acting hospital stewards, forty-seven privates of the hospital corps, and eleven male contract nurses. She carried large quantities of medical supplies, and officers and men as passengers for duty in the Philippines. She did good work in the islands, returned to San Francisco in the winter of 1900, and, her services being no longer needed, she was then transferred to the Quartermaster's Department for use in the transport services.

There was one other hospital ship of short life as such, during the Spanish-American War—the *Bay State*, afterward the *Aid*. She was first fitted up by the people of Massachusetts and did good work during the summer of 1898. She was purchased by the Government but was not found satisfactory for hospital-ship purposes. She was very small and unsuited for rough weather, and not long after her purchase was turned over to the Quartermaster's Department.

In the Santiago expedition the fourth divisional field hospital of the Fifth Army Corps was retained on board the steamer *Olivette*, which received patients after the battles about Santiago, and as an extemporized hospital ship did excellent and valuable work.

During the period that hospital ships were used during and following the Spanish-American War there were 8,370 admissions, distributed as follows:

Olivette: Admissions from June 14th, 1898, to August 31st, 1898, regulars and civilians, 661; volunteers, 170. Total, 831.

Missouri: Admissions from September 1st, 1898, to February 17th, 1900, regulars and civilians, 1,334; volunteers, 703. Total, 2,037.

Relief: Admissions from July 1st, 1898, to July 31st, 1901, regulars and civilians, 3,272; volunteers, 2,230. Total, 5,502.

The *Relief* sailed on her first outward voyage from New York City for Siboney, Cuba, carrying much needed supplies, arriving July 7th, 1898. She returned to New York July 23d, with 254 patients and on her second and third voyages went to Ponce, Porto Rico, returning filled with sick which she discharged at New York and Philadelphia. She then helped distribute patients from Montauk Point to hospitals in Boston and Philadelphia, and later made four more trips to Cuba and Porto Rico bringing back each time sick and convalescents to her full capacity. She was then ordered to the Philippines and after thorough repairs sailed March 3d, 1899, for Manila via the eastern route. She touched at Gibraltar, Port Said, Perim, Colombo, and Singapore, arriving at Manila April 12th, making the fastest time ever made between New York and Manila. She remained in Manila Bay ten weeks as a floating hospital. On June 22d she sailed for San Francisco with 250 patients, touching at Nagasaki, Yokohama, and Honolulu for coal. After arriving at San Francisco August 2d, 1899, it was decided to send her back to the Philippines for work in the islands, it having been concluded that she was not adapted to the long Pacific voyage. She continued in service as a hospital ship, taking part in the China expedition, until July 31st, 1901, when she was finally abandoned for hospital purposes and turned over to the Quartermaster's Department for use as an inter-island transport in the Philippines.

The work done by our hospital ships cannot be estimated nor appreciated by mere statistics. All cases, it may be said, did well on board. The clean, cheerful surroundings, the pure air, the good food, freedom from insects accomplished marvellous results.

The work of hospital ships properly designated as such was almost all done by the *Relief* and *Missouri*. It was the writer's fortune to serve on the former, and such knowledge as he may possess about such duty was gained by his service on that vessel. In the following discussion of the subject of Hospital Ships, he is simply giving the results of this observation and experience, and the conclusions drawn therefrom.

Paragraph 1622, Army Regulations, 1901, reads:

"Hospital transports, boats, and railway trains after being properly assigned as such, will be exclusively under the control of the Medical Department, and will not be diverted from their special purposes by orders of local or department commanders or officers of other staff corps."

It was under the provisions of this regulation that General Orders, No. 53, A. G. O., dated May 25th, 1898, was issued.

"General Orders, No. 53, Headquarters of the Army, Adjutant General's Office, Washington, May 25th, 1898. . . .

"II. By direction of the Secretary of War, the following is published for the information and guidance of all concerned:

"The steamship recently purchased for the use of the Medical Department of the Army as a hospital ship will be named the *Relief*. In accordance with the terms of the Geneva Convention the Geneva Cross flag will be carried at the fore whenever the national flag is flown, and the neutrality of the vessel will at all times be preserved.

"No guns, ammunition, or articles contraband of war, except coal or stores necessary for the movement of the vessel, shall be placed on board; nor shall the vessel be used as a transport for the carrying of despatches, officers, or men not sick or disabled, other than those belonging to the Medical Department.

"By Command of Major-General Miles:

"H. C. Corbin,
"*Adjutant General.*"

The articles of the Geneva Convention which concern the Marine are as follows:

"Art. VI. The boats which, at their own risk and peril, during and after an engagement pick up the shipwrecked or wounded, or which having picked them up, convey them on board a neutral or hospital ship, shall enjoy, until the accomplishment of their mission, the character of neutrality, as far as the circumstances of the engagement and the position of the ships engaged will permit.

"The appreciation of these circumstances is entrusted to the humanity of all the combatants. The wrecked and wounded thus picked up and saved must not serve again during the continuance of the war.

"Art. VII. The religious, medical, and hospital staff of any captured vessel are declared neutral, and, on leaving the ship, may remove the articles and surgical instruments which are their private property.

"Art. VIII. The staff designated in the preceding article must continue to fulfil their functions in the captured ship, assisting in the removal of the wounded made by the victorious party; they will then be at liberty to return to their country, in conformity with the second paragraph of the first additional article.

"The stipulations of the second additional article are applicable to the pay and allowance of the staff.

"Art. IX. The military hospital ships remain under martial law in all that concerns their stores; they become the property of the captor, but the latter must not divert them from their special appropriation during the continuance of the war.

"Art. X. Any merchant ship, to whatever nation she may belong, charged exclusively with removal of sick and wounded, is protected by neutrality; but the mere fact, noted on the ship's books, of the vessel having been visited by an enemy's cruiser, renders the sick and wounded incapable of serving during the continuance of the war. The cruiser shall even have the right of putting on board an officer to accompany the convoy, and thus verify the good faith of the operation.

"If the merchant ship also carries a cargo, her neutrality will still protect it, provided that such cargo is not of a nature to be confiscated by the belligerents.

"The belligerents retain the right to interdict neutralized vessels from all communication, and from any

course which they may deem prejudicial to the secrecy of their operations. In urgent cases special conventions may be entered into between commanders-in-chief, in order to neutralize temporarily and in a special manner the vessels intended for the removal of the sick and wounded.

"Art. XI. Wounded or sick sailors and soldiers, when embarked, to whatever nation they may belong, shall be protected and taken care of by their captors.

"Their return to their own country is subject to the provisions of Article VI. of the Convention, and of the additional Article V.

"Art. XII. The distinctive flag to be used with the national flag, in order to indicate any vessel or boat which may claim the benefits of neutrality, in virtue of the principles of this Convention, is a white flag with a red cross. The belligerents may exercise in this respect any mode of verification which they may deem necessary.

"Military hospital ships shall be distinguished by being painted white outside, with green strake.

"Art. XIII. The hospital ships which are equipped at the expense of the aid societies, recognized by the governments signing this Convention, and which are furnished with a commission emanating from the sovereign, who shall have given express authority for their being fitted out and on their final departure, and that they were then appropriated solely to the purpose of their mission, shall be considered neutral, as well as the whole of their staff. They shall be recognized and protected by the belligerents.

"They shall make themselves known by hoisting, together with their national flag, the white flag with a red cross. The distinctive mark of their staff, while performing their duties, shall be an armlet of the same colors. The outer painting of these hospital ships shall be white, with red strake.

"These ships shall bear aid and assistance to the wounded and wrecked belligerents, without distinction of nationality.

"They must take care not to interfere in any way with the movements of the combatants. During and after the battle they must do their duty at their own risk and peril.

"The belligerents shall have the right of controlling and visiting them; they will be at liberty to refuse their assistance, to order them to depart, and to detain them if the exigencies of the case require such a step.

"The wounded and wrecked picked up by these ships cannot be reclaimed by either of the combatants, and they will be required not to serve during the continuance of the war.

"Art. XIV. In naval wars any strong presumption that either belligerent takes advantage of the benefits of neutrality, with any other view than the interest of the sick and wounded, gives to the other belligerent, until proof to the contrary, the right of suspending the Convention, as regards such belligerent.

"Should this presumption become a certainty, notice may be given to such belligerent that the Convention is suspended with regard to him during the whole continuance of the war.

"Art. XV. . . . (*f*) Hospital ships are required to carry the Geneva cross flag at the fore whenever the national flag is flown, and their neutrality must at all times be preserved. No guns, ammunition, or articles contraband of war, except coal or stores necessary for their movement, will be placed on board, nor should they be used as transports for carrying despatches, officers or men not sick or disabled, other than those belonging to the Medical Department."

Under existing laws and regulations the Quartermaster's Department is charged with all matters of transportation and all expenditures pertaining to the same. This department therefore makes all alterations necessary to fit the vessel for hospital purposes, and provides the necessary force to operate her at sea as a steamship. All supplies necessary for such operations, fuel, deck stores, engineers' supplies, etc., are furnished by this department. It employs a master or ship's captain and all the crew of the various departments, deck, engineer's, and steward's. These sign the ship's articles and are subject to marine laws and regulations. An officer is detailed as quartermaster on board who looks after all matters pertaining to the quartermaster's department. He submits from time to time, through the commanding officer, requisitions for supplies and repairs to maintain the efficiency of the vessel. He acts as disbursing officer and is furnished funds for the payment of the employees of his department on board and for such emergency purchases of fuel, stores, etc., as may be necessary. He also keeps on hand clothing for issue to enlisted men of the hospital corps and others who may be on duty on board, and to patients received for treatment. He should make frequent inspections of the vessel and by constant scrutiny and supervision take proper steps to keep the ship in good repair. To effect this he should consult the chiefs of the various ship's departments and require them to furnish him detailed statements of the needs of their departments which he should consolidate and carefully revise before submitting the same to the commanding officer. Except in emergencies all estimates are sent to the Superintendent of the Army Transport Service who takes proper steps to make all repairs and furnish all supplies pertaining to the Quartermaster's Department. The regulations of the Army Transport Service are followed by the quartermaster of a hospital ship in so far as they do not conflict with the regulations of the Medical Department in its management and control of the vessel as a hospital.

A hospital ship is a general hospital afloat; as such it is under the exclusive control of the Surgeon-General and is governed by such regulations as the Secretary of War may prescribe. The surgeon in charge commands and is not subject to the orders of local commanders. As commanding officer the surgeon in charge is responsible for the ship at all times. His duties as commanding officer are practically the same as those of a commanding officer of a post, and in addition he conducts and maintains the hospital department. He is responsible for the proper application and preservation of all property, for the strict enforcement of laws and regulations, and will satisfy himself that the disbursements of officers under him in charge of funds are in accordance with laws and regulations and that their accounts are correct. The commanding officer should study the regulations governing the marine and be careful to observe and conform to the laws and regulations regarding quarantine, pratique, and customs of any port the vessel may visit. For the proper navigation of the vessel he looks to the master of the ship and holds him responsible for the efficiency and discipline of the crew. He should co-operate with the quartermaster and master in all matters which tend toward the comfort, safety, and efficiency of all on board. He should require frequent fire drills and make, with the quartermaster and master, frequent inspections of all parts of the vessel.

The conducting of the various departments of the ship, deck, engineer's, and steward's departments, differs but little, if any, from the management on any steamship in passenger service.

A Commissary Department is maintained on board under the charge of an officer designated as commissary officer. The quartermaster usually acts in this capacity. There are kept on hand ample commissary supplies, not only the components of the ration, but a variety of additional stores for sale to those on board and for issue to the sick.

Early in the Spanish-American War the subsistence of those on board a hospital ship came from three different sources. First, issues of the ration to enlisted men serving on board and to the sick who did not require special diet. Second, all sick requiring special diet were subsisted by stores purchased in open market by the medical officer in charge, not to exceed sixty cents per day per man. Third, the subsistence of the ship's crew was provided by the Quartermaster's Department; an allotment

was made of fifty cents per day for each man and one dollar per day for each ship's officer and placed in the quartermaster's hands for their subsistence. For convenience of administration, there was maintained on the *Relief* at this time a hospital mess only, and the ship's employees were considered as living in this mess which was maintained by the medical department. The quartermaster at the end of each month paid to the medical officer commanding the amount allotted for the subsistence of his employees, and this amount was accounted for on the hospital fund statement.

Later the subsistence of all on board was placed in the hands of the subsistence department. The employees were subsisted from supplies purchased by the commissary officer not to exceed a fixed amount; a hospital mess was maintained for enlisted men on duty and the sick, and rations were issued for all these except such of the sick as required special diet. For these an allowance of forty cents per day was made, to be expended as provided in Army Regulations, 1892, 1893, and 1895:

"Par. 1392. The medical officer in charge of a general post, or camp, hospital ship, or transport, carrying patients, is authorized to purchase, under the laws and regulations relating to purchases of subsistence stores, such articles of food, both solid and liquid, not carried in stock by the subsistence officer who issues rations to the hospital, and to call upon such subsistence officer for the issue of such quantities of articles from the stock already on hand as, in the judgment of the medical officer, are required for the diet of enlisted patients under his charge who are too sick to be subsisted on the ration as ordinarily issued; the total combined money value of the stores hereby authorized to be purchased and issued as above in any month not to exceed the rate, calculated on the month's transactions, of forty cents per man per day for those actually requiring special diet. Subsistence officers are authorized to pay all duly certified bills of purchases made by medical officers under the provisions of this paragraph, or to make the purchases themselves at the request of the medical officers, and to make issues for special diet hereunder from stores on hand at their request, provided that the rate of forty cents per man per day for those enlisted men actually requiring special diet is not exceeded in any month."

"Par. 1393. When a ration has been drawn by the hospital for an enlisted patient for a ration period and it becomes necessary during that period to put him upon special diet, due deductions will be made by the surgeon in charge on the next ration return of the hospital for the rations unused by him; and, reciprocally, when a patient on special diet has been restored in a ration period to regular diet, the necessary additions will be made on the next ration return of the hospital for the rations used by him. The object of this rule is to prevent the hospital from having the benefit of the rations of enlisted men for the period they may be put upon special diet, and to give the benefit of an issue of rations where men have been restored to regular diet when rations had not been drawn for them."

"Par. 1395. The formation of a hospital fund from articles purchased for special diet for enlisted men too sick to use the army ration, or the application of such articles to uses other than those for which intended, is prohibited. Such articles will, as far as practicable, be procured in quantities sufficient for the needs of specific patients only, and no large accumulations will be made. Nothing in this regulation will be construed to prevent the maintenance of a hospital fund from savings of the rations of the hospital corps, and the patients who do not require special diet."

The duties of quartermaster and commissary on board may satisfactorily be performed by an experienced medical officer who can otherwise materially assist the commanding officer.

The Medical Department furnishes and supplies a hospital ship the same as it would a general hospital on shore. It causes to be detailed a medical officer commanding, and medical officers to assist him in its administration. It details a suitable number of hospital stewards, privates of the hospital corps, and nurses, male or female as may be required, and employs such civilians as may be necessary as mess stewards, mess men, cabin boys, cooks, laundrymen, etc. The commanding officer has placed at his disposal funds for the payment of the employees of the department and the purchase of such medical and hospital supplies as may be necessary. For these funds he is personally accountable and must submit his accounts each month to the Treasury Department through the Surgeon-General. The ship is provided with medical supplies of every description for her own hospital needs, and stores in abundance in excess of these, for issue from time to time to shore stations, or transports, etc., where supplies may be needed.

The *Relief* was fitted up with double bunks, one above the other, with felt mattresses and woven-wire bottoms fastened to tubular bent iron frames, enamelled white. These were secured to the deck and arranged end to end lengthwise of the ward with suitable aisle spaces. Each bed was supplied with side rails of maple, about three inches wide, fastened by clips and bolts to head and foot for rolling boards. One of these was never removed; the other was used only in rough weather, being detached for convenience in handling the patient at other times. Swinging cots were not used on board, but it is believed that a certain number swung on gimbal joints would prove very satisfactory for very severe cases. Each ward had one or more bathtubs and wash basins fitted with "Gagenstrom" plumbing fixtures for both fresh and salt water, heated by steam, with shower, etc., the tubs curtained off by canvas screens suspended from the ceiling. Portable tubs on wheels were also supplied, but usually patients were carried to the ward tub when necessary. Each tub fixture was supplied with a thermometer so that the temperature of the water flowing into the tub could be accurately determined and controlled.

Directly off each ward were water-closets and urinals in sufficient number. All closets on board ship should be supplied with automatic flushing apparatus or some device to insure the security of the trap seals. In rough weather the rolling of the vessel empties out ordinary traps and permits soil-pipe odors access to the ship. Plumbing connections should be made of heavy rubber tubing in all places where the working of the ship might break the pipes. On the upper and main decks of the *Relief* were hoppers, fore and aft, with a salt-water flushing supply pipe designed to receive dejecta from bed pans, slops, refuse, etc. The outlets of these hoppers were five-inch pipes running clear of the ship outside, down to the water line. The bedding for the sick was that furnished shore hospitals, good feather and hair pillows, woollen blankets, sheets and pillow cases. An abundance of towels was supplied for all needs. The interior of the wards was painted white, touched up with gold. Each ward had many large windows by means of which fresh air and light were freely admitted. On the main deck the ward floors were kept shellacked. Floor polish was tried, but did not prove satisfactory at sea. The floors of the upper wards were the canvas-covered decks, and strips of rubber matting were used in all aisles and passageways. When the vessel first sailed her main deck was painted within and without, but paint was found to be unsatisfactory. The decks were later scraped, planed, and sand-papered; in the wards they were then treated with shellac varnish, and the outer decks were holystoned. Interlocking rubber tile floor gave excellent satisfaction in toilet, bath, and operating rooms. This comes in various designs of shapes and colors, and if well put down is easily kept clean and sanitary. On ship board when paint is used it must be frequently renewed, for chemical action is rapid both from gases of coal combustion and from the salt water. Cleansing and overhauling seem to be always necessary. Just as a satisfactory condition of cleanliness seems attained, it becomes necessary to put on coal and coal dust