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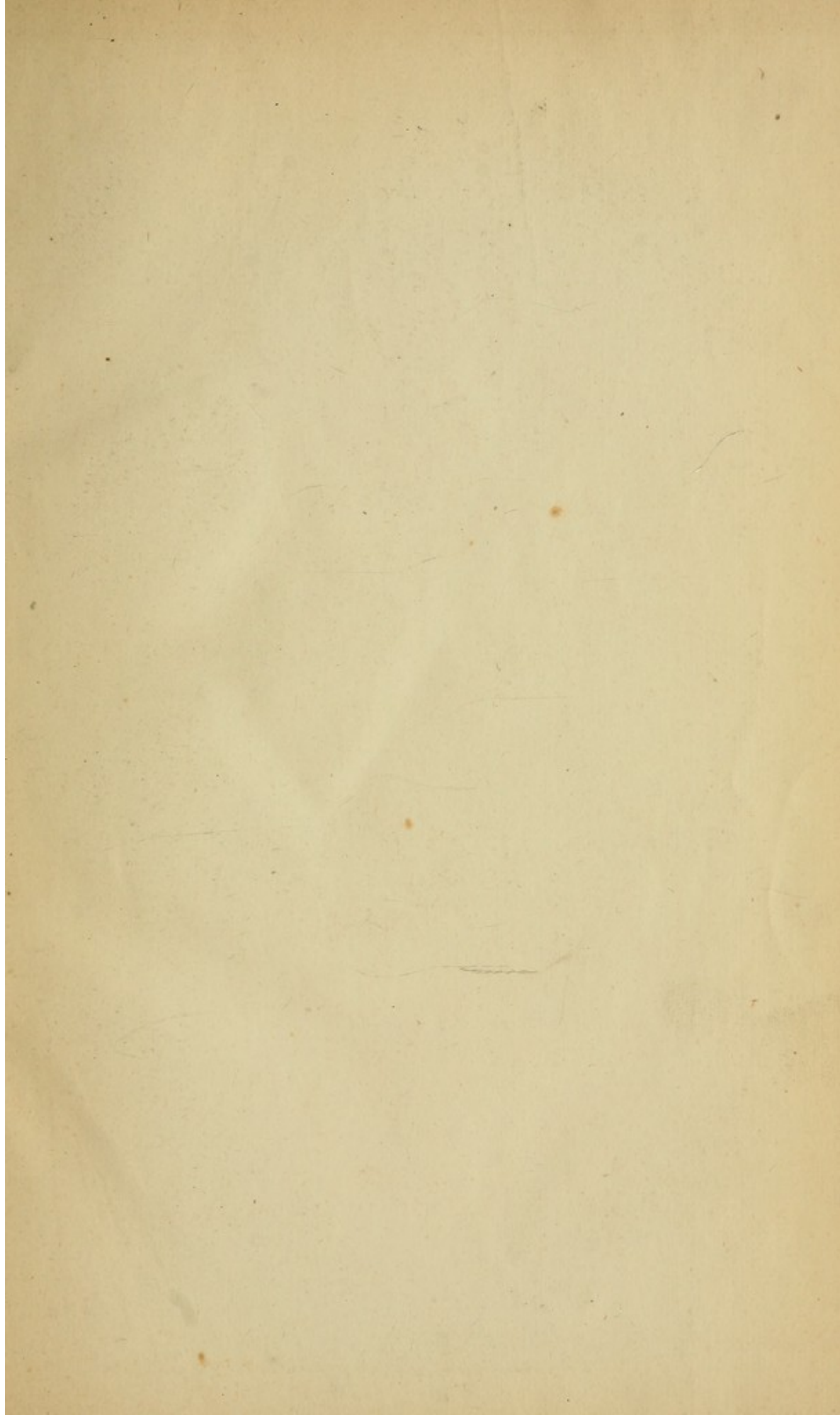
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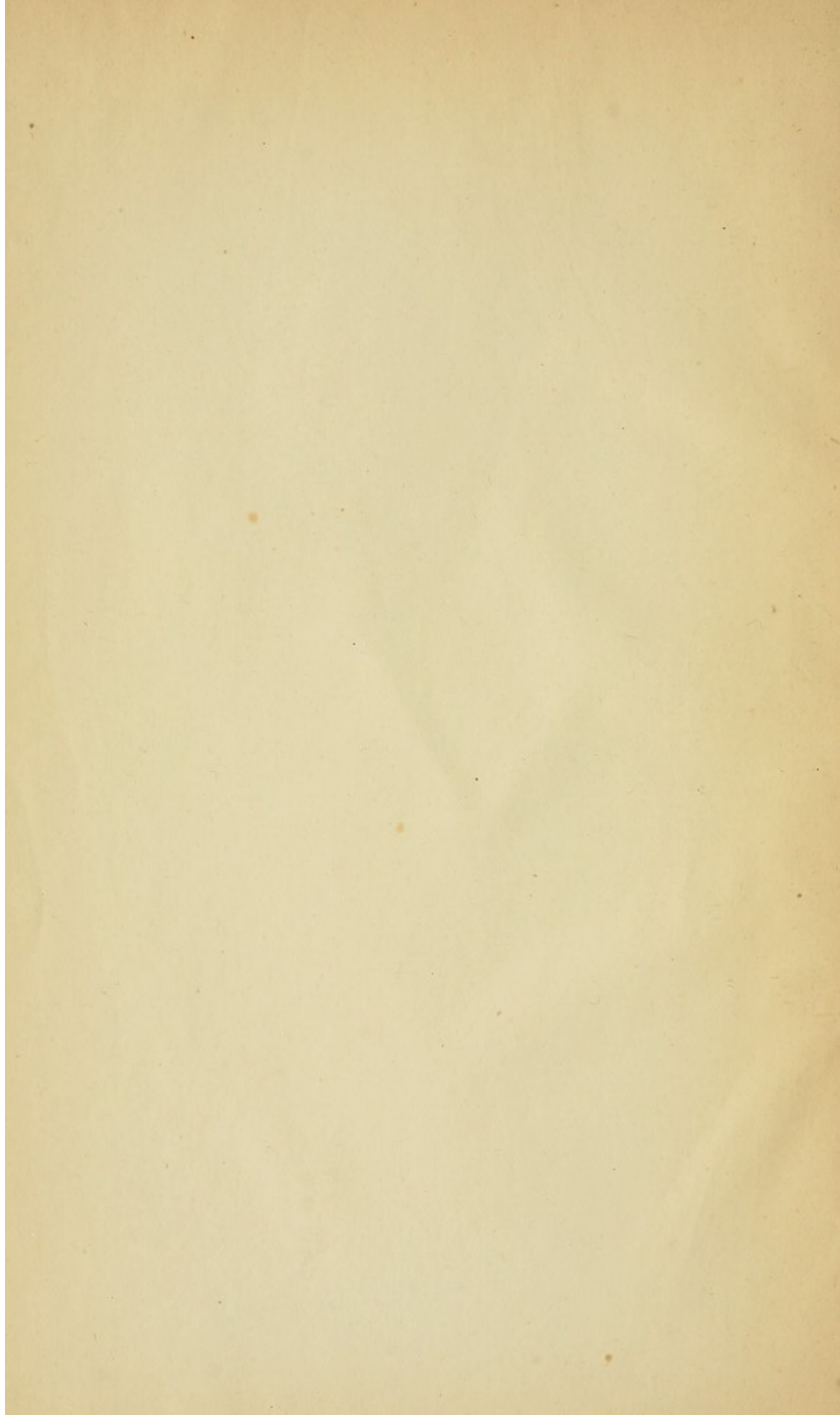
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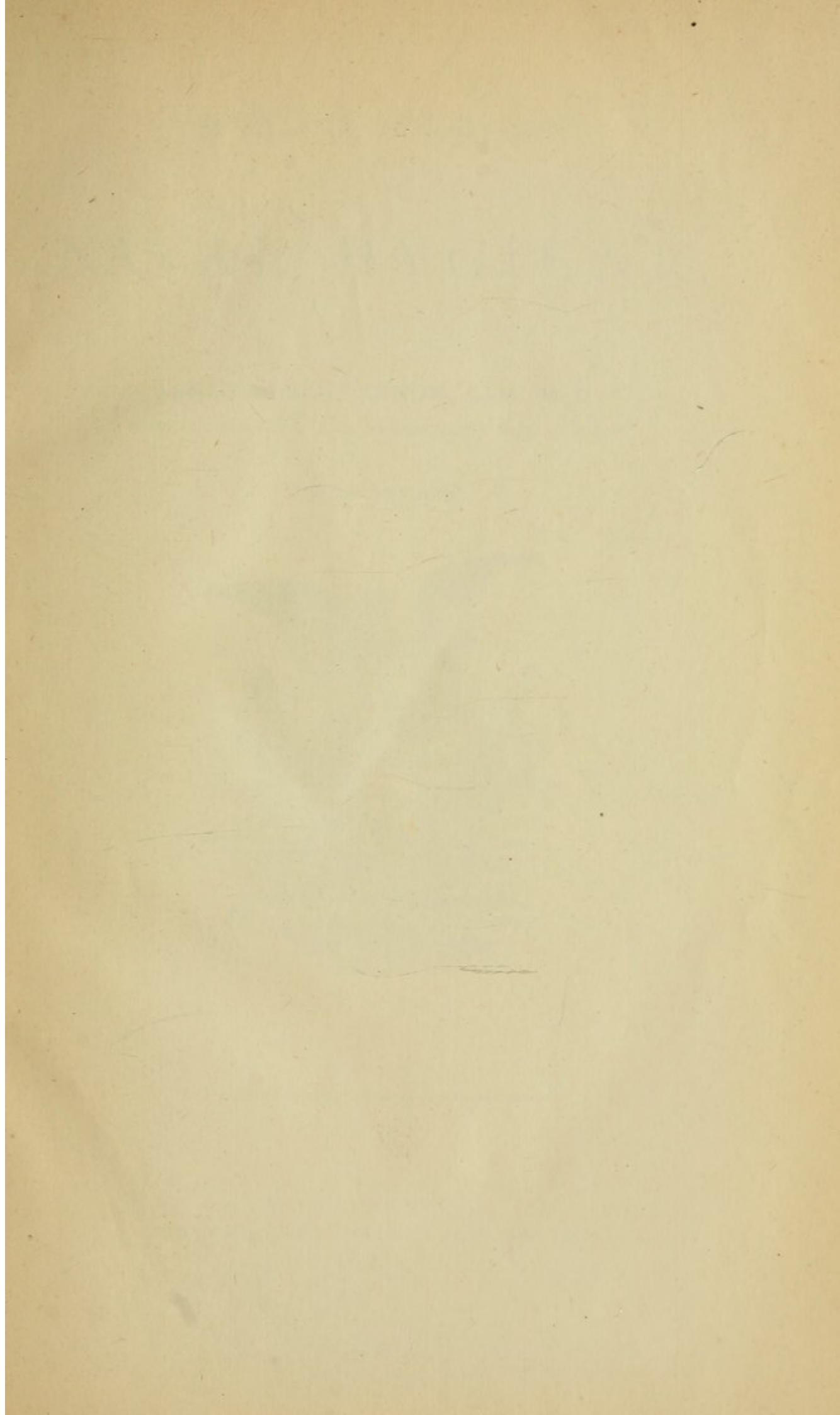
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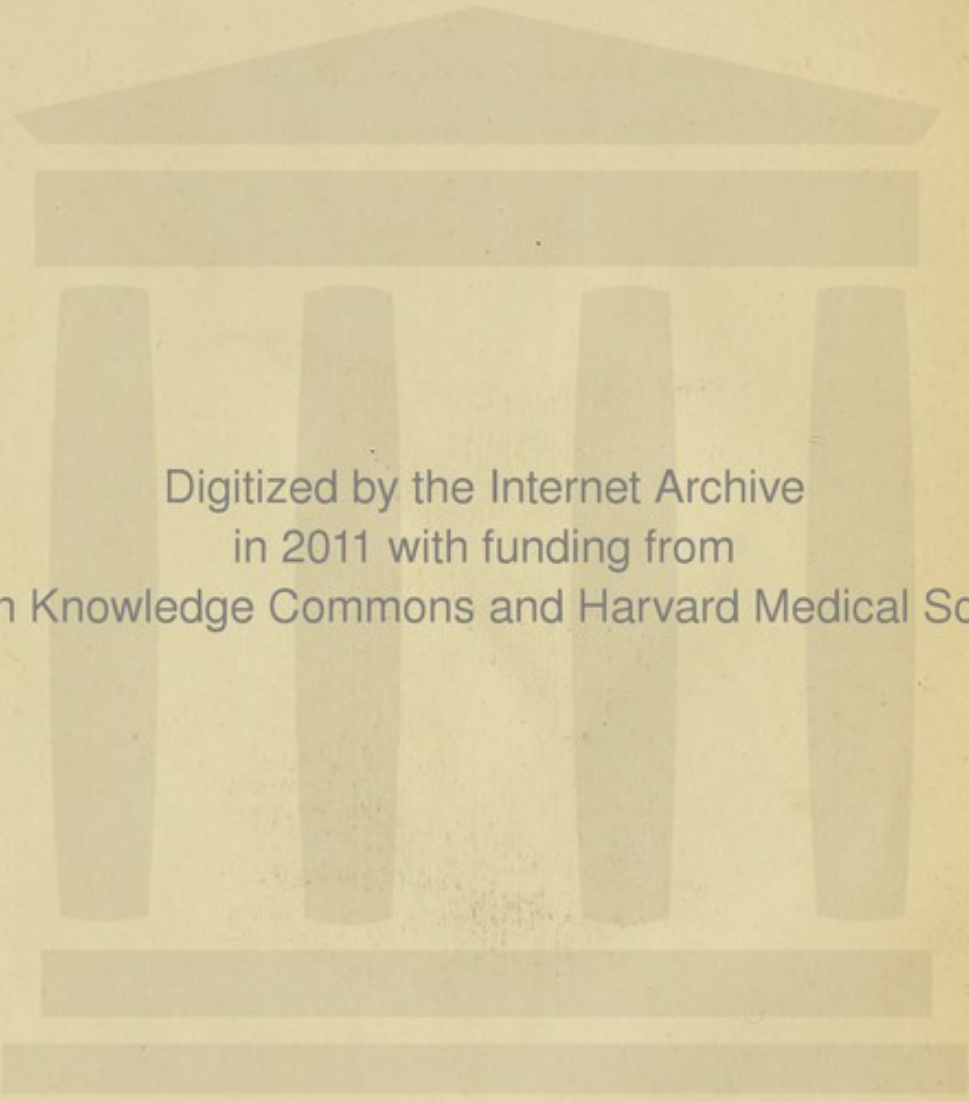


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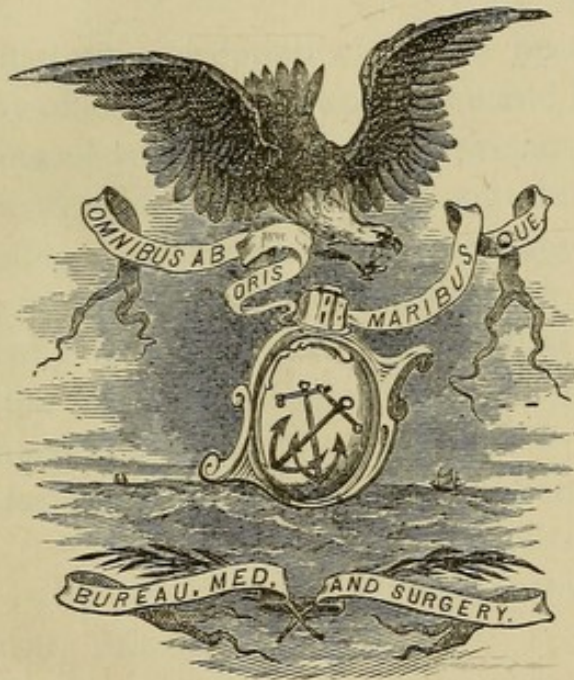
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PRACTICAL SUGGESTIONS
IN
NAVAL HYGIENE,

BY

ALBERT LEARY GIHON, A. M., M. D.,
MEDICAL INSPECTOR U. S. N., MEMBER NAVAL MEDICAL BOARD.

(THIRD EDITION.)



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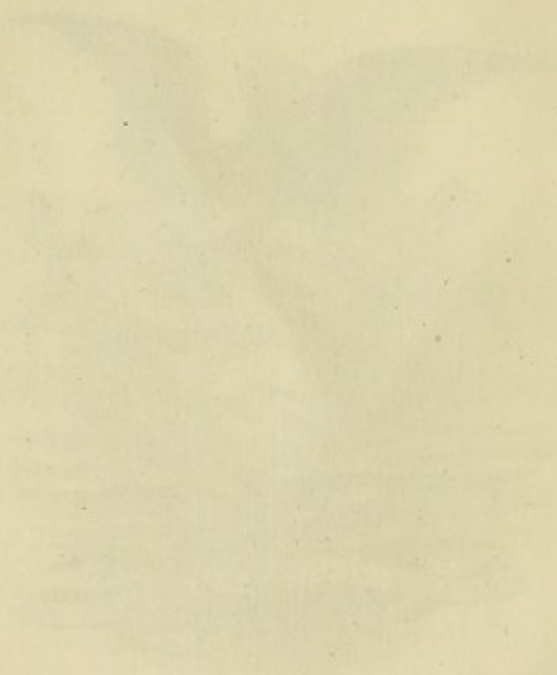
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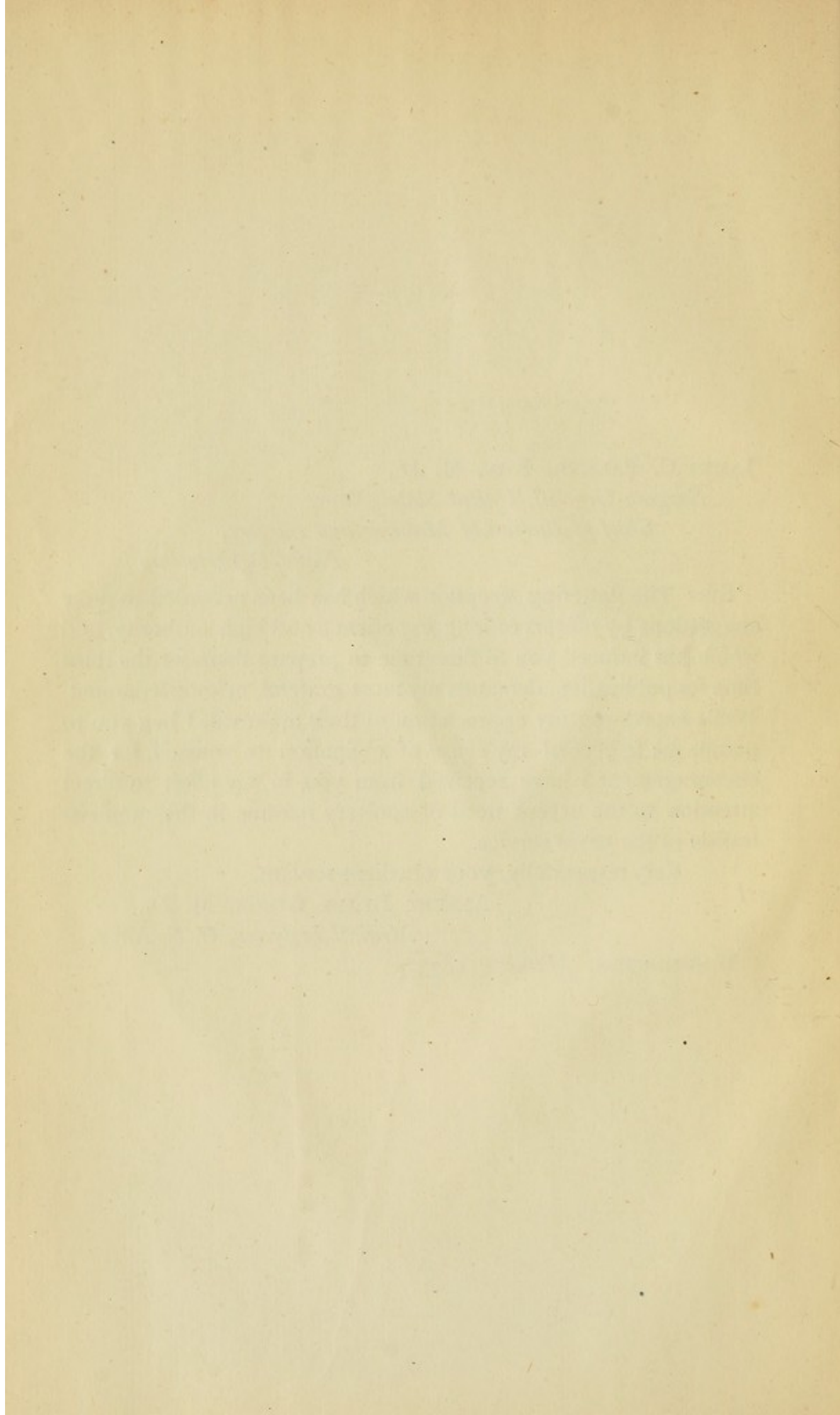
JAMES C. PALMER, ESQ., M. D.,
Surgeon-General, United States Navy,
Chief of Bureau of Medicine and Surgery,
Navy Department:

SIR: The flattering reception which has been accorded to these suggestions by officers of long experience and high authority, and which has induced you to direct me to prepare them for the third time for publication, demands my most grateful acknowledgment. While expressing my appreciation of their approval, I beg you to permit me to record my sense of obligation to yourself, for the encouragement I have received from you, in my effort to direct attention to the urgent need of sanitary reforms in the administration of the naval service.

Very respectfully, your obedient servant,

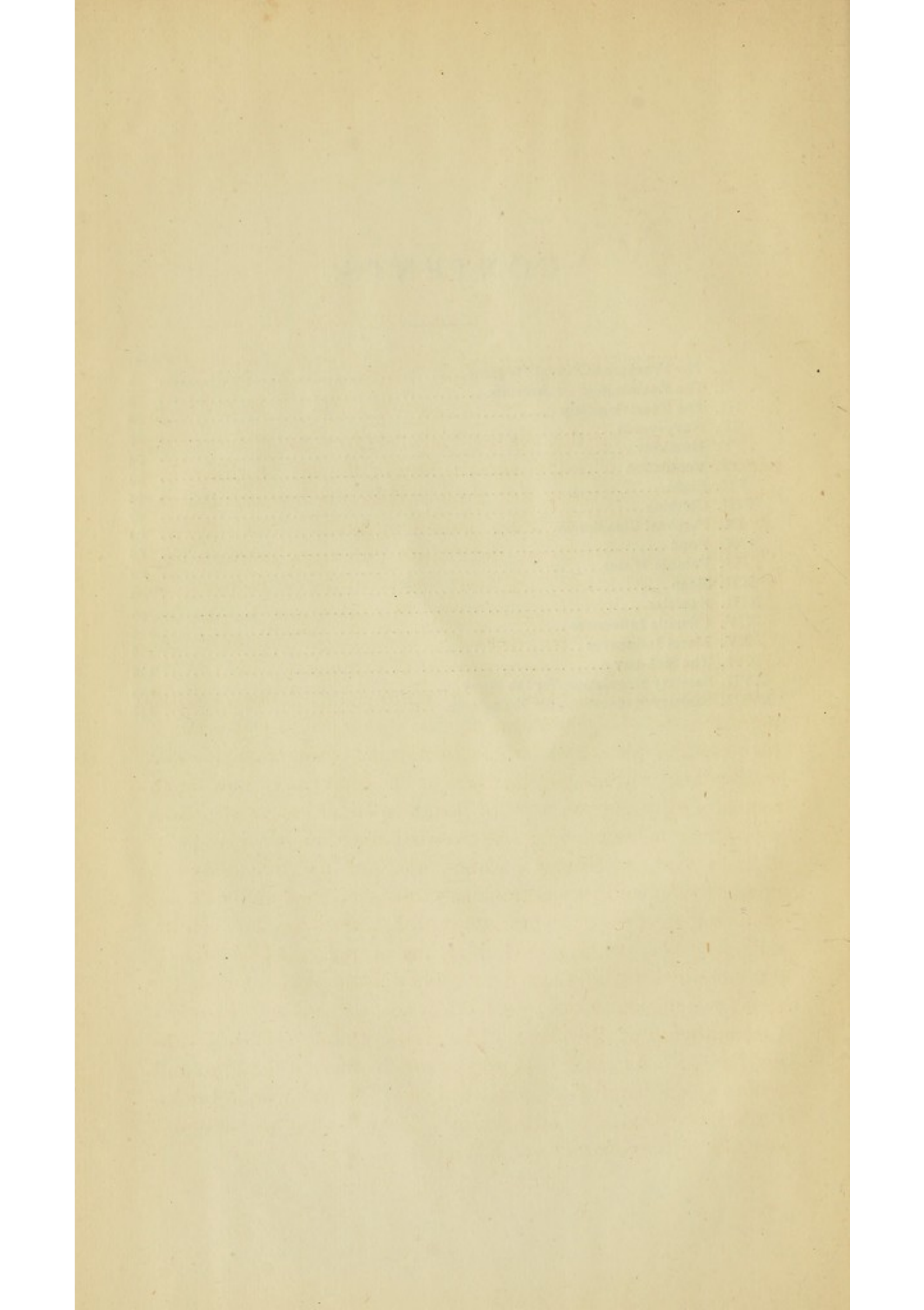
ALBERT LEARY GIHON, M. D.,
Medical Inspector, U. S. Navy.

WASHINGTON, *March 1, 1873.*



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NAVAL HYGIENE.

THE PROVINCE OF NAVAL HYGIENE.

Notwithstanding the general knowledge of the fact that the better mode of relieving human flesh of the ills to which it is heir is to prevent them, very little is done toward lessening the amount of physical suffering among mankind. Not only are individuals improvident of health, but public communities neglect precautions that would avert many attacks of disease; and even governments, having control of armies and navies, are unmindful of preventive measures which would diminish the expense and promote the efficiency of these bodies.

It ought to be unnecessary to urge the importance of naval hygiene. If it be so requisite to study what to do and what to leave undone on shore, where everything demanded for the healthy maintenance of the body is in abundance, how much more strictly ought the laws of health to be observed on board ship, where human beings are crowded together in violation of all these laws, breathing a scanty supply of air vitiated by the retention of their own excretions, subsisting upon an unwholesome diet, their sleep always interrupted, and their minds continually disquieted by passions called into operation by the unnatural circumstances of their lives. Yet no sanitary code has ever been promulgated in our own service, nor, until recent years, has it been attempted elsewhere. The young medical officer is without a guide. As much confused by the manners of those around him as by the maze of rigging overhead, he credits whatever he is told and accepts, "it is the custom of the service," as palliating whatever appears barbarous and unnatural.

The same cause that has retarded the influence of civil hygiene has prevented the institution of sanitary regulations for the Navy. The real character and mission of the physician have not been recognized. He is regarded solely as a *medicine-man*, and there is a general rebellion against his authority when he prescribes to the well what they shall eat and drink, how they shall live, dress, and sleep, how their houses should be built, their lands tilled, and their food cooked. The public mind does not rise to the comprehension of the extent of province of our great profession. The scientific medical man is at most regarded as an "allopath," a sectarian amid globulistic and rational homœopaths, Thomsonians, and Swedish-movement curers.

The naval surgeon has had his domain still further retrenched. Despite the radical changes which time has effected in the service, traditional jealousies and want of confidence have been perpetuated, and there are still many who, through a fear lest the medical officer transcend his position, are deaf to his warnings. Over the country are distributed the victims of this system, and many a grave has been untimely filled through inattention to sanitary recommendations. Every national vessel arriving at our naval sea-ports brings a number of invalid men and officers; the business of the naval hospitals is disproportionate to the size of the naval establishment; and this sacrifice of life and money will continue "until physicians have the place in the councils of military commanders that is due to science. The health history of the late wars in Europe is demonstrative in proof of the important fact that military life has been sacrificed in an enormous proportion to ignorance—that is, to the unwillingness of commanders to be advised on subjects which they could not themselves be supposed to know."—(Robert Jackson.) "From the neglect of the precautions specified, thousands of lives have been sacrificed which might otherwise have been preserved. The care of the health of the troops should certainly be one of the first duties of a military commander. Unless his men are in good physical condition they can be of no service to him in carrying out the ends he may have in view, but

are a hinderance to him and a burden to themselves. And yet how often it happens that those in command are heedless of the warnings and inattentive to the advice given by their medical officers."—(Hammond.) "It is urgently necessary that the influence of enlightened medical opinion be more and more felt in the administration of the Navy in all matters relating to health, for costly blunders still continue to be committed in the construction and arrangement of our ships of war, which seriously injure the efficiency of the crew, and which might be easily effected if every ship were thoroughly examined by a sanitary officer before she was commissioned. One of our iron-clads, the Royal Oak, was found to be a most unhealthy vessel from first going to sea, and thrice had she to be inspected by a sanitary board before her high sick-rate was reduced. And this is but one of many similar instances that might be adduced."—(Medico-Chirurgical Review.)

The naval authorities of Great Britain and France have already acted toward the establishment of sanitary codes. The medical officers of our own service, therefore, would be delinquent in delaying longer to obtain the sanction of the Department to their recommendations, and that indorsement of authority which will secure their observance. In this let us disclaim any purpose of interference with any other corps. It cannot be too often repeated that the function of the physician on board ship is to assist the executive authorities by maintaining the *personnel* of the Navy in its state of utmost physical efficiency; not to augment, but diminish sick-lists and empty sick-bays and hospitals. When a vessel with a complement of one hundred and fifty men has a daily sick-list of ten or fifteen, something is wrong. Both commanding and medical officers should be mutually interested in discovering and remedying that wrong, and it is often possible that the latter, through misjudged kindness, the imposition of malingerers, or an unpardonable feeling of spite, is as responsible as the former, whose unwise harshness, laxity of discipline, or neglected hygiene has disabled his vessel. Let us hope, therefore,

that henceforth both commanding and medical officers, with a more perfect confidence in each other's professional integrity, will not hesitate to confer amicably on all questions concerning the hygiene of the ships and stations on which they serve. Cheerfully recognizing our obligations of obedience to the commanding officer and constituted authorities, we ought to have no desire to do anything that is foreign to our calling as physicians. The sacred character of our profession bestows such honor and enviable distinction and dignity upon its followers, that we need not seek to encroach upon the functions of others. We, therefore, demand that our motives in making these suggestions may be no longer impugned; but that our efforts to accomplish the legitimate objects of our vocation may be generously assisted by the other corps, that our common aim, the honor and efficiency of the service, may be attained.

THE EXAMINATION OF RECRUITS.

The province of naval hygiene begins at the recruiting-office. To banish disease from shipboard as effectually as possible, it is as necessary to guard against its admission within the bodies of the officers and men themselves as to prevent its development among them, just as the attempt to extirpate the syphilis of the public prostitutes of large cities is fruitless so long as men who are themselves affected are allowed access to them. Hence the importance of carefully guarding this avenue of disease. With the medical corps rests the entire responsibility of selecting the *personnel* of the Navy. The various grades of officers are examined prior to appointment by special medical boards, while the medical officer of the rendezvous is charged with the examination of all applicants for the subordinate positions of shipped and enlisted men in the Navy and Marine Corps, and with the rejection of all who are unfit for these branches of the service, whether on account of existing acute or chronic disease or deformity, or constitutional taint, infirmity, predisposition, or inheritance, physical or mental. Could this duty be always performed with rigid exactness, sick-lists would consist only of acute maladies and injuries; but, unfortunately, all the cachexiæ are represented on our medical returns. Many of these latent seeds of disease are hidden beyond the ken of the most acute observer; still there is reason to complain of the superficial manner in which these examinations are often conducted. It is not unusual for a man discharged with a certificate of ordinary disability from a naval hospital to re-appear at that hospital within a few weeks,

either from the receiving-ship or from some vessel to which he had been transferred and found unfit for duty. A second discharge has been followed by reshipment at another station. Most of these cases wait until their arrival at a foreign port, and then present themselves with chronic and incurable maladies, for which they have to be invalided, and sent, at great expense, to a naval hospital in the United States, perhaps the very one they had left. Dr. Ruschenberger "sent a man home from on board of the United States ship Falmouth, at Rio de Janeiro, who twice imposed himself upon the recruiting officers with a fistula in perineo of several years' standing, for which he has been unsuccessfully treated at several civil hospitals." There are men who have passed years in the service in this way, without having ever completed a cruise. Hæmorrhoids, prolapsus ani, fistulæ, reducible hernia, stricture of the urethra; functional cardiac diseases, syphilis, and chronic rheumatism are the complaints which are most frequently thus alternately concealed and reported. It is not presumed that all such cases can be exposed at the rendezvous, but greater care and minuteness of examination would reveal many of them, and the establishment of dynamometric tests would discover the greater number, as well as convalescents from exhausting diseases. Thus, it would have prevented the shipment of a man with chronic luxation of the head of the humerus, whom I have encountered three or four times in the service, and who, while able to perform the usual movements of the shoulder-joint, could not accomplish violent circumduction without displacing the bone. Dr. Magruder, of the Iroquois, when fitting at the Philadelphia navy-yard for a cruise in the East Indies, informed me that he had to transfer to the hospital, with phthisis pulmonalis, a recruit whom he found to have been surveyed and discharged from the service only eight months prior to his reshipment; and stated that there were two other cases of incipient phthisis and one of the developed disease already on his list, although the ship had been but a few days in commission. A few years ago, a man who had recently shipped was discharged from the New York Naval

Hospital with double inguinal hernia, which he confessed to have had five years; and among a list of forty-seven cases of pulmonary tubercle then in the hospital, (1860,) twenty-three had been in the service but a few weeks, and in most of these there was not a doubt that the early stages of the disease, or the tendency to its development, were positively indicated at the time of shipment by local physical signs or by evidences of constitutional impairment. Chronic rheumatism and subluxations are more difficult of detection, but even these can seldom perfectly dissemble all the abnormal actions of their articulations.

As a further check to the admission of disqualified men into the service, it is necessary to particularize descriptive lists, to specify and locate exactly every ineffaceable mark, scar, or peculiarity of the individual, and to describe, more fully and accurately than is now done, the general appearance and development of each person. This complete descriptive list should accompany the man throughout his connection with the service; when transferred from one vessel to another; when invalided and sent to a naval hospital; when discharged from that hospital, whether on certificate of ordinary disability or to duty; when discharged from the service, whether with ordinary or honorable discharge; and it should appear on all certificates of disability, death, or pension. In all cases of discharge for permanent disability from incurable affections or injuries, it should be filed at the Navy Department for reference when suspicion is entertained that such a man has re-shipped, and as evidence against him, if this have been done, on his trial for the fraud he had perpetrated upon the Government. Men should also be instructed to preserve these lists carefully as conclusive and requisite for their identification. A recent instance within my own knowledge illustrates the necessity for minuteness and exactness in descriptive lists. Jeremiah Griffin presented himself at a rendezvous to ship as coal-heaver, and was refused by the recruiting-officer on the ground that he had already shipped and had failed to repair on board the receiving-ship. This he denied, and reference to the surgeon's register, although estab-

lishing the prior shipment of Jeremiah Griffin, coal-heaver, of the same height, age, and nationality as the applicant, exhibited in the column of remarks, "defective teeth," while the man then offering had a perfect set. Incompleteness of descriptive lists subjects the Government to fraudulent claims. John Smith, boat-swain's mate, shipped and presented an honorable discharge on which he claimed three months' extra pay. He was well marked by the loss of a portion of a finger, but no mention was made upon the discharge which he presented, of the deformity, which had existed a long time. A seaman recently died, at the Naval Hospital at Philadelphia, with erosion of the entire penis, who had suffered amputation of a third of the organ, ten or twelve years before, at a civil hospital at Adelaide, Australia; yet, as Dr. Ruschenberger remarks in his report of the case, "there was no professional testimony as to the condition of the penil stump at the time of his last enlistment in the Navy." The sale and transfer of honorable discharges is readily carried on when descriptive lists are merely filled up with "eyes dark, hair dark, complexion dark, marks none," or "eyes light, hair light, complexion light, mark on arm;" and, furthermore, the interests of the man himself are often jeopardized by his name not being spelled in conformity with the original shipment, or by carelessness in transcribing the meager items of description. The records of the Bureau of Medicine and Surgery contain the following names, which are all intended to represent one individual: Charles Jacks, Charles Zerks, Clans Zeike, Clane Ezekiel, and Ezekiel Clause. I have known Houghton, after only two years in the service, to return as Horton, Bacquiel as Boquil, Tuer as Ture, and Koulousi as Gulachi and afterward as Galusha; transformations which originated, perhaps, on board the receiving-ship, where some careless or uneducated clerk, in making out the roll of the crew to be transferred to a sea-going vessel, spelled by sound, or as well as he knew how, the names as they were read to him, and committed an error which may appear under a second mutation of form on the honorable discharge, filled up in a similar manner by another equally heed-

less clerk. Even should the man present himself for reshipment at the same rendezvous where he originally passed, the very medical officer who wrote the first descriptive list must perpetuate the error on the second to secure the sailor his three months' bounty, since its payment will be refused unless the reshipment agrees in name exactly with that on the face of the discharge. Instances of this are numerous. One related to me by Surgeon Kitchen occurred in January of this year, (1871.) A very worthy and intelligent petty-officer, named Charles L. Anthony, having refused to sign his name on reshipment Charles T. Anthony, as it had been erroneously entered on the books of the ship to which he had previously been attached and thus copied upon his honorable discharge, was, in consequence, refused the payment of the bounty to which his long and faithful service entitled him. In my own experience, Peter Woppel, as an honorable discharge styled him, though he protested that he was baptized Vaupel, and so wrote it in a legible hand, had to remain a Woppel until another blunderer might convert him into a Wobble or something else; his claim for admission into the Naval Asylum, after twenty years' service, consequently being invalidated under the rule requiring that service to be under the same name, or great difficulty being occasioned in the adjustment of any pension claim in his favor. As it devolves upon the medical officer to fill up the blank descriptive list with the name, nationality, etc., of the recruit, it behooves him, for the sake of being exact, to cross-examine closely the answers that are made on these points. Many men, who profess to have been born in New York, Boston, or Philadelphia, will, when asked the precise place of birth, mention Cherry, North, or Penn streets, localities not remarkable for the fecundity of the females who dwell there. This is done through a fear lest only natives of the country will be accepted, or in the belief that it will insure them more favorable consideration; but when assured on these points, they frankly admit that they are of foreign birth. Confusion often arises from the number of identical names on board ship. I have seen a John Smith 12th. The most of these

are simply "purser's names," and a little coaxing and argument will usually induce the man to acknowledge his proper name, and in other cases will reveal a middle name, which is seldom tendered unless asked for. Foreigners should be required to spell their names in their native languages, since it will often happen that a man may be designated Louis Blanc or Johann Schmidt, who would otherwise have become a numerical Lewis White or John Smith. Not unfrequently common English names are spelled incorrectly by the examiner himself. Since writing the above, I was in a rendezvous where I observed a young assistant surgeon enter the name of a recruit without asking the orthography, and to my inquiry how he knew that to be the proper spelling, he replied, "Oh! I judge so." Thus Thomson is given a p, Emory an e, and Fraley an i, merely as the indolent or indifferent examiner may judge proper. However acute he may be in other respects, no exercise of judgment will enlighten him whether Riley or Reilley, Dixon or Dickson, Wallis or Wallace, Fife or Fyffe, Sheppard or Shepherd, Diehl or Deal, Bailey, Bayley, or Baillie is correct. All this care on the part of the medical officer, however, will be thrown away unless the Government exacts a rigid adherence to the original returns of the rendezvous in spelling and every other particular, by every person whose duty it is to transcribe those returns. How readily could the applicant for re-enlistment, or the chronic invalid, who, as soon as sent on board ship and required to do duty, repairs to the sick-bay with a sprained back, a stricture of the urethra, or a rheumatic joint, be identified, if his descriptive list were filled up in some such manner as follows: John Henry Smith, seaman; native of Galway, Ireland; age, when shipped, $26\frac{5}{12}$ years; height, 5 feet $6\frac{1}{2}$ inches; figure, slender; hair, brown and curly; complexion, florid; face, square; forehead, low; nose, sharp; mouth, small; teeth, perfect; eyes, dark chestnut and sunken; broad cicatrix of scald on left shin; anchor on right hand; etc. All this involves a little more labor, but it is labor that the Government has a right to demand of its officers. The subject is so important that I have been induced to dwell upon it at some length. Every act

of duty, however trivial, should be well done, and professional pride should deter every officer, whatever his rank, from affixing his signature to a subordinate's work until he has satisfied himself that it has been performed entirely free from mistake. The following series of errors in the descriptive list of the crew of a single vessel, (the *St. Louis*,) effectually illustrates the magnitude of the evil sought to be corrected :

Isaac J. Borden, age 39; instead of Isaac G. Borden, age 31.

Petrie Martin, age 29; instead of *Pierre* Martin, age 40.

William *Evene*, native of *Hartford, Connecticut*; instead of William *Evans*, native of *Maryland*.

William J. *Herne*, native of *Maine*; instead of William J. *Hearne*, native of *Canada*.

Alfred McDonald; instead of *Alexander* McDonald.

Randall McVerrish; instead of *Ranald* McVerrish.

William *Sims*; instead of William *Syms*.

Alexander *Gorman*; instead of Alexander *O'Gorman*.

James *Nolen*; instead of James *Noulean*.

George *McGoyn*; instead of George *McGoyme*.

Christian Allvord; instead of *Christop* Allvorden.

Frederick *Linderman*; instead of Frederick *Lendman*.

William *Channer*; instead of William *Charmerin*.

Daniel *Callihan*, native of *Rhode Island*; instead of Daniel *Callaghan*, native of *New York*.

Cornelias Callighan; instead of *Cornelius* Callaghan.

Peter *Durgan*; instead of Peter *Dugan*.

Monroe *Durgan*; instead of Monroe *Durgin*.

John *Custice*; instead of John *Curtice*.

Charles J. *Conlogue*; instead of Charles J. *Conologue*.

Andorous Dodge; instead of *Andorus* Dodge.

Agustus McEwen; instead of *Angus* McEwen.

Benjamin A. *McClain*; instead of Benjamin A. *McClane*.

Charles H. Smith, age 25, native of *Denmark*; instead of Charles H. Smith, age 22, native of *Providence, Rhode Island*.

John Kelly, native of *Brooklyn*; instead of John Kelly, native of *Philadelphia*.

John Brown, native of *Ireland*; instead of John Brown, native of *Boston*.

Henry Johnson, native of *Russia*; instead of Henry Johnson, native of *Prussia*.

George Brown, native of *Nova Scotia*; instead of George Brown, native of *New Hope, Pennsylvania*.

John Williams, native of *Sweden*; instead of John Williams, native of *Pennsylvania*.

Andrew Anderson, native of *Philadelphia*; instead of Andrew Anderson, native of *Norway*.

Patrick Fardy, native of *Maine*; instead of Patrick Fardy, native of *Ireland*.

George D. Vanness, native of *New York*; instead of George D. Vanness, native of *New Jersey*.

Samuel Wood, native of *Russia*; instead of Samuel Wood, native of *Maine*.

John Butler, native of *Boston, Massachusetts*; instead of John Butler, native of *Edgartown, Massachusetts*.

Jacob K. Woodbury, native of *Boston, Massachusetts*; instead of Jacob K. Woodbury, native of *Beverly, Massachusetts*.

George W. Martin, native of *Maine*; instead of George W. Martin, native of *Lynn, Massachusetts*.

John E. Woodbury, age 35; instead of John E. Woodbury, age 21.

Yet blunders gross as these are still committed. While preparing my monthly return of men examined for enlistment during July, 1872, at the Philadelphia rendezvous, with which I was then temporarily connected, I was induced to compare it with the recruiting officer's list, and was surprised to find that a man described as John J. Harrison on the surgeon's roll, was represented on the other simply as James Harrison. Referring to the original certificate of physical capacity, (Form Q,) it was evident that part only of the man's full name, John James, had been retained by the careless clerk who prepared the records of the office. During the same month Private Ketterer was recruited as Ket-

tereer and described as Ketteerer, although he had legibly signed his name without any double e whatever. A still more flagrant case occurred a month later. I had sent in the descriptive list of Hermann Philipp Spengler, and in five minutes received an enlistment paper from the clerk for my indorsement filed up with the name of Hermann Phillip Spangler.

No physical examination can be thoroughly and deliberately conducted in the five or ten minutes which, I have reason to believe, are the average time devoted to this purpose, particularly by young officers. More than thirty years ago, Surgeon Ruschenberger, prefacing the American edition of an essay by Deputy Inspector-General Marshall on the "Enlisting, Discharging, and Pensioning of Soldiers," declared that "the inspection of recruits, both for the Army and Navy, involving, as it does, the consideration of the interests of the Government and of individuals, which are often conflicting, is perhaps the most important and difficult duty which the surgeon is called upon to perform. Men who, through vice, dissipation, or misfortune, find it difficult to obtain a livelihood from private patronage, are very apt to seek employment in the Army or Navy, often with the sole view of obtaining medical attendance, and ultimately an asylum for pension; and even when the greatest caution and circumspection are observed, some unworthy and inefficient individuals gain admission into the service. Nor is this very surprising, when we consider that, prompted by their interests, recruits resort to every means within their knowledge to deceive the inspecting officer, whose examination is generally limited for each recruit to ten or fifteen minutes, a period much too short to ascertain the qualities of a horse, in which the most astute and wary jockey may be deceived."

Paragraph 166 of the Regulations for the Government of the Navy requires a muster of the officers and crew, at which the executive officer, surgeon, and paymaster shall be present, whenever a ship shall be put into commission, "for the purpose of verifying the descriptive lists, of ascertaining that the name

of every man is correctly registered, and that every one has the exact uniform dress prescribed by regulations," at which muster any discrepancy in the descriptive lists, or error in the transfer roll, shall then be corrected. But if the objects of this regulation are not very generally ignored, except as regards the inspection of uniforms, the examination of the descriptive lists is certainly never conducted in the critical spirit intended, nor is such possible at a general muster; and even when errors are discovered paymasters very strenuously object to the alteration of the entries in their books. The three officers indicated should sit as a board, and deliberately and carefully examine every individual of the crew singly with regard to the spelling of his name, his age, nativity, and correspondence with the other items of the descriptive lists.

The points to be particularly noted by the examining medical officer at the rendezvous are—

1. *Name*—in full, middle, if any, and in his native language.
2. *Nativity*—specifying town or other locality.
3. *Age*—in years and months at time of shipment.
4. *Height*—in feet and fractions of inches.
5. *Circumference of thorax*—immediately below the nipples, and apex of scapula, after full inspiration and prolonged expiration.
6. *General development and figure*—slender, robust, corpulent, muscular, stooping, etc.
7. *Intelligence*—good, bright, ordinary, obtuse, etc.
8. *Face*—oval, square, high-cheeked, freckled, pock-marked, smooth, bearded, etc.
9. *Forehead*—high, low, receding, prominent, etc.
10. *Complexion*—pale, fair, florid, dusky, tawny, swarthy, quadroon, mulatto, negro, etc.
11. *Eyes*—light or dark blue, gray, hazel; bicolored, prominent, sunken, etc.
12. *Hair*—light or dark chestnut, brown, auburn, sandy, red, flaxen, gray, black; thin, bald, straight, curly, wool, etc.

13. *Nose*—large, small, aquiline, pug, flat, sharp, bent, etc.
14. *Mouth*—small, large, thick or thin lipped, etc.
15. *Teeth*—perfect, irregular, deficiencies, etc.
16. *Distinguishing marks*—smoothness or hirsuteness of surface, prominence of pomum adami, peculiarities of ensiform cartilage, hollowness of sternum, prominence, rotundity, or flatness of abdomen, unusual size or smallness of penis, scrotum, or testes, hollowness or prominence of anal region, bow-legs, knock-knees, splay-feet, largeness of hands, feet, or joints, besides every abnormal feature not inconsistent with perfect bodily vigor, such as *nævi materni*, discolorations, cicatrices, outgrowths, varicose veins, deficiencies, etc.

The certificate of the applicant that he is "not subject to fits," etc., (Form Q,) which precedes the physical examination, is usually signed without hesitancy and without regard to fact. Cases of epilepsy, stricture of the urethra, hæmorrhoids, chronic rheumatism, old injuries, congenital and inherited affections, present themselves on the sick-list of every vessel in commission, encumber sick-bays, and materially interfere with the health and the comfort both of the well and of those who have become sick in the performance of duty. If the certificate of exemption from these complaints were required to be in the form of an oath, and its fraudulent signer were subjected to court-martial and punishment as a perjurer, these cases would soon become infrequent.

In this connection I desire to propose a system of physical examinations, which may assist the younger medical officers who have had little or no experience in such duty. It must be borne in mind, however, as Dr. Fallon, of the Belgian army, has well observed: "That rules and regulations on this subject, however carefully they may have been devised, and however minutely they may enter into detail, are but very imperfect guides. They furnish an outline, it is true, of the track which requires to be followed, but they do not enable us to escape many mistakes into which we may fall." The Prussian regulations for the medical examination of recruits, after reminding the surgeon that it is one

of the most difficult and responsible of the duties he has to perform, add: "It is impossible to frame specific rules for the examination of recruits so as to obviate every difficulty. In a great variety of cases the decision must depend on the discretion and experience of the inspecting medical officer." Hence the impropriety of ordering newly-appointed officers to rendezvous, or of intrusting the physical examination of recruits and applicants for survey and pension to the assistant surgeons on board vessels to which their seniors are attached or in squadrons, since officers of experience are guided in a great degree by their knowledge of the duties and habits of sailors, the deceptions they are accustomed to practice, and the requirements of the service. The routine of examination, which I here propose, and no single detail of which should ever be omitted, will, I believe, indicate to the medical examiner every important point to which his attention should be directed.

1. The examiner must satisfy himself of the sobriety and cleanliness of the applicant. It is proper to require a bath before examination,* for the better exposure of syphilides, etc.; and the least evidence of the narcotic effect of alcohol upon the eye, face, or heart should decide the medical officer to decline proceeding any further at that time.

2. The applicant having then made oath or affirmation of his freedom from any disability of which he is himself cognizant, let him stand erect before the examiner in a broad light, and perfectly nude, with chin elevated, heels together, and arms hanging extended, and let him slowly turn so as to present his front, rear, and sides in succession. This inspection will satisfy the examiner of the unfitness of the applicant should he have an attenuated

* Captain George Henry Preble, the commanding officer of the naval rendezvous at Boston, Massachusetts, which is located, as all such establishments should be, within the precincts of the navy-yard, has recently added two large bath-rooms to the rendezvous, where unclean men can bathe before examination, without expense to themselves, delay to the examiner, or risk of the loss of the recruit to the Government.

or crooked form, cutaneous or other external disease, glandular swellings and other evidences of the strumous cachexia, excessive development of fat, softness of muscular tissue, œdema, deformities, tumors, extensive cicatrices, nodes, varicosities, etc. Evidences of medical treatment, particularly when recent, in the shape of leech-bites, discolorations from blisters, seton, issue, or scarificator marks, or cicatrices of operations, in connection with marked diathesis, are valuable suggestions of liability to disease.

3. The general appearance being satisfactory, the next point to be determined is the existence of venereal disease. I particularly advise a careful inspection of the internal epitrochlear spaces and posterior cervical region for indurated lymphatic glandulæ, as positively indicative of the existence of a syphilitic taint. The penis should be scrutinized in its entire length, the prepuce retracted, the glans and orifice carefully inspected, the urethra compressed, and the man required to cough to eject purulent matter. Most men affected with gonorrhœa or gleet wash out the urethra by urinating immediately before entering the examining-room; so that when there is any reason to suspect this disease, it is well to look at the urethra again after all the other examination has been completed. The flexion of the glans upon the dorsum, and firm pressure near the bulb, generally occasion so much pain that the man winces and exposes himself, even when there is no discharge discernible. The scrotum should be carefully examined for varicocele, cirsocele, orchitis, and the other diseases of these parts. Any permanent abnormal condition, singularity of development, retention of testis, induration of globus minor and vas deferens, etc., should be noted on the descriptive list. Notwithstanding the large proportion of sailors affected with stricture of the urethra, it is scarcely possible to guard against their shipment except by requiring them to certify on oath to its non-existence, and by punishing them by sentence of court-martial on the subsequent exposure of the deception practiced. Few Americans could be persuaded, like the French, to submit to the introduction of a bougie; and it would be almost as repugnant to require them to urinate in the presence of the examiner.

4. Direct the applicant to stoop over, touching his toes with his fingers, the knees stiffened, and in a straight line with the legs, the feet apart, and the nates exposed to a strong light. Separate the latter widely, and inspect carefully to discover hæmorrhoids, prolapsus, fistulæ of the anus and perinæum, etc. The latter diseases very often escape observation, and, when overlooked, constitute the grounds for so many applications for survey. I remember one man who had been operated upon for fistula ani at two hospitals, reported himself on my sick-list on board the Preble, was again the subject of operation, transferred to a third hospital, and discharged from the service. A few months later I again encountered him an inmate of that same hospital.

5. While the man is still stooping, make forcible pressure on each of the spinous processes of the vertebræ, to discover spinal affections, and over the renal regions for evidences of tenderness.

6. Cause him to rise and face the examiner ; to present both the dorsal and palmer surfaces of each hand ; to flex and extend every finger ; to grasp with the thumb and forefinger and with the whole hand ; to flex and extend the wrists and fore-arms ; to pronate and supinate the hands ; to perform all the motions of the shoulder-joints, especially violent circumduction ; to extend the arms at right angles from the body, and from that position touch the shoulders with the fingers ; to elevate the hands above the head, palm to palm, then back to back, and, while standing thus, examine the axillæ and groins for enlarged lymphatics, and the latter regions closely for fistulous openings, herniæ, and relaxation of the inguinal parietes predisposing to ruptures, compelling the recruit to bend forward, cough and strain repeatedly and violently. Inspect the abdomen for umbilical hernia, and for enlargement of the liver and spleen. Next cause him to evert and invert the feet ; to stand on the heels and then on tip-toe, coming down on the heel quickly and heavily, and lifting the toes from the floor ; to bend each thigh alternately high up on the abdomen, and while standing on one leg to hop with each foot ; to squat low down by bending both knees and thighs, and to rise quickly from this position ; to per-

form all the motions of the hip-joints; to walk backward and forward slowly and at double-quick; and thus to exercise every articulation of the body in all its movements.

7. Examine the thorax by percussion and auscultation, especially in the infraclavicular and cardiac regions, at the same time observing the radial pulse; cross the arms upon the chest, placing each hand upon the opposite shoulder, and, inclining the body forward, examine the posterior regions of the thorax. Observe the movements of the chest during prolonged inspiration and expiration, recording its extreme dimensions by measurement with a tape in a horizontal direction immediately below the nipples. In this connection, the indications of the expiratory and inspiratory power afforded by the hæmadynamometer would be valuable. Observe the effects of violent exercise upon the pulse and respiration.

8. Examine the scalp for cicatrices, depressions, tinea, etc.; direct the head to be bent forward and backward, and to be rotated upon the neck; observe the motions of the lower jaw. Examine the ears for polypi, disease of the membrana tympani, etc. Test the hearing by asking questions in an undertone, at a distance, each ear being alternately closed by an assistant. Examine the eyelids and eyes, closing and opening them to observe the motions of the iris. Test the eye-sight by requiring the applicant to read test-types, or to distinguish articles of various sizes and colors at proper distances, using each eye alternately. Note the absence of cilia, corneal opacities, redness of tarsal edges, obstruction of the puncta, etc. Throw back the head and inspect the nostrils for polypi, ozæna, etc. Examine the teeth, noting great defects. Absence of all the teeth of one jaw, or of all the molars, is sufficient reason for rejection, since imperfect mastication, especially when the man is restricted to the regular sea-ration, is very apt to cause dyspepsia and its consequences. Note if the cutting edges of the central incisors are excavated internally, believed, on good grounds, to be indicative of congenital syphilis. Depress the tongue and examine the fauces for hyper-

trophied tonsils, syphilitic ulceration, mucous patches, etc. Decided stammering or difficult enunciation are sufficient reasons for rejection.

9. Ascertain whether he has been vaccinated, or presents satisfactory evidence of having had variola.

10. Discover by adroit questioning with what diseases he has been affected, and of what his parents or near relatives have died. This part of the examination is important, as it enables the medical officer to discover the fatuity or imbecility of the applicant. Many officers probably remember a man named Benjamin Seaman, who has several times appeared in the service as an ordinary seaman. He was utterly inefficient on board ship, and was twice sent to naval hospitals. Any careful observer ought to have been satisfied, after a few minutes' conversation, that this man was of very feeble intellect. Unprincipled persons sometimes attempt to impose weak-minded boys upon the service to rid themselves of their care. I was witness to two such attempts, in the year 1860, at the naval rendezvous at New York, by ministers of religion, one of them an officer of a charitable orphan asylum.

At the risk of the accusation of imposing unnecessary labor upon the examiner, and of making the inspection needlessly tedious to the subject, I urgently advise the establishment of dynamometric tests for ascertaining the absolute and relative strength of the individuals presenting themselves for shipment, as furnishing important data for determining their ability to perform the labor and endure the fatigues of a nautical career. I do not recommend this, however, for the object proposed by the French hygienists—the stationing of the crew according to the indications of the dynamometer. Thus, Kéraudren, writing on this subject, states, “Other things being equal, we consider those sailors who are endowed with great *manual strength* as the most proper to be stationed in the tops; we know what a prehensile power topmen require to gather up or reef a sail which is blown about or distended by the wind. Those men, on the contrary, who possess a considerable *renal* (lumbar) *strength* should be assigned to the

battery, and particularly to the working of guns of heavy caliber." No complex apparatus will be required for the purpose I suggest. It is desirable to ascertain and record the hoisting, hauling, and lifting power of the individual. The number of pounds which he can lift a certain distance, or the height to which he can elevate a certain weight by pulling steadily on a rope led through a block overhead, will give the first; by hauling on a rope led horizontally through a block fastened at the level of the waist, the second will be ascertained; while the third may, of course, be obtained by attaching as many weights to a bar or ring as can be lifted the same distance in the ordinary way. These very simple contrivances may be extemporized on board any vessel, and may readily be introduced into the examining-room of the rendezvous. The numbers obtained are not to be entered on the descriptive list, but should be recorded on the medical officer's register for statistical purposes, along with those indicated by the hæmadynamometer, should its use also be authorized.

THE RECEIVING-SHIP.

The receiving-ship is the nursery of the man-of-war's man. First impressions are enduring, and the sailor will be permanently influenced by the examples he sees around him on entering the service. The receiving-ship should be a disciplined man-of-war. The recruit, with his civilian clothes, should cast off his civilian habits, and witness, at the very outset, the spectacle of order, cleanliness, and discipline, to which he will be subjected during his whole naval career.

When the recruit leaves the rendezvous, he is furnished with a descriptive list and a due-bill for the authorized advance; but, instead of at once repairing on board, he returns to his boarding-house, indulges in a last debauch, and is finally carried off to the receiving-ship by his landlord. He is required to present himself clean, sober, and, until recently, outfitted. He is now allowed to obtain his clothing from the paymaster of the receiving-ship, but it is a matter of regret that this is not made compulsory.* The furnishing of the outfit constitutes a large part of the business of boarding-house keepers, and of a class of persons who have shops attached to or adjoining the rendezvous, and who seize upon such of the recruits, usually boys, landsmen, and merchant-men, as they can persuade to patronize them.

* Commodore Reynolds, Chief of the Bureau of Equipment and Recruiting, has issued, (January, 1873,) an order prohibiting the payment for the outfit of clothing out of the advance money.

The recruiting-office ought undoubtedly to be either on board the receiving-ship, or within the precincts of the navy-yard,* and the agency of the landlord entirely ignored by the Government. The vast majority of men now received in the naval service are picked up by the "landshark" as soon as they are paid off from a cruise, supplied with rum, board, and money for prostitutes as long as he sees fit, and then carried by him to the rendezvous, where he receives their descriptive lists and the due-bills for their two or three months' advance, and whence he takes them back to his tavern, indulges them in a farewell spree, outfits them with worthless clothing, and then transfers them to the receiving-ship. If any of them have had honorable discharges, he increases his bill proportionally, and likewise receives the three months' extra pay to which that discharge entitles them. The descriptive list and due-bill ought in every instance to be delivered only to the recruit himself, who should be informed that he must obtain his outfit on board the receiving-ship, unless he is in possession of clothing from paymaster's stores. He ought to be required to proceed at once to the receiving-ship; and when this is not done, the medical officer of the rendezvous should inform him that he has to be re-examined, and that he must wash his body, dress cleanly, and have his hair cut short before reporting himself on board. After the second examination by the surgeon of the receiving-ship, which is preliminary and requisite to his acceptance, and which is absolutely necessary not only for detecting recent venereal affections, but for discovering anything that may have escaped the first examiner, he should be required to bathe thoroughly, using warm water and soap, under the supervision of

* This has been the case for some time at all the naval stations, and is still so, except at New York, where the rendezvous is about being established as a matter of experiment in the same building with the office of the United States commissioner for enlisting seamen for the merchant service. All the latter are now required by law to be obtained from this office, where they are paid off at the expiration of their periods of enlistment, and where a reading-room, savings-bank, etc., are established, completely removing them from the influences of the landlords, whose intermediacy is no longer permitted.

the master-at-arms, in a part of the vessel especially assigned for that purpose, and be provided with the outfit of clothing indicated elsewhere. His former clothing should be returned to his family or disposed of for his benefit. From this time he should be regarded as the child of the Government, and should be cared for by the officers who represent that Government. He should be taught the necessity of obedience, the certainty of punishment for misdoing, and of reward for meritorious conduct, and he should be assured that the arm of authority by which he is chastised is also powerful to defend him from imposition and injustice. There is a class of persons who have filled certain petty-officers' positions on board receiving-ships for years, and who, like the sutlers at the various marine barracks, take advantage of their stations to extort money from new men on various pretenses, or make loans to them at exorbitant rates of interest. Some of these persons have acquired large fortunes by their nefarious trade, which they adroitly conceal from the officers of the vessel, who are continually changing and do not become familiar with or are indifferent to their extortions. Every transaction of this kind should be strictly prohibited by law, and every infraction of the law severely punished; a monthly allowance of pay, conditional upon good behavior, removing the excuse for obtaining money in this way. This is not ground foreign to hygiene. The moral health of a crew is as necessary to discipline and efficiency as the normal condition of their bodies. The superiority of the modern over the old-time sailor, as an intelligent, thinking man, is evident to the unprejudiced, and the late war demonstrated that he was no less zealous, brave, and competent than his ruder predecessors, who made a naval reputation for their country. It is the province of hygiene to correct all errors and abuses whatsoever which enfeeble the body, obtund the mind, or degrade the moral nature of the sailor. The purpose of its suggestions is to diminish sick-lists, empty brigs, and banish from the berth-deck the filth, obscenity, and profanity, of the existence of which only those are ignorant who never visit it except when it is prepared for inspection.

The sanitary regulations applicable to receiving-ships are the same as those I shall recommend to be adopted on board cruising vessels. They do not, therefore, need any special discussion in this place.

Before being drafted to a sea-going vessel, every man should be inspected by the executive officer as to the completeness of his outfit of clothing, and by the medical officer as to his health and cleanliness. The executive and medical officers of the sea-going vessel should also carefully inspect them as they come on board. Under the present system, men are sent away usually scantily clothed, sometimes in ill-health, and generally unclean in their bodies. I have known vessels to receive their crews in the winter season, a majority of the men being without mattresses, blankets, under-clothing, stockings, jackets, or overcoats, and many of them infested with vermin, with which they were compelled to suffer several weeks, the intensely cold weather rendering it impossible to cleanse their bodies. It is not uncommon to clear off the sick-list of the receiving-ship by sending its most troublesome *habitués* away with a draft, and when these men have to make a passage in a dispatch-boat or tug, to some distant navy-yard, they are frequently exposed for several days to the rigors of our coast, always insufficiently clad, and forced to sleep about the decks, without bedding, wherever they can find a place. Such men invariably report for treatment as soon as they get on board the vessel to which they are ordered. Many others, who were well when they started, contract severe acute diseases, which disable them when their services are most required, and often entail permanent organic changes, for which they have to be invalided sooner or later during the cruise. The medical journal has usually to be opened as soon as the ensign is hoisted and the vessel put in commission, and the apothecary is at work compounding prescriptions before the cook has lighted his fire at the galley. The transfer of a case of parotitis from the sick-bay of the receiving-ship to that of the Tennessee, a transfer effected without the consent of the medical officers, resulted

in the illness from that disease of more than seventy of the crew of the latter vessel. Every man-of-war should begin her cruise under the most favorable circumstances possible, and hygiene exacts nothing so important as that every man shall be in good health and provided with all the clothing he may need. The necessity for the vessel remaining a few days at the navy-yard after going into commission is apparent, that omissions may be supplied and provision made for every possible contingency, but it is no less important for the Government to provide a proper transport, with adequate berthing accommodations, for drafts of men sent from one naval station to another.

NAVY-YARDS.

There is a medical officer attached to every navy-yard, whose special and almost only recognized duty is to attend the sick among the officers and marine guard, and to examine applicants for enlistment in the Marine Corps. His more important functions should pertain to the sanitary considerations involved in the construction and proper preservation of the home of the sailor—questions similar to those within the province of civil health-officers. If it be important to require architects to consider hygienic principles in the construction of dwelling-houses, it is of no less consequence to insist that ship-builders shall have regard to the healthfulness and comfort of the structures in which so many thousand men have to pass so large a portion of their lives. In claiming for the medical corps this professional interest in the building of vessels, and the care of those in ordinary, no interference is sought with the customary routine of dock-yard duty. The recommendations of the medical officer are of general applicability, and would be better embodied in stringent regulations of the Department than left to the suggestion of individual officers. The medical officer of the navy-yard is, doubtless, the proper person to supervise the observance of these regulations, and call attention to their neglect by subordinates.

The objects it is urged upon the Department to enforce by regulation are—

1. To preserve vessels in ordinary and those building as dry as possible.
2. To keep them perfectly clean.

3. To provide the most perfect means for their ventilation.
4. To provide the most perfect means for the admission of light into their interior.

Dampness, dirt, foul air, and darkness are the direst enemies with which the sailor has to battle when afloat. They can never be wholly routed and conquered, but they may be subdued and rendered comparatively harmless. Leagued together, they slaughter more than all the adversary's powder and shot. The most accomplished ordnance officer has no more subtle and powerful ally, in the work of bringing death to his country's foes, than the poor hygiene of his opponents. Sir Gilbert Blane attributed the failure of the British arms during our war of Independence to the deficiency of numbers, and want of strength and energy of the men from excessive sickness and mortality, and declared that if the same death-rate in their navy had continued during the French revolutionary war seamen would no longer have been procurable, and their famous victories have never been achieved; so that, says Professor Guy, "it was not the seamanship and fighting qualities of our sailors alone that carried us triumphantly through that terrible contest, but a reduced mortality, due to the sanitary discoveries and reforms, which first recruited our population by saving lives in infancy and childhood, and then cut off from our forces, by sea and land, the destructive supplies of jail-fever, scurvy, dysentery, and small-pox." Therefore, while, inventive talent is being strained to meet the exigencies of an exceptional state of war, let something be done to stay the murderers who are dealing out death as well in times of peace as in those of conflict.

It is not expected that ships can ever be made as comfortable and healthful as homes on land. The creatures that swim the sea and those that roam over the earth each have their habits. The carpeted and mirrored steamship, like the painted harridan, is pretty only in spots. Her foul and unclean parts are only masked by the local splendor. The attempt at reform need not, however, be stopped because absolute perfection is impossible.

Humanity demands that all should be done that may. The floating hells of the past century, and the rude, strange race who lived and died upon their ocean home, who spoke a language unintelligible to shore folk, and were ignorant of the customs of the land world, have become historical. Sailors are men, and ships the habitations of men, but there are still filth and depravity and sickness where there might be cleanliness and decency and health. The medical corps is laboring to this end—not to overturn for the sake of overturning, as has been unkindly and unjustly insinuated.

The first great fact which should be impressed on all naval constructors, sailing officers, and dock-yard officials, is the necessity of keeping a vessel as *dry* as possible, not only when in commission and in ordinary, but even when on the stocks. The wood of which a vessel is composed is a dead organic substance, subject to molecular decay, which is accelerated by heat and moisture. The temperature is to a certain extent beyond our control, but it is not altogether out of our power to maintain a certain degree of dryness, which will not only retard this decomposition, but diminish one of the causes of that humidity on board ships which I shall presently show to be so prejudicial to the health of the crew. All vessels should be built under cover, in dry seasons of the year, of old and seasoned timber, and the operations of building should be conducted slowly, so that a circulation of air may take place between all parts of the frame. When timber has been allowed to soak in salt water for purposes of preservation, it should be thoroughly dried before being used in the construction of vessels. Green wood, from the amount of contained sap and the softness of its tissues, is more readily decomposed than old hard timber in which the wood-cells are compact, and vessels constructed of it are notoriously unhealthy. Fonssagrives, whose excellent work on naval hygiene is the most complete that has ever been published, narrates two instances in point: “We are indebted to M. Delalun, *capitaine de vaisseau*, for the two following facts, demonstrating the influence of the mode of construc-

tion of vessels upon their salubrity. At Navarino the crews of our vessels were properly subsisted and were spared by the scurvy. The vessel of Admiral de Rigny alone, although it had fresh meat twice oftener than the others, was decimated by this affection. There were about eighty men constantly on the sick-list. The fact was explained by the humidity of the wood which was used in this vessel and by the rapidity of its construction. The improvised squadron of Antwerp (1812-'13) had been built of wood felled while in sap. At the end of eight years all these vessels were out of service, and there was not one of them that could be repaired. The ship L'Hector, among others, was so rotten that she could not even be used as a hulk. She was constantly full of scorbutic cases." The histories of our own "ninety-day gun-boats" and "double-enders" illustrate the same fact.

Vessels in ordinary should be immediately housed over. When fitting out for sea, it should be the especial duty of the watchman or ship-keeper to carefully close all hatches and ports in wet weather, and open them in dry. It is not unusual when a vessel is in the hands of the navy-yard *employés* to find her lower decks flooded with water or piled up with snow, even when her crew is hourly expected on board. Large painted awnings or tarpaulins should be provided and so arranged as to be quickly spread on the occurrence of rain or snow.

No vessel can be made absolutely impervious to water. It finds entrance by a thousand channels, by opening seams, by worm-holes, by leakage from tanks and casks, by the condensation of the aqueous vapor in the atmosphere. Great care should, therefore, be taken in ship-building that it be allowed to run down freely into the limbers, and find access, without obstruction forward or aft, to the pump-well, whence it can be daily removed. Medical Director Joseph Wilson, in his work on naval hygiene, calls attention to a very common defect in pumps, which are too short to reach to the bottom of the well, and thus discharge all the accumulated water. I translate the following instance quoted by Fonssagrives from a thesis on dys-

entery by M. Collas, a surgeon in the French navy, illustrating the danger that may result from any obstruction to the discharge of this bilge-water: "The corvette *La Triomphante* was anchored at *Nouka Hyva*, at a point where there were no marshes. There was not a single case of dysentery on shore. Soon afterward this disease commenced to rage on board. The agitation of the vessel, first by a gale of wind and then by getting aground, soon caused new cases to appear. The hold was examined, and under the store-room a pool of stagnant water was found which could not run into the pump-well, the vessel being down by the head from the anchors on the bow. The place was carefully cleaned, and the epidemic disappeared."

It would be supposed to be impossible to make complaint of the uncleanliness of newly built vessels, but it is a fact that there are few which do not carry with them from the stocks as great a source of disease as the foulness accumulated by a whole ship's company during a cruise. There is a general neglect, inexcusable and criminal because it does not involve much trouble, to remove the chips and other remains of building-materials, which collect on the floor of the vessel and are planked up under the ceiling, where they remain year after year, decomposing under the influence of confined and heated air and the admixture of fresh and salt water constantly in the limbers. The report of the Portsmouth Relief Association upon the origin of the yellow fever which prevailed at Norfolk and Portsmouth, Virginia, in the year 1855, relates an instance of frightful extent of illness traceable to this cause; and an illustration quite as conclusive was furnished by the United States ship *Macedonian* during her cruise on the north coast of South America. The fact was communicated to me by her first lieutenant. Numerous cases of fever having occurred on board this vessel, it was remarked by her surgeon, now Medical Director Grier, that the men attacked were chiefly those who slept in the forward part of the vessel. A local cause was suggested and discovered by scuttling the fore peak. As soon as an opening was made, a noisome

effluvium arose, and a candle introduced into the peak was instantly extinguished. Both sides were scuttled, wind-sails were let down, and, after the place was sufficiently ventilated to allow men to descend into it with safety, was cleaned out. More than fifty bucketfuls of putrescent vegetable matter and several hogs-heads of foul discolored water were removed. From this time the disease disappeared. A letter in the London Times, September 18, 1861, from Halifax, where Her Britannic Majesty's ship Jason then was, states that "she is a new vessel, built of green wood; her bilges cannot be kept sweet; the officers have tried all means to do so without success. This is considered the principal cause of her being so unhealthy. The stench is abominable, particularly in the after part of the ship and in the officers' cabin, and the Jason is not the only sickly ship in which such a nuisance has existed."

Naval constructors will, doubtless, admit that when planning vessels the very last subject, if ever, in their thoughts is hygiene. They aim at buoyancy, speed, strength, lightness of draught, but never salubrity. The means of ventilating a ship in commission will be hereafter referred to, but the constructor has it in his power to make those means much more efficacious than they can be under the present system of internal arrangements. There should be no such thing as a solid bulkhead in the inhabited part of a vessel. Some of our finest ships have their berth-decks ruined by being divided into four or five close compartments by as many complete transverse bulk-heads. Every partition, those separating private apartments as well as those marking the larger subdivisions of ward-room, steerage, warrant officers' steerage, sick-bay, etc., should be latticed or gratinged above and below. This can always be done without any sacrifice of strength. The cabin and ward-room bulk-heads and doors usually have Venetian blinds or perpendicular bars in their upper part, but the lower panels should also be permeable to air, and all other bulk-heads, whether of store-rooms, lockers, sail-room, shell-room, etc., should be arranged in the same way. Every place should be accessible

to air, which should circulate freely forward and aft on every deck of the vessel. The furniture of officers' rooms is not only antiquated and inelegant, but such as unnecessarily diminishes the cubic air-space of the rooms. Cumbersome and unwieldy bureaux, bunks, and wash-stands are taken out and restored, cruise after cruise, without change or improvement. Instead of the huge box-like wash-stand, a neat iron upright, with rings for basin and pitcher, sockets for mug and soap-block, and hooks for towels, might be devised to occupy one-fourth the space. The bureau could be made of much lighter materials, and the bunk would be far more comfortable if constructed on the principle of the French swinging cradles. A neat style of clothes-locker might be contrived of wire which would be cleaner, more commodious and more ornamental than the great wooden boxes and drawers that are now never opened nor closed without difficulty. These changes would furnish space for a much larger amount of respirable air, and if, in addition, all the bulk-heads were latticed, though only for a few inches at the top and bottom, the officers' room would not be such an inclosure of confined and heated air, from which the occupant escapes on deck in the morning with nausea, dyspnœa, and headache, and to which he returns with loathing at the dampness and foul smell he encounters.

The apertures for the admission of light are necessarily few. These are the gun-ports, air-ports, and hatchways. Sometimes deck-lights of very thick glass are introduced in the ward-room and cabins, and might, with great propriety and no risk, be distributed forward over the berth-deck.

These improvements are all feasible in old as in new vessels. Naval constructors would, undoubtedly, cheerfully exercise their skill in the furtherance of these hygienic objects if the matter were brought officially to their notice. Some of these gentlemen, with a laudable desire to contribute to the comfort of officers, have introduced the novelty of bathing-tubs, and I am, therefore, sure they would be no less disposed to devise improvements conducive to the health of those who have to inhabit the floating houses they put together.

HUMIDITY.

The great danger the sailor encounters is water. Not the mighty deep he traverses, on whose wide waste he is but an indistinguishable speck, and from whose depths he is only separated by a few inches of plank. It is not the water without his vessel that imperils his life so much as that within it—that which saturates his clothes and bedding, fills the air he breathes, and, creeping in wherever that air can enter, permeates the very tissue of the wood of which his ship is built. This is his enemy; terrible because unseen, powerful because denied, depreciated and therefore unresisted. Fewer lives are lost by shipwreck than by the operations of this subtle agent. Man's skill has mastered the fury of the ocean. He is able to oppose its storms and currents, and go upon its surface as he lists; but he makes no attempt to combat this insidious slayer.

The daily variations in the hygrometric constitution of the atmosphere do not amount to more than a few grains in weight per cubic foot. Air is saturated at 52° F. by 1.42 per cent. of its volume of aqueous vapor, in weight about four and a half grains to the cubic foot. As the temperature rises it becomes able to retain a larger quantity of vapor in solution, being saturated at 77° F. by three per cent. or 9.8 grains, while at the freezing-point it holds only a fraction over two grains, or less than one per cent. of its volume. Ordinarily, it seldom contains more than two or three grains, or from thirty to fifty per cent. of the quantity of water in the state of vapor required to completely saturate it. The fluctuations in humidity, which the rheumatic invalid appre-

ciates so sensitively, sometimes correspond to a change of weight of less than a single grain. The marine atmosphere normally contains a larger amount of aqueous vapor than the terrestrial, and on board ship the proportion is further increased by the exhalation of fluid from the surface of the bodies of the men confined upon it, and very greatly by that from the lungs in the act of expiration, twenty-five to forty ounces of water being discharged daily by each individual in this way. The evaporation from a wet deck supplies water enough to the atmosphere to raise it to its point of saturation; and when this is repeated without regard to temperature and season, all those evils result which are attributed by the scientific to the prolonged influence of moisture and heat, and which have conferred upon the climate of the west coast of Africa its notorious unhealthfulness; and as far as my own observation has extended, it has generally escaped attention that these two morbid influences usually act in conjunction. According to Tyndall the aqueous vapor of the atmosphere absorbs solar heat radiations with rapidity, and the greater the amount of vapor and the more humid the atmosphere the greater will be the amount of heat absorbed, and consequently the smaller will be the excess of sun temperature over that of the shade. Hence, a ship, the atmosphere of which is always kept near the point of saturation by being frequently deluged with water, will have the temperature of its shaded parts raised almost to the height of those exposed to the unshielded sun. In temperate climates the usual average yearly excess of sun over shade is twenty degrees, and in the tropics it is three times as much. It is evident, therefore, that the beneficial effect of spreading awnings is very much diminished and the temperature of the lower decks greatly augmented, if the ship is kept damp; and this is not inconsistent with the fact that the occasional sprinkling of a dry heated uncovered spar-deck momentarily reduces the temperature through evaporation.

Since, then, such minute differences in the amount of aqueous vapor in the atmosphere disturb the harmonious action of the functions of the human body, how urgently necessary are those

measures of precaution which are insisted on by medical men! There is but one opinion on this subject among naval surgeons all over the world. "Humidity," says Pringle, "is one of the most frequent causes of the derangement of health;" and Fonsagrives, the greatest authority on naval hygiene, uses this language: "The practice of medicine on board ship confirms the truth of this assertion: Whenever a vessel may be said to be very damp, it may be said to be an unhealthy vessel. All the authors who have written on the diseases of seamen, Rouppe, Lind, Poissonnier-Despérières, Kéraudren, Raoul, etc., are unanimous in attributing a very great importance to this etiological influence. The latter, after having, in his report on the cruise of the Caraïbe, analyzed the causes of the production of scurvy on board different vessels, and discussed all other influences, as nourishment, sojourn in port or at sea, different stations, etc., finally attributed this formidable affection to the persistence of humidity. All are of one accord on the insalubrity of an atmosphere saturated with water, in which the cutaneous depuration greatly flags, and respiration is performed with difficulty."

English testimony is quite as decisive. Captain John McNeill Boyd, of the royal navy, candidly admits that "the objections to wet decks are supported by the medical officers, with such a weight of evidence that they cannot be gainsaid, and if the mate of a deck does not think the health of the crew a matter of indifference, he may so arrange the process of cleaning as to prove that dry decks are not incompatible with health;" and in the Life of Collingwood, it is stated that "his flag-ship, with a crew of eight hundred men, was on one occasion more than a year and a half without going into port, and never had more than six on her sick-list. This result was occasioned by his system of arrangement and his attention to *dryness*, ventilation, etc., but above all by the contented spirit of the sailors, who loved their commander as their protector and friend, well assured that at his hands they would receive justice and kindness, and that of their comforts he was more jealous than his own."

The unanimity of our own medical corps in this matter, instead of attracting that attention and consideration it deserves from commanding and executive officers, is too often regarded as a mere perverse contrariety of opinion, having no other object than a mean and petty attempt to interfere with the routine of the ship; and this ungenerous belief will probably continue until the principles of hygiene are better understood by the officers of the other corps. The consequences of ignorance on this point were remarkably and conclusively demonstrated on board the Coast-Survey schooner *Varina*, during the autumn of 1860, while anchored off the navy-yard at Brooklyn. The officers of this little vessel, desirous of emulating the customs of their huger men-of-war neighbors, scrubbed their decks every day without regard to weather. Numbers of her crew soon became ill with bronchial, pulmonary, and rheumatic affections, and at one time nearly a third of them had been sent to the hospital. As soon as the fact was represented to Captain (afterward Admiral) Foote, then executive officer of the yard, he ordered the wetting of the decks to be discontinued, from which time her sick-list rapidly diminished. Since the first issue of these suggestions, I have been favored by officers of experience, both line and medical, with numerous instances corroborating these views. A prominent case, related to me by Medical Director Maxwell, was that of the *Powhatan*, a vessel formerly remarkably healthy, which was anchored during the rainy season at Kow-luen, opposite Hong-Kong, and soon became totally ineffective from an enormous sick-list of pneumonia, dysentery, and fever. Agreeably to his recommendations, the ship went to sea with every furnace lighted and every port and hatch kept open until she was thoroughly dried, with the immediate abatement of the miasmatic affections which had decimated the crew. Admiral Boggs informs me that he, of all the naval officers commanding the mail-steamers to Aspinwall, escaped illness by having his cabin heated every evening; and he narrates a conclusive instance of the prophylactic influence of heat from his experience on the coast

of Africa, when compelled to pass a couple of days on shore below Monrovia, he and all but two of his men remained with impunity by sheltering themselves at night in a hut in which a large fire was kept burning, while those two who slept outside succumbed to the prevailing fever.

A ship must be kept dry to be healthy; her crew must be healthful to be efficient. To promote this efficiency is alike the duty of medical officers as of commanders and lieutenants. But she must be kept clean, it is replied; cleanliness is likewise essential to health. The daily wetting of the decks, however, is not evidence of cleanliness, but of dirt. That is an ill-managed vessel which becomes so quickly foul. A well-arranged ship and well-conducted crew do not accumulate dirt. When the weather or sea necessitates the eating of meals below, not a crumb should be spilled from a mess-cloth. The cooks at the galley should be required to remove grease as they let it fall. Tarpaulins should be spread whenever the hold is broken out. The cleaning of mess-things, blacking of boots, brushing of clothes, and every other operation that can occasion dirt, should be done in the open air. The unclean berth-deck is so only because of the inattention or incapacity of the mate or other officer whose duty it is to take care of it.

Berth-decks and covered gun-decks do not require to be wetted oftener than once, or, at most, twice a month. They should then be cleaned thoroughly, and not upon any stated day, but when the weather is such as will justify it. A dry, clear, sunny day, after a prevalence of fine weather, is the most proper for the purpose. It should always be selected and indicated by the commander himself, who should solicit and be guided by the advice of the medical officer. On these days all other exercises should be suspended. Every man, except the cooks and such others as are engaged in the work, should be sent on deck with his bag and ditty-box, and should be compelled to remain there until the deck is thoroughly dried. Hot water should be supplied for the purpose from the galley, and the greatest care should be taken

not to use it in such quantities as to overflow the coamings of the hatches into the hold. After scraping and scrubbing as much as is necessary, the greatest expedition should be made in removing the unclean water by swabs and squilgees, and then drying-stoves should be lighted and kept swinging until the decks are completely dried, when they should be thoroughly coated with shellac. The common form of drying-stove is objectionable, because not provided with cover and pipe for discharging, through the ports or hatchways, the products of the combustion of the charcoal, an arrangement which should only be omitted when the vessel is rolling too much to allow its use. The hatchways should, all the while, have been wholly uncovered, wind-sails let down to the deck, ventilators worked, and, when possible, air-ports opened. In this way a lower deck may be properly cleaned with the least detriment to the health of the ship's company.

When a prevalence of wet weather causes the decks to become damp, they should be scraped and drying-stoves should be frequently lighted. No other process of cleaning should ever be tolerated. A practice prevails on board some vessels, which cannot be too strongly reprobated, of going over the berth-deck every morning with a wet swab, for what purpose it is difficult to understand except it be to maintain an appearance of having observed the ancient custom of daily scrubbing, the decadence of which some officers class with the abolition of the cat, as among the causes of the degeneracy of the Navy.

The flying berth-decks of small vessels should be scrubbed and dried in the open air, as should also the hatch-covers, ladders, and gratings of all other vessels which are wetted on any other than the day for the general cleaning of the lower decks.

It is singular that while there is such difficulty in keeping water which finds an entrance from natural causes out of a vessel, there should be such a universal habit of deluging it above and below, and thus superadding an artificial and unnecessary cause of humidity. There is a general custom of wetting or "holy-stoning" the spar-deck every morning, which has been handed down from

the past century, with other observances that are equally inconsistent with the intelligence of this age. It is very proper to do this when the crew have soiled the deck with soap-suds by washing clothes and scrubbing hammocks, and these occasions occur so frequently that there is no necessity for wetting it at other times, except after some special unclean work, as weighing anchor, coaling, provisioning, etc.

Small vessels are habitually wet when under way. This can be partially obviated by greater care in fitting bucklers to the hawse-holes, and by calking the bridle-ports.

In wet weather the officer of the deck should always promptly cause the boom-cover to be hauled out at sea, and the awnings to be spread and housed when in port, rather than cover the hatchways with tarpaulins.

In this connection I have to suggest a protection against getting wet, which, to the disgrace of the educated officers of the present day, has not been already generally instituted—a hood for the head. Men are compelled to visit this place and sit exposed to no matter how heavy a rain or intense a sun. This is one of the most potent sources of disease on board ship. A man gets out of his warm hammock at night, and returns to it with his clothes drenched with water. His blankets and mattress become wet, and in vessels where bedding is aired but once in two or three months, they remain damp and foul all that time. On board small vessels without sick-bays and water-closets for the sick, invalids often refuse to use the close-stool in the vicinity of their shipmates' messes, and watch an opportunity to elude the vigilance of the nurses and steal on deck. Very many cases of disease, mild in their incipiency, have been aggravated by this cruel exposure. Nothing can be easier than to provide a properly fitted tarpaulin or canvas cover for the head, which would not only defend from the rain, but from the spray continually breaking over the bows at sea. Even if unsightly, though it need not be so, a sacrifice of appearance is a small evil that will be productive of so much good. So many comforts

have of late been instituted in cabins and ward-rooms that it were only generous to extend a semblance of them to the berth-deck and fore-castle, where the customs of civilized life may be imitated without greater risk of effeminacy in the one case than the other.

Another cause of humidity on board ship is provisioning, wooding or coaling in bad weather. Unless absolutely necessary, these operations should be conducted only on dry days. No wet or green wood, wet or unclean casks, or wet coal should ever be allowed below the spar-deck. All coal and wood should have been kept under cover before being taken on board, and the latter should also have been deprived of its bark and baked. The hoops of all casks should also be barked, and the casks carefully swept prior to being sent below. It would be an additional safeguard to whitewash them, and this could be repeated whenever the hold is broken out. In this way the hold and spirit-room may be kept perfectly clean and dry.

It is a matter of controversy whether water should ever be purposely admitted into a vessel. It is manifestly improper when it is made a daily habit for the theoretical purpose of "keeping the vessel sweet," and the only occasion when it is allowable is when bilge-water has formed, and the bilges are so constructed that they cannot be cleaned in any other way. In this case the bilge-water should be pumped out, and fresh water admitted into the pump-well by a hose from the stop-cock in the ship's side, but not to exceed in amount the depth ascertained by the first sounding of the well. This should then be discharged, a second supply of water admitted and pumped out, and this operation should be repeated until the discharge from the pump-well is free from smell. On board some vessels a very reprehensible practice exists of opening the magazine-cock and flooding the spirit-room and hold. Such vessels will always be troubled with bilge-water, which forms the more rapidly as these wettings are frequent. Experiments are now being made with an automatic bilge-pump of very simple construction, which proposes to prevent any accumulation of water

in the bilges, and the reports of its effectiveness, on board vessels in which it has been introduced, are so satisfactory that it will probably be generally adopted.

I would also urge the necessity of requiring hygrometric observations by the medical officers of every vessel in commission, with a careful particularization of the attendant circumstances, so as to establish on an indisputable basis of fact the propositions here advanced. These observations should be the duty of the assistant surgeon, and not be delegated to nurses or apothecaries, who would perform it in the same superficial manner as the quartermasters, who record the temperatures indicated by the dry and "wet-bob" thermometer. The points to be determined are the degree of relative humidity and the absolute weight of aqueous vapor in a cubic foot or litre of air. It is desirable that every medical officer, on duty on shore or afloat, should be required to make a detailed annual sanitary report,* embracing not only a summary of these and other meteorological observations, but precise information on all the subjects that relate to the preservation of the health of the Navy, and which are certainly as important as the records of the failures to effect this object, as shown by the quarterly reports of sick and expenditure of medicines and medical stores necessary for their treatment.

* Surgeon-General Palmer, in the forthcoming revised volume of Instructions for Medical Officers of the Navy of the United States, requires such a sanitary report from the senior medical officer of every vessel and shore-station.

VENTILATION.

It is scarcely possible on board ship to supply every man with the thousand cubic feet of space for air which physiologists declare to be the minimum that can be safely assigned, except when extraordinary provisions are in operation for its renewal. Probably no single-decked vessel in the service supplies one-third of that amount. The best authorities agree that a healthy man requires a supply of twenty cubic feet of fresh air every minute. Hammond states that thirty to forty are desirable, and Professor Donkin places the minimum at three thousand cubic feet per hour. According to Martin, "the constant movements going on in the atmosphere prove that the amount of change which nature has provided for healthy existence is unlimited. The test of ventilation in a sick-ward is the comparative freshness or purity of the air. The interesting experiment of Lariboisière appears to prove that about four thousand cubic feet per hour are required to insure this." The amount of air which passes through the lungs is variously estimated at from three hundred to four hundred and eighty cubic feet, four per cent. of which, at the ordinary rate of respiration, is carbon di-oxide, (carbonic acid-gas,) that is, one hundred times as much as normally exists in the atmosphere, while the proportion is largely increased when the latter is moist; consequently, were there no renewal of air by ventilation on board ship, one day would suffice to make its atmosphere irrespirable, since, according to Lankester, over six parts in ten thousand in a breathing atmosphere are adverse to comfort and obnoxious to health. The rapidity with which air is deterio-

rated by respiration may be understood by imagining a room seven feet in size in each of its dimensions, and having nearly the cubic capacity of three hundred and fifty feet, which, containing normally about one gallon of carbon di-oxide, will, at the end of ten hours, all apertures being closed, have this amount raised to ninety-two and a half gallons by the respiration of a single adult man, showing that every particle of that air had passed through his lungs. This, however, is not the only noxious element acquired by air in apartments which are defectively ventilated. Every act of expiration discharges a large amount of aqueous vapor, raising its quantity, according to Dr. Craig, of the United States Army, from one to seventeen grains in a cubic foot; elevates the general temperature of the air, and thus increases its absorbent power for vapors; and further, adds a variable amount of organic matters, the presence of which is distinctly enough indicated, even to the unprofessional observer who leans over the fore or main hatch toward the end of the first watch, by the heavy mawkish odor, which appeals to the sense of taste as well as to that of smell. According to Gavarret, air thus vitiated is unfit for respiration, and may lead to serious accidents, not on account of the carbon di-oxide (carbonic acid gas) it contains, but from the mere presence of the putrid exhalations of the body, since organic matter in stagnant air, as that of berth-decks, putrifies as rapidly as that in stagnant water. Fonssagrives believes "that air may yet supply the chemical needs of respiration in a place crowded with men, when from the organic miasms which impregnate it, it has already become a deleterious agent," and thus quotes Piorry: "That which is the most dangerous in the vitiated air of confined habitations we do not know; chemistry does not inform us of it; but our senses, more delicate than chemistry, demonstrate to us, in an evident manner, the presence of deleterious putrid matters in the air in which man has long resided." Nor is respiration the only human process which empisons the air. The whole cutaneous surface imperceptibly, but ceaselessly, contributes a determinate amount of aqueous vapor, carbon di-oxide, and

organic emanations. Furthermore, to produce these nocuous elements, which are thus poured into the atmosphere, each adult on board ship, according to Dumas, completely disoxygenates twenty gallons of air every hour, requiring the hourly addition of more than a hundred gallons to simply restore its equilibrium, disturbed by this cause alone, without taking into account that necessary to wash away or dilute the morbidic vapors and gases which have been added. Finally, the decomposition of provisions and ship's stores, especially coal, and that resulting from the admixture in the hold of fresh and salt water with the leakage of brine, molasses, vinegar, etc., all operate to deteriorate the atmosphere of the ship, not merely by the addition of the gaseous products of this decomposition, but, as in the case of the crew, by the direct removal of the oxygen, on which the fitness for respiration of the atmosphere depends. The problem of ventilation, therefore, is one of the most interesting and important that can occupy the naval hygienist.

The greater number of our national vessels are overcrowded with men. Few can berth their whole complement. With hammock-hooks only fourteen inches apart, less than the breadth of a man's shoulders, with numbers swinging under the top-gallant-forecastle, many of our single-decked vessels, when both watches are below, as in port, still have a dozen or more men who are compelled to billet themselves on deck, behind mess-chests, or wherever else they can stow themselves away. Frequently vessels are sent home from distant stations cumbered with men whose terms of service have expired, with prisoners, and, with manifest impropriety, the accumulated chronic invalids of the squadron. The ship-fever of emigrant packets, and the typhus, not uncommon on board men-of-war twenty years ago, and notably virulent among the transports employed during the Crimean war, were due to overcrowding. Fonsagrives narrates the case, among others, of the corvette *La Fortune*, which, having been employed in transporting Turkish troops, had two-thirds of her crew prostrated by this disease, of whom half were lost, and was obliged to land the rest at

Messina. Even when the ill effects of overcrowding are not so disastrous and manifest, they are not compensated by any advantage whatsoever. The effective number of the crew is reduced by a sick-list of from fifteen to twenty-five a day, and the invalids, who require to be returned to the United States, ultimately bring down the complement of men to the capacity of the vessel. All this additional expense, as well as the discomfort which a large sick-list necessarily occasions to the well, might be obviated by a reduction of the ship's company at the outset. As the small gun-boats and iron-clads are the worst circumstanced in every sanitary respect, and besides being officered by young and inexperienced men are, in consequence of their lightness of draught, often required to cruise up narrow rivers and in unhealthy localities, they present, relatively, the largest number of disabled men, and thus have their effectiveness seriously impaired; hence, while especial care should be taken to provide for the proper ventilation, cleanliness, etc., of this class of vessels, it is desirable to limit their complements of men and officers to the smallest numbers absolutely necessary to work them, introducing every possible labor-saving appliance known to the nautical art, and dispensing with superfluous attendants by diminishing the number of officers' messes; and furthermore to change their crews annually by transferring them to the larger vessels of the squadron.

Too little attention is paid to the subject of ventilation by officers of the Navy. I have heard them express incredulity when told there was danger from battening down hatches two or three days continuously, and I have seen a boy confined for some trifling offense six hours at a time for several successive days in a narrow "sweat-box," with only a few perforations at the top of the door, and none at the bottom or sides, and where, after sinking from fatigue below the level of the holes, he had to breathe an atmosphere as fraught with danger to his life as that of the most dreaded plague-ridden spot on earth.

The neglect to provide proper means of ventilation has been often attended with rapidly fatal consequences. The case of the

Black Hole of Calcutta, where one hundred and twenty-three persons out of one hundred and forty-six died after one night's confinement in a room eighteen feet square, provided with only two small windows, is familiar to every reader. Of three hundred Austrian prisoners confined in one room after the battle of Austerlitz, two hundred and sixty died; and Carpenter narrates an equally horrible catastrophe which occurred afloat: "On the night of the 1st December, 1848, the deck passengers on board the Irish steamer Londonderry were ordered below by the captain on account of the stormy character of the weather, and although they were crowded into a cabin far too small for their accommodation, the hatches were closed down upon them, and the consequence was that out of one hundred and fifty individuals, no fewer than seventy were suffocated before the morning." Instances of less severity used to be of common occurrence on board men-of-war. On one occasion, nine or ten prisoners were confined in the main hold of a single-deck sloop-of-war and half of the hatch closed over them. At the end of four hours one of the men was taken out asphyxiated, and resuscitated with difficulty. The occupants of "sweat-boxes" have often been found almost lifeless or have fallen out insensible as the doors were opened. Dr. Billings, of the United States Army, in his report on barracks and hospitals, published in Circular No. 4, from the Surgeon General's Office, refers to instances of exhaustion and insensibility from confinement in "sweat-boxes," as experimental evidence in determining the minimum amount of air on which life can be supported. In the same able report, he fixes the proper allowance of fresh air for soldiers in barracks at two thousand cubic feet per hour for each man. It is useless to expect to violate with impunity the immutable laws of our existence, and therefore, so long as the circumstances of our nature require the inspiration of oxygen into the lungs and the ingestion of food in the stomach, it will be just as impossible to compel sailors to do without the one and be healthy, as to abstain from the other and live. Statistical inquiries on mortality prove beyond a doubt that of all the causes of death which

usually are in action, impurity of the air is the most important. Guy states, in his recently published lectures on public health, as the results of a laborious inquiry into the health of letter-press printers, and of others following in-door occupations, "that out of thirty-six thousand deaths a year in England and Wales, which I attributed to pure pulmonary consumption, five thousand might be saved by increased space and improved ventilation in shops, work-shops, and factories; that among men doing the same work under the same roof, the liability to consumption was determined by the space; and that this might be narrowed to a point at which men would die as fast as by some contagious malady, so that here, as in Italy, consumption might seem to pass from one person to another." According to Dr. Parkes, the extraordinary amount of consumption which prevails among the men of the royal and merchant navies, and which in some men-of-war has amounted to a veritable epidemic, is in all probability attributable to faulty ventilation. I have remarked the same excess of tubercular disease of the lungs in our own naval service, and injustice has undoubtedly been done in many cases of phthisis pulmonalis which were certified "not to have occurred in the line of duty," but assumed to have had a remote inherited origin, when the disease was in fact directly attributable to the unwholesome and humid air they were compelled to respire, for the researches of Bowditch and Buchannan show that, independently of mere impurity of the atmosphere, there is a decided relation of cause and effect between dampness and consumption. The nosological heading "phthisis," on the quarterly report of sick, often represents only advanced cases of the disease, and not all of these, many being carelessly recorded as bronchitis chronica, while a very large proportion of incipient pulmonary tubercle is simply classed as bronchitis acuta or catarrhus. Constitutional predisposition assuredly existed in some of these, but the majority might have escaped the development of the disease had they lived under proper hygienic conditions, especially with regard to a sufficient supply of pure air.

Notwithstanding the importance of this matter of ventilation, few officers trouble themselves about it further than to order the wind-sails set when the weather is fine. These are certainly among the most important ventilating apparatus we possess, but they are seldom set in wet, cold, or very windy weather, although a larger proportion of the crew is below at these times, when the hatchways are also usually partly covered up. On many of these occasions they could be kept hoisted without inconvenience. They ought not to be lowered at every fresh breeze or rain-squall. A fire-tub placed under the foot of the wind-sail and watched would prevent the deck from becoming flooded with water, and in cold weather the men had better protect themselves by extra clothing than keep warm by confining and corrupting the atmosphere; for though the human odor is not perceptible when the temperature is low, the air is still loaded with organic matter, and disoxygenation and the exhalation of carbon di-oxide go on as at other times. Steamships are now generally heated by coils of steam-pipes, and if proper apertures are provided for the discharge of the heated and access of fresh air, they become excellent aids to ventilation. Wind-sails, of which there cannot be too many, require to be carefully watched while set. They should always be accurately trimmed to the wind, kept free from bends, and fastened down not more than a foot from the deck, never triced up by a lanyard to the beams. When the latter is done, those men who sleep exposed to the currents of air through them are apt to contract catarrhal affections. The bottom piece, sometimes added for ornament, should always be removed, a hoop taking its place, and large fenestrated openings being made in the sides of the wind-sail above the hoop. They should be hoisted however light the air, even in calms, when all the fore and aft sails should be set with their sheets hauled as flat as they can be got, not merely to assist in steadying the vessel, but to create a movement in the atmosphere through the rolling of the ship. In narrow rivers and inlets, ships at anchor should be sprung to the wind whenever

feasible, the broadside of the vessel with its numerous apertures affording a very much greater surface for the admission of air than the bows, and the wind-sails not operating to becalm each other as when the wind is right ahead. On some stations, as Japan, this is a subject of stringent regulation on board the British men-of-war. A scuttle admitting a wind-sail or ventilator should always open into the sick-bay and yeoman's store-room, the latter the worst ventilated apartment in the vessel, its atmosphere being rendered still more impure by one or two lights kept constantly burning. When it is absolutely necessary to cover them, light iron gratings over all the hatchways are better than the ordinary heavy wooden covers or gratings, being more easily cleaned, and allowing larger apertures for the admission of air. When sailing-vessels are under way with courses and spencers set, powerful currents of air are directed downward through the open hatches. In steamers this is, in a measure, compensated for by the upward current induced by the elevation of the temperature of the engine-room atmosphere; but during the long anchorages in port, and especially during calm weather, when wind-sails are of little service, the galley-fire, should it be located on the berth-deck, is the only means for exciting motion in the stratum of air below the level of the lowest line of air-ports. Two or more large iron ventilating pipes or funnels, like those communicating with the fire-room on board passenger steamers and steam-vessels, in the Navy, should open on the berth-deck. In severe gales it is occasionally necessary to batten down all the hatches, closing every aperture by which air or water can enter, except a small scuttle in the main and steerage hatches, and at other times this has been done as a mere measure of precaution. In such cases the atmosphere soon becomes unfit for respiration, and much suffering is occasioned and danger incurred by the sick, and those whose duties confine them below. Much of this inconvenience, as well as that experienced from covering the hatches and skylights during the long rainy seasons of so many of the stations of our naval vessels, would be obviated by venti-

lating-funnels, projecting six or eight feet above the spar-deck and fitted with movable cowls, carefully adjusted to the wind. When the hatches are battened down, both watches should be kept on deck, and the watch off duty allowed to sleep on the poop or other convenient dry place. The officers should also be required to remain in the open air, and the bed-ridden sick be removed to the spar-deck cabin, or to some equally sheltered and ventilated place when there is no such apartment.

Nor is this all that can be done toward ventilating a vessel. It is not merely sufficient to provide for the admission of fresh air, but that which is impure should be removed. It is discreditable to the mechanical ingenuity of our country that so few attempts have been made to devise machines which can effect this double purpose. On board steamers the problem would seem to be very easy of solution, air being propelled through a system of pipes traversing the vessel, and even kept in motion by punkahs or fans operated by the machinery when under way, or by a donkey-engine when at anchor. The officers of the French navy have taken the lead in this matter, commanding as well as medical officers having interested themselves in it. The apparatus of Captain Brindejone and that of M. Peyre, though both of small size, are fully able to accomplish the objects proposed. The principle of the first is the same as that of the ordinary rotary fan ventilator, recently placed on board some of our vessels, a number of fans being made to revolve by means of a crank, in a cylinder, from which canvas tubes lead above and below for the admission and discharge of air. Though occupying but a small space and employing the labor of only one or two men a few hours every day, it is able to effectually supply every part of the vessel with fresh air. I have been attached to but one vessel in the Navy which has been provided with this apparatus, and even on board this ship, notwithstanding my repeated recommendations, it was only put in operation on two or three occasions, and then principally as a punishment for black-listers. Certainly, as a system of punishment, it is better to employ men at this work than, as

may be daily seen, at polishing round-shot, scraping, painting, and rescraping iron stanchions, walking up and down the deck carrying heavy loads, or sitting idly in the brig with their hands and legs ironed, rejoicing in their exemption from labor. Simple as is this apparatus in its construction, it is necessary to pay attention to the freedom of the tubes from bends and to the direction in which they are led, while to produce a current of sufficient velocity, that is, one moving at least two feet per minute, the cranks should be turned with considerable rapidity. If two apparatus are put in operation at the same time, as is desirable, one should be used forward and the other aft, the one discharging air from below, while the other forces it from above, reversing the direction of the currents every hour. The same principle involved in the automatic bilge-pump, to which I have elsewhere referred, has been applied in the construction of an apparatus for ventilation, a column of water acted upon by the rolling of the vessel being substituted for the mercurial column in the bilge-pump; and I learn from Rear-Admiral Boggs that he has introduced this ventilating-pump on board some of the light-ships, and that the escape-air issues in sufficient force to operate a fog-horn.

A captain in the French navy has devised a system of stowage known as the "Arrimage Lugeol," by which the flour, salt, provisions, bean-lockers, rigging, and every other substance in the hold subject to decomposition, are surrounded by aeriferous canals. By wind-sails or ventilators introduced into these passages, currents of pure dry air may be distributed through every part of the vessel, thus not only contributing to the health of the crew, but also to the preservation of the provisions and other destructible stores. Such vessels are less apt to be overrun by roaches and other vermin, which are active sources of offensiveness. As our own vessels are constructed, all that can be done is to open the spirit-room, holds, sail-room, etc., every few days in pleasant weather, lower wind-sails into them, and at other times renew their atmosphere by the fan ventilators. The superior means of cleansing and ventilating the decks, holds, bilges, in-

terspaces of the ribs, and those under the engine-rooms, which have been introduced into the British service, are advanced improvements, from which Dr. Smart declares "high results may be reckoned, and as these means are perfected, so we may calculate on a reduced rate of sickness and a diminished mortality from yellow and remittent fevers, dysentery, and broncho-pneumonia, to which may be assigned three-fourths of the present large amount of phthisis."

The private mess-stores of officers contribute greatly to vitiate the air of the lower decks. The ward-room and other pantries, and the various store-rooms on the berth-deck and orlop contain eggs, fresh meats, and vegetables, which decompose rapidly and become very offensive. These rooms should all be accessible to air, through numerous openings in the bulk-heads, and they should also be opened and ventilated several times a week. I have already suggested the desirability of latticing all the bulk-heads on the berth and gun decks to permit the free circulation of air forward and aft.

If proper attention is paid to these points, there will seldom be occasion for the employment of chemical disinfectants. Dryness, cleanliness, and ventilation are the most powerful disinfecting means. The holds, spirit-room, and store-rooms for provisions should be whitewashed every month, as well as all casks which are stowed below, and whenever these are broken out for the purpose of taking an inventory or for cleaning the hold, they should be swept and re-whitewashed. Whitewash should also be used on the berth-deck beams and bulk-heads instead of paint. By absorbing carbon di-oxide, it assists in purifying the air. Lead nitrate, chlorinated lime and soda, carbolic acid, etc., are never more than aids to proper ventilation. They can never be carried in bulk sufficient to be serviceable alone, and, besides, their effects are only temporary.

L I G H T .

Light is a powerful vital stimulant. Removed from its influence, both plants and animals lose color, strength, and firmness of tissue. "Of all the elements which play a high part in the material universe, the light which emanates from the sun is certainly the most remarkable, whether we view it in its sanitary or scientific relations. It is, to speak metaphorically, the very life-blood of nature, without which everything material would fade and perish. Man in his most perfect type is doubtless to be found in the regions of the globe where the solar influences of light, heat, and chemical rays are so nicely balanced. Under the scorching heat of the tropics man cannot call into exercise his highest powers. The calorific rays are all-powerful there, and lassitude of body and immaturity of mind are its necessary results; while, in the darkness of the polar regions, the distinctive characters of our species almost disappear in the absence of those solar influences which are so powerful in the organic world."—(Sir J. Ranald Martin.) According to Dr. Edwards, the proper development of the body depends upon its free exposure to sunlight, absence of which he considers one of the external causes of those deficiencies of form seen in children affected with scrofula. The feeble, puny, and deformed offspring of those people who habitually live underground in cellars, caves, and mines, and, in a less degree, of the dwellers in dark lanes and alleys, and of the inhabitants of the frigid zone, is due to the deprivation of light as well as to uncleanness, starvation, and defective ventilation.

The greater part of the crew of the man-of-war has sufficient em-

ployment in the open air, but there are numerous individuals on board ship, whose special duties confine them below all day, who exhibit the pallid exsanguious appearance, the effect of habitually remaining in the dim twilight of the lower decks. All such persons should be permitted, or, if necessary, compelled, to go on deck and expose themselves to the sunlight every day. Recovery from disease is accelerated by the beneficial influence of this agent. The occupant of a bright and consequently cheerful sick-chamber will leave it sooner and have less the aspect of an invalid than one who lies in continual shade behind heavy draperies in a gloomy apartment. So the sick and convalescent on board ship will improve more rapidly if kept on deck as much as possible, those unable to walk being placed in chairs or cots under the top-gallant fore-castle, the break of the poop, or quarter-deck awning.

All the lower decks will be better illuminated by thick plates of glass set in the deck overhead. The only objection that can be opposed to them is that they are apt to leak, but this can easily be remedied by a renewal of the setting.

Artificial light is more injurious than beneficial. Every lamp and candle is an active consumer of oxygen, and therefore contributes to vitiate the air. Hammond's experiment shows that a single good sperm candle, burning at the rate of 135 grains an hour, will produce 9,504 grains (nearly 69 gallons or 11.6 cubic feet) of carbon di-oxide in twenty-four hours; and as many candles burn faster and produce more carbonic acid gas, it is within the bounds of fact to say that a candle, while burning, in the main causes as great a deterioration of the atmosphere as an adult person breathing in it during a similar length of time. Hence the minimum number of lights absolutely necessary should be placed on the berth-deck, and these always under open hatchways, that the upward current of the heated gaseous products of their combustion may assist the ventilation of the deck. Those officers who confine themselves to their rooms not only experience the pernicious effects of breathing an impure atmosphere, but have their sight impaired by the flickering blaze constantly near their eyes.

Deck-lights of thick glass over their apartments would often enable them to dispense with the use of candles.

Another advantage attending the employment of whitewash on the berth-deck, besides its effect in purifying the air, is that it multiplies the light admitted by the ports and hatchways. All the furniture of officers' apartments and of the ward-room and steerages should be painted white, the otherwise unpleasant uniformity being relieved by a little gilded molding or ornamental decoration with bright colors. On the spar-deck an excess of white or metal bright-work is objectionable, and should give place to light-blues, greens, or yellows, or to the natural color of the wood.

CLOTHING.

Every man in the Navy should be required to possess the following articles of clothing:

One water-proof cap.

One water-proof pea-jacket.

One pair of blue cloth trousers.

Two pairs of blue satinet trousers.

Three blue flannel overshirts.

Four blue flannel undershirts.

Four blue flannel drawers.

Three white sheeting frocks.

Three pairs of white duck trousers.

One blue flannel jumper.

Four pairs of woolen socks.

One pair of boots.

One pair of shoes.

One straw hat.

One black silk neckerchief.

One mattress.

Two blankets.

Of which there should be supplied to the recruit, as an outfit, the pea-jacket, cap, neckerchief, shoes, mattress, and blankets, one pair of cloth and one of satinet trousers, a flannel overshirt, two undershirts, two pairs of drawers, and two of socks. Although only these things may be required at the outset, it is indispensable that the remainder be obtained as soon thereafter as possible, that the proper changes may be made in the event

of getting wet. The British admiralty, with a view of lessening the indebtedness which men have to incur on entering the service, has authorized the gratuitous presentation to certain recruits of a blue cloth jacket and pair of trousers, a blue serge frock, a white duck frock and trousers, a black silk neckerchief, and a pair of shoes.

Many sailors prefer to buy the materials from the paymaster and make their own clothing, being able to fit themselves better and to sew them together more neatly and enduringly. This affords occupation for the crew, and should, if only on that account, be encouraged. One of the most interesting spectacles presented on board a man-of-war is that of groups of men seated on their ditty-boxes between the guns busily sewing.

I have restricted the number of white clothes because they are seldom worn, on board some vessels never, and ought to be abolished. Their chief use is as a Sunday morning mustering-dress in the tropics, but in recent years the whim of the executive officer of the flag-ship, or, in its absence, of the vessel, determines whether the dress shall be white shirts and pants, blue shirts and white pants, white shirts and blue pants, or blue shirts and pants, apparently more for the sake of variety than anything else, straw hats and blue caps, with or without white covers, extending the number of permutations. The absurdity of requiring a man to clothe his legs in flannel and his arms in white duck to-day, while to-morrow he is blue above and white below, ought to be evident to even the non-professional, as it is to the old quartermaster whose "rheumatiz" is made to shift from his shoulders to his loins and back again; but I have known ships on board which the daily dress-signal followed the card as regularly as the paymaster's stewards did in issuing the appropriate ration for the day. Whether white is or is not worn, under no circumstances, in no climate, ought the sailor to omit wearing flannel next the skin. This is a hygienic measure of the utmost importance, and should invariably be insisted upon. The flannel abdominal belt has been recommended as a substitute,

but it is difficult to keep in position, and while doubtless of great benefit where dysentery is apt to occur, does not offer the same protection against pulmonary complaints and malarial diseases as the complete flannel suit. The single argument in favor of white is that it absorbs and transmits less solar heat, and is therefore cooler than blue; but if worn for this reason, the whole suit should be white and made of flannel, for the additional woolen under-clothing will more than counterbalance the advantage of the light-colored outside garment. The white dress as now worn is a useless expense and an unnecessary addition to the bag, and boys and landsmen will elude observation and wear no other clothing on account of the discomfort and annoyance occasioned by the thick heavy undergarments now served to them, which may be obviated, as shown by Surgeon E. D. Payne, United States Navy, who has recently performed some interesting experiments, testing the hygienic value of certain articles of sailors' clothes, by supplying for use, in warm climates, a quality less heavy in texture and lighter in color. In very hot weather both flannel under and overshirts may be left off, and a neat light flannel jumper substituted. The narrow leathern strap, or belt, often worn around the waist, should be interdicted, on account of its interference with the circulation; the pantaloons and drawers being supported by buckles or lacings. If caps are worn in the tropics, they should be covered with white,* but a light straw hat is the proper article of head-gear. The weight of the coarse sennit hat made on board ship is objectionable. If men are sent aloft or exposed to the sun on deck in the tropics, they should be advised to put wet handkerchiefs or cloths inside their hats, and allow a flap like an army havelock to fall over the neck. Dr. Payne has shown the very

* The Secretary of the Navy has issued the following regulation, dated February 7, 1873:

“ Hereafter, whenever it is considered conducive to comfort or health, white caps of the regulation pattern, or white linen cap-covers, may or shall be worn by officers on shipboard within the tropics, or elsewhere in very hot weather, with the permission or by the direction, as the case may be, of the commanding officer of the vessel or station.”

considerable elevation of temperature above that of the outside air, under the cap now worn. He has also called attention to the power of absorbing water from a damp deck possessed by the soles of the shoes with which men-of-war's men are now supplied.

Neatness and cleanliness of dress are always to be inculcated. Clothing should be kept in order. The custom of allowing men to have their bags on deck once a week, usually on Saturday, should be universal, and departed from only in emergencies. Clothes-lockers have been proposed as substitutes for bags, but the change is not desirable. The latter are more convenient, protect the clothes better from dampness, and can be taken on deck, and their contents exposed to the sun and air. They prevent the accumulation of dirt unavoidable in lockers, and a not less important advantage is that they do not encroach so much on the air-space of the vessel. Their removal on deck, when the berth-deck is cleaned, allows the access of air to their racks. Ditty-boxes or bags are conveniences which every man should be permitted, preferably the former, since they can be arranged not only for sewing-articles, shaving-utensils, trinkets, and writing-materials, but may also serve as desks and stools. It would be well for the Government to supply them of uniform size, numbered with the bags. When not in use, they should be carefully stowed away in racks assigned for them.

The sailor can easily be taught habits of order and regularity. In a well-disciplined man-of-war the whole crew soon acquires them. If a berth-deck is always dry and clean, every bag and ditty-box in its place, the master-at-arms will have very little trouble with the men themselves. A few lazy, worthless fellows, however, if allowed to go unchecked, will inconvenience and confuse all the rest. The berth-deck is the man's home; his bag and ditty-box are to him what the privacy of the officer's room is to the latter, and it is, therefore, proper that he should enjoy as much comfort there as is possible under the peculiar circumstances of his life.

Under-clothing should be frequently changed. This does not require argument, yet it is a matter to which not the slightest

attention is paid in the service. The officers' servants, landsmen, and many of the foreigners in the crew are habitually unclean, both in person and dress, and require careful supervision. Few of them provide themselves with proper outfits except by compulsion. They will keep a clean mustering suit, which they remove immediately after inspection, and a few clean articles in their bags to satisfy the quarterly examination of their contents, and will wear the same pair of drawers and socks for months. One of the most important duties of division officers is to attend to their men being properly provided with clothing, and it is equally important that, at every morning inspection at quarters, they should ascertain whether they are cleanly clad. It will soon be evident which men are habitually clean and neat, and which will require examination. Sufficiently frequent opportunities should be allowed for washing and drying clothes. At sea, unless the weather is very bad, this may be done daily; in port, twice a week. New navy-blue flannel requires frequent washing before the color ceases to come out, and men's skins and blankets are usually dyed an intense blue for several weeks when this is not done.

I have already insisted upon the necessity of keeping a vessel dry, and have indicated the means by which this object may be attained. I have omitted until this place to refer to the subject of damp clothing. There are officers who believe that it will make men delicate to insist that they shall remove their wet clothes, and point to the impunity with which some continue in them for days. Where there is one such exception, there are many who succumb, sooner or later, and appear at the sick-bay. The French *Département de la Marine* has not considered this matter unworthy of its interference. The *ordonnance* of August 15, 1851, prescribes that the watch officers shall see that the men do not keep on their wet clothes when their watch is over, and that they shall enter on the log all such accidental changes of dress. In bad weather, when the watch is piped down, and at all times when boats' crews return wet, let them be compelled to remove their wet clothes and deposit them in fire-tubs. The

provision of outfit which I have recommended will allow three changes. Should the rain continue, and no occasion offer for drying the wet clothes, let each man remove his damp outershirt and trousers on turning in, and hang them on his hammock-hooks, to be resumed when he returns on deck. Men should not be allowed to expose themselves needlessly. Every one should be provided with a water-proof overcoat, and if the weather is not cold, be required to remove shoes and stockings. If too cold to go barefoot, boots should be worn. Similar precautions about wet feet should be exacted while washing decks. Few old sailors keep on their shoes when at this work, but landsmen and merchant sailors shipped for the first time, too lazy to take them off, will not do so unless compelled.

Numerous attempts have been made to devise a material for water-proof clothing which will not only exclude water but protect from cold, and not be so cumbrous as to interfere with the agility of movement required especially aloft, nor too bulky for compact storage. The seamless overcoats formerly issued were popular when first introduced, but they easily soiled, became hard and stiff, and split in the folds. The ordinary pilot-cloth pea-jacket is comfortable in cold weather, but is heavy when wetted and not easily dried. The favorite weather-clothing with sailors themselves are the old-fashioned oil-skins, the familiar signs of seamen's outfitting establishments on the water-front of all maritime cities, but they only imperfectly answer their purpose. Lieutenant George C. Reiter, United States Navy, in a letter to me, dated March 3, 1873, calls attention to the fact that men are never properly protected from rain, etc., by any of the tarpaulin clothing now in use in our Navy. He says: "I have never found any water-proof clothing at all serviceable except that made in England. The best we have is the 'Cape Ann' coat and overalls, but after they have been stowed away for a short time, as they must be on a man-of-war, it requires a powerful man to pull them apart, and afterward they are not good for much." He advises the manufacture by the Government of tarpaulin jackets and overalls, of three sizes, to be furnished as part of the outfit, and recom-

mends, after a satisfactory personal experience of two years, the application of a paint, the invention of a sailmaker at Deal, England, which will render them perfectly water-proof and yet leave them so flexible that they can be folded up and stowed compactly without injury. The same result promises to be better achieved by the process of the "Porous Water-Proofing Company of Pennsylvania," which proposes to make textile fabrics of wool or cotton, leather, paper, etc., water-repellent, mildew-proof, and absolutely moth-proof. Medical Director Bache, United States Navy, reports to the Secretary of the Navy, that in the case of cloth treated by this process and made up into clothing, "the water-proofing power was very manifest; long exposure to driving rain did not wet the material through," and that a pair of partly-worn thick winter shoes of calfskin similarly treated, "was found to be more soft and pliable than before treatment, and to be perfectly water-proof after long exposure in actual wear in mud and melting snow." Commander Braine, United States Navy, bears similar testimony to its efficacy in increasing the strength of flax and cotton canvas, and rendering them water-repellent, and Major General Upton, United States Army, states that four tents treated by this process and used by the cadets during their encampment at West Point in a season of heavy rain, "were white and apparently sustained no damage," while all others were badly mildewed, and had entirely lost the appearance of being new.

A board of Army quartermasters appointed to investigate the process of Cowles & Co. has reported that "the evidence is abundant, continuous, clear, and positive that the prepared goods withstand the action of moths, are in a measure water-repellent, and resist mildew far longer than the unprepared," and was of the opinion that "the process should be continued so long as a better and cheaper does not offer." The Secretary of the War concurred in these views and recommendations, and directed them to be carried into effect. It is probable, however, that while this process will be found efficient as protective against moths, it is inferior to the other in water-repelling power, and therefore less serviceable for the Navy.

PERSONAL CLEANLINESS.

Occasionally a man notoriously filthy is ordered to be scrubbed in the head, or the negro servants are inspected during the morning watch by the master-of-arms; but beyond this, I have never witnessed nor heard of any inquiry by officers into the bodily condition of the crew. If a man's cutlass is bright and his overshirt clean, the inspecting officer is satisfied, although his axillæ, groins, and perinæum may be abominably dirty and verminous, his under-garments unclean and unchanged for weeks, and his bedding disgustingly foul and offensive. Even when some one with sensitive nostrils has obtained an order for the daily inspection of the ward-room boys, they are only compelled to strip to the waist, and if the collars of their shirts and wristbands are not very much soiled, they are pronounced clean, although their genitals, buttocks, and thighs have not been touched with water during the whole cruise. I have known officers' servants to come under treatment at the sick-bay, and to be discovered to have worn the same pair of drawers, night and day, for months.

It is not altogether the fault of the men that this is so. The human beast requires to be taught to be cleanly. Physicians know that sordid bodies, as well as sordid minds, are found even among the possessors of wealth and the occupants of prominent stations in society. Bring the rude, illiterate sailor, therefore, on board ship, still reeking with the foulness of the slums whence the land-shark has beguiled him, compel him to live, eat, and sleep uncleanly, deprive him of every semblance of personal comfort, never appeal to his reason or intelligence, but teach him that he is nothing but a

slave or beast of burden—what result may be expected? Seamen are naturally careless. Left to themselves, they will neglect themselves. Some few men-of-war's men are exceptions, but the great majority of patients admitted into the naval hospitals from before the mast are shamefully unclean. Always the first, and sometimes the only prescription they require is a warm bath and clean shift of clothing. What physician would ever think of attempting to accomplish a diaphoretic effect upon the begrimed, callous, hide-like cuticle of most sailors, until he has dissolved off as much as possible of it with warm water and soap, or borax? Yet I have heard officers frequently joke about the appearance of these dirt-encased fellows, and laughingly describe them as "veritable old shell-backs," or as "covered with barnacles."

Ninety per cent. of the men presenting themselves at the naval rendezvous are filthy in person, and every medical officer should refuse to examine them in such a condition; and even after passing them he should direct them to bathe again before reporting on board the receiving-ship, otherwise they will remain dirty, will be transferred to some sea-going vessel in the same state, vermin on their bodies and in their hair, and they will continue so until they are discharged or become sick, and are sent to a naval hospital and subjected to a compulsory bath.

When swimming is possible or allowed, usually about twenty or thirty of the crew avail themselves of it as a diversion, but months sometimes intervene between these opportunities. The customary usual time for washing is during the morning watch, after the decks are "holy-stoned." Some of the men strip to the waist and wash their necks, arms, breasts, axillæ, and feet, but the greater number do not. Scarcely any ever cleanse their thighs, groins, or buttocks. Officers of divisions are responsible for the unclean condition of their men. They should require them to present themselves at the morning inspection, not only with clean outer-apparel, but with clean under-clothing and clean skins. They can perform this duty without any abasement of dignity. It is less disagreeable for the division officer to make this in-

spection than for the medical officer to conduct an examination of a patient who has fistula ani, or to labor by the hour to dilate his strictured urethra. Many duties are unpleasant, but the object in view should reconcile us to their performance. Very properly, in ports where prostitutes are subject to examination, no man is allowed access to them until the medical officers are satisfied of his own exemption from venereal disease, and no greater outrage is committed upon the man's modesty when he is required to satisfy the officer of his division that he is clean in person. False modesty cloaks both vice and dirt, and the man who makes the loudest outcry about outraged sensibilities will be found to have the strongest reasons for avoiding exposure. Habitually clean men will be very soon discovered and relieved from examination; others will be shamed into an attention to their persons that they had never been taught at home nor seen practiced elsewhere; while the incorrigibly foul will be isolated and cleansed by force. It is not proposed that the men at quarters shall unbutton their pantaloons and submit to a close scrutiny of every square inch of their surfaces every day; but their spare underclothing should be frequently and carefully inspected. Provision should be made to allow general ablution by every man on board, and the divisional officer should satisfy himself in as private and delicate a manner as possible that this has actually and thoroughly been done. No man should be allowed to remain, as is often the case, for weeks with his skin of a deep-blue color from the dye-stuff of his rarely-washed new flannel shirt and drawers, and, in tropical climates, daily general ablution should be exacted of every member of the crew. If objection is made to the construction of a proper permanent bathing apparatus, a large fire-tub may be placed under the top-gallant fore-castle, or in the manger, or in some other convenient situation, and surrounded by a screen, or the head-pump may be screened at certain times in the day and devoted to this purpose. In vessels where condensed water can be obtained in quantities, this should be used in preference to salt-water. Every man should be required to

possess one or more towels, which should appear among the paymaster's stores, and facilities should be afforded every day for drying them. If a "sweat-rag," as the little piece of sheeting is termed, which some men use, is now seen flying anywhere to dry, it is immediately ordered down, even while the spans of the quarter-boats are fluttering with officers' towels. When the clothes-lines are not up, the men usually spread their "sweat-rags" upon their shoulders and back, and dry them there.

The hair, beard, and teeth are all neglected on board ship. It would be a difficult matter to compel old sailors to cleanse their teeth, but all the boys should be obliged to purchase tooth-brushes, and to use them regularly.

Firemen and coal-heavers should be compelled to bathe every day, when the vessel is steaming, but not immediately after quitting their stations. Cardiac diseases, pulmonary affections, acute inflammations, etc., are common among this class from their imprudent exposure to cool draughts, and from washing with cold water while their bodies are heated. The engineer on duty should attend personally to the disposition of men who come off watch, and not allow them to throw themselves under the ventilators, nor to bathe until a proper time has elapsed.

FOOD.

No objection can be urged against the quantity of food furnished by the Government, nor, if inspectors continue to do their duty as faithfully as at present, to its quality. That enough is supplied by the ration is evidenced by the amount thrown overboard by the cooks, and by the fact that there are few messes which do not commute one or more of their rations. The Government authorizes this to the extent of two rations for every ten men. It is idle to speculate upon the amount of carbon, oxygen, hydrogen, and nitrogen required to supply the waste of the body, and to endeavor to arrive, by chemical analysis, at the precise number of grains a man should be given to eat. The molecular waste of tissue depends upon climate, physical exertion, and health; but the naval ration undoubtedly supplies the maximum under any circumstances. The robust appearance of an American man-of-war's crew attests this fact, as do the zest and exclamations of surprise and delight with which foreign sailors partake of it when invited. In the French navy each man receives less than half a pound (214 grammes) of meat a day, and only 3.3 pounds (1,500 grammes) of animal food (beef, bacon, and cheese) and 16.5 pounds (7.5 kilogrammes) of vegetable substances (beans, peas, and rice) a week. In the American service each man gets every week from six and a half pounds of the former (beef, pork, and preserved meats) at sea, to eight and three-quarters pounds of fresh meat in port, and eleven of vegetables, (beans, rice, flour, dried fruit, desiccated potatoes, and mixed vegetables,) with a liberal allowance of sugar, molasses, vinegar,

and pickles. This ration has been instituted sufficiently long for its effects upon the health on long cruises to be manifested. That the former ration was not exactly what the human body required for its healthy maintenance was evident from the disturbances occasioned by its persistent use; but on two days on which salt beef and rice were then served out, preserved meats and vegetables are now substituted. The change leaves scarcely any other improvements to be suggested, except a more frequent issue of preserved beef or other meat in lieu of salt, an increase in the allowance of coffee and butter, and a further extension of variety in vegetables by the occasional substitution of peaches, sauer-kraut, and cranberries for dried apples. With these exceptions it is probably the best that can be devised, for temperate climates at least, to meet all the requirements of economy of space, capability of resisting decomposition, palatability and alimentariness, until experiments now being made with the object of preserving fresh meat by the abstraction of its moisture, allow the total abolition of salt meat as an article of diet. Dr. Alexander Rattray, surgeon Royal Navy, in an admirable report published by the admiralty, in their annual volume on the health of the British navy, has called attention to the injurious consequences of the use of salted meat, which he correctly styles an unnatural form of food, and which he recommends to be almost entirely displaced by preserved meat. Commanding officers should eagerly embrace every occasion of going into port or of speaking vessels at sea to obtain supplies of fresh meat and succulent vegetables. One pound and a quarter of fresh or three-quarters of a pound of preserved meat, which should not always be beef, may be substituted for a pound of salt; one pound of soft bread or of flour for the daily allowance of ship-biscuit; and fresh vegetables not to exceed in value the dried. When the stay in port is prolonged beyond a fortnight, salt food may be issued twice a week. Dr. Rattray has proposed a radical change in the British naval dietary, arranging it for temperate and tropical climates, for harbor and for sea. One prolific source of the

disease in the Navy, or notoriously unhealthy tropical stations, is the neglect to adapt the diet, dress, and labor to the necessities of the climate. Englishmen have been performing a great physiological experiment for many years in every quarter of the globe in their extensive colonial dependencies. Carrying their national customs wherever they have immigrated, they have dressed, eaten, slept, and generally lived as they were accustomed in their own foggy island, with results that are now matters of scientific history. The red-coated, leather neck-cased, overlaid soldier is not so often seen marching under a mid-day Indian sun; but despite all lessons, the wealthy Englishman, male and female, dines at seven off as many courses, drinks beer and brandy and soda, and goes home with "liver." The Japan Weekly Mail, of Yokohama, for August 12, 1871, refers to a recent instance of culpable violation of sanitary laws by military authorities, for which the medical officers were in no way responsible, in the following terms:

The old story again! The weary old story of life sacrificed, but sacrificed for nothing—to appease no gods; to propitiate no demon; to gain no laurels; to chastise no enemy; to procure no benefit; to afford no example; to inspire no devotion. Any moderately sensible judge of human affairs might have dreaded some such a catastrophe as has overtaken the Tenth Regiment and the newly-landed battalion of marines, which has arrived to relieve it. The regiment is moved in marching order in the heavy clothes which a tropical climate converts into shirts of Nessus, with knapsacks, arms, and full paraphernalia. They may have been moved on empty stomachs, but what with parade, the march to the quay, and the time required for getting on board, they are for three hours exposed to the sun before they get food or arrive under the shelter of an awning. Meanwhile the plague has begun. The full-blooded men are smitten with heat-apoplexy, and the wonder is that more do not succumb to the enemy. Three good men fell victims to that march—men who had been long in the regiment, and who might have lived to feel the pride of belonging to it. On the same day the marines, who have replaced them, come under the same fatal influences. Three were struck down. One is dead, others are in a dangerous state, and their recovery doubtful. Now it is clear that coddling soldiers is absurd, but you cannot inure men to a hot sun by exposing them to its deadly rays. You may gradually acclimatize them, and after all this you must handle them in the sun as in the presence of an enemy

whom you may, with certain precautions, defy, but whom you cannot conquer. You must avoid him to the uttermost. In war it may be necessary to face him; in peace it can hardly be so. The whole question is one of management and administration. The regiment was incontestably in good order; but why was it moved in August, with the thermometer at ninety, and the ominous typhoon-fly hovering about?

It is a physiological impossibility for the sailor at Singapore, Batavia, Hong-Kong, or Maranham to eat the same kind and quantity of food as at Kittery or Boston, where he shipped, and remain healthy and efficient. Messes in the tropics should, therefore, be allowed, advised, and encouraged to commute parts of the ration of meat for vegetables, especially rice, at sea, and for fruits and fresh vegetables when in port. Most messes stop one or more entire rations and draw their value in money, either to pay their several cooks, which should be prevented by not allowing "steady" cooks, or to create a fund for the purchase of potatoes, turnips, onions, or other vegetables as sea-stores, which should be encouraged, and conveniences afforded by the authorities of the ship for their storage in the boats, under the boom-cover, or elsewhere on the spar-deck. They enter into the composition of the morning "scouse," which is the favourite dish of the sailor, and they are better antiscorbutics than anything in the dispensary. When one has been a month at sea a roasted "spud" (potato) is relished with an avidity that only a man starved of his natural aliment can experience, and a plentiful supply of this vegetable will render unnecessary any large provision of lime or lemon-juice, or any other medicinal antidote to scurvy. It is commonly but erroneously believed that this disease has disappeared from the Navy. Medical Director Wilson, in his *Naval Hygiene*, relates two instances, during his experience, of the development of the scorbutic tendency on shipboard, the first occurring on the frigate *Savannah*, on her return from California during the Mexican war, and the second on board one of the vessels of the Japan expedition during her passage from New York to the Straits of Sunda. I have also had to treat the disease, the first time while attached to the sloop-of-war *Levant*, which, as in Dr. Wilson's second instance, was making a passage from New York to China via the

Straits of Sunda, and again on board the Idaho in 1868, while *en route* for Japan by way of the Ombay passage. Short stoppages were made in both cases at Rio de Janeiro and at Cape Town, but the crews were not allowed liberty on shore, and consequently did not experience that indescribable but marked benefit which undoubtedly results from simple contact with the earth, the deprivation of which may be ranked with the want of fresh vegetable food as one of the efficient causes of the disease. The passage of the Levant was stormy, the men were exposed to continued rain and cold, their labor was arduous, and almost every article of the ration was badly spoiled. After a delay of only two days at Anjer, the ship resumed her course to Hong-Kong, where she arrived on the one hundred and eighty-third day from New York, a passage greatly exceeded by the Idaho, which did not anchor at Nagasaki until the two hundredth day. In neither of these cases did the disease manifest itself by those terrible symptoms formerly supposed to be essentially diagnostic. There were few individuals who sought to be excused from duty, but the general condition of the whole crew was below par; they performed their duties listlessly and slowly, and were cursed for being morose and lazy; they lost strength and appetite; their bodies were covered with mottled discolorations; their gums were tender and bled easily, causing those who chewed to attribute it to the tobacco, for which they lost taste; scratches, wounds, and bruises healed slowly or not at all; and men, often of the finest normal physique, succumbed readily to trifling causes of disease. Large numbers were subsequently invalided, whose disabilities really began at this time, and the actual money loss to the Government was far greater than would have been the expense caused by a few days' longer sojourn in port. Sporadic cases of scurvy appeared the current month, (November, 1871,) on board of several of the Russian escort squadron during their wet and stormy passage from Madeira to New York, though it was not protracted much beyond a month. A further delay at sea would have certainly been followed by serious consequences.

In foreign ports, bumboats attend all vessels whose crews are

permitted to draw any portion of their pay. A small allowance of money, conditional upon good behavior, should always be made for this purpose, since the men have no other way of obtaining the fruits of the countries they may visit, and which in tropical climates ought to enter largely into their diet. Excessive indulgence, however, particularly on first joining a station, must be carefully guarded against. In some bumboats, which should always be inspected by the medical officer that no unripe fruit nor other improper articles may be offered for sale, boiled eggs, broiled chickens, fried fish, steaks, etc., are prepared, which the sailor, cloyed with the unvarying boil of the coppers, relishes exceedingly, and which it is highly proper he should be permitted to enjoy. A watchful and comprehensive hygiene neglects no occasion of catering to the native instincts of the body, in violation of which the seaman lives, and of recalling the customs of civilized life, from which he is unnaturally severed.

Besides vegetables, eggs, properly packed, might be allowed to be purchased by the several messes as sea-stores. They can easily be fried before the galley is given up to the officers' cooks, and they make a palatable morning meal. The practice of carrying live-stock to sea is of doubtful propriety. It encumbers the decks, diminishes the air-space, impoverishes the atmosphere, creates filth, and becomes diseased, while it benefits a very small proportion of the persons on board. Fowls are more easily kept clean and healthy than other live food, but their flesh is not superior in flavor or nutrient properties, nor better relished even by the sick, than that properly canned. This is especially true of the poor emaciated sheep and calves, which are sometimes killed for food after six or eight weeks' fright and torture on board a rolling ship. An exception may be made in the case of the large green turtle, which, whenever obtainable, should be taken to sea to be made into soup for the whole ship's company.

It seems to escape officers of the Navy that the *cooking* of the sailor's food has anything to do with its nutritive value or palatability. The ship's cook is appointed without any special ques-

tioning as to his ability to perform his duties, which, however, are of the simplest character. Everything given the sailor is boiled in the coppers, except in port, when some of the mess-cooks, by arrangement with the cabin or ward-room cooks, succeed in getting a piece of meat or a fowl roasted. The craving of the sailor for change is shown by the popularity of the scouses, which some commanding officers are thoughtful enough to encourage by allowing the range an extra supply of wood. Our galleys are not very commendable exhibitions of American inventive talent. It is certainly not impossible to contrive an apparatus possessing facilities for roasting meat and baking bread. In this matter, as in every other within the province of hygiene, the French are far in advance of all other nations. The "*cuisine distillatoire*" of Peyer and Rocher combines an oven for baking with an apparatus for distilling fresh water from salt, the coppers being at the same time heated by the steam, which is in process of condensation into fresh water. Freshly-baked bread, when properly made, ought to be substituted for biscuit whenever possible.

It is the duty of the officer of the deck to inspect the dinner prior to the serving out at seven bells in the forenoon watch. As now conducted this inspection is a mere form. The ship's cooks brings a mess-pan to the mast containing the choicest piece of meat from the coppers, which the officer of the watch inspects by cutting off a slice or two as a lunch. This duty should be performed by some other officer, preferably one of the medical corps, and the inspection should extend to all the messes and to all the food at every meal. The fresh soups are sometimes so badly made, the vegetables not being half cooked nor the meat properly boiled, that it is common for sailors to attribute to them all their digestive irregularities in port; yet some cooks are so expert in making these soups that officers find them very palatable as their own noonday meal. At sea the same complaint is general with regard to bean-soup. Sometimes this is due to the inferior quality of the beans, occasionally to the hardness of the water, but most frequently to the neglect to soak them properly

(a whole day being sometimes necessary) in cold water and to boil them sufficiently long. Cooks often have the water in the coppers boiling before they add the meat for the soup, ignorant of the fact that the flavor and nutritious qualities of the latter depend upon the extraction of the soluble principles of the meat, which only takes place when it is put in cold water and that slowly heated. On "duff" days, it is very proper to boil the water before the beef is added, since it is thereby prevented from yielding all its nutrient qualities to the water and is consequently more tender, juicy, and palatable. The "harness-cask," in which the meat is thrown after it has been issued by the paymaster's subordinates, and where it remains until ready to go into the coppers, is often imperfectly cleansed and allowed to become dirty from the accumulation of stale brine. It should be carefully and thoroughly washed after every using, and the master-at-arms should be required to inspect it daily with the coppers and all the cooking-utensils at the galley and the mess-things of the berth-deck cooks.

The tea and coffee especially require examination into the method of their preparation. Frequently they are such abominable mixtures that even the men refuse them, while there is no part of their ration of which they are more fond, none which is of greater importance to their well-being, nor any which is so easily prepared. Tea-water should be issued to the mess-cooks boiling, not more than ten minutes before the hour for the meal, and the mess-kettle should be kept tightly covered until the beverage is served out. Properly, coffee should be made by the ship's cook at the galley, and only issued a few minutes before breakfast is piped. As nutritive properties are of more importance to the sailor than delicacy of flavor and aroma, which he probably would not appreciate, it would be well to preserve a portion of the tea-leaves and coffee-grounds from each meal for addition to the ration of the following.

The usefulness of tea, coffee, and alcohol in the form of wine, beer, or whisky, as food-stimuli or accessory food, has been satis-

factorily established by Anstie, Lankester, and others. An old writer, whose wisdom has never been questioned, epitomizes in Ecclesiasticus, chap. xxxix, v. 26, with a scientific precision to which the learning of twenty centuries has but little to add: "The principal things for the whole use of man's life are water, fire, iron, and salt, flour of wheat, honey, milk, and *the blood of the grape*, and oil and clothing;" adding significantly in v. 27, "All these things are for good to the godly; so to the sinners they are turned into evil." The frightful consequences of intemperate indulgence in alcoholic liquors have resulted in the abolition of the spirit portion of the ration. If the substitution of a pint of beer or a half a pint of wine for the gill of spirits, which the Department used to authorize, could be effected, there is no doubt of the propriety and benefit of its issue. The objectionable feature of the old service of grog was that it was drunk undiluted and upon an empty stomach. The moral argument that it engendered and fostered a fondness for intoxicating liquors applied only to boys and a few landsmen, most sailors, firemen, and marines having already acquired the taste and habit before entering the service. It is doubtful whether even three years of enforced total abstinence could destroy the appetite in the confirmed inebriate. In such cases the land-shark and prostitute can nullify in half an hour the resolutions of years. There are few medical officers in the Navy whose experience cannot furnish instances of officers of rank and education who have repeatedly violated the most solemn pledges and oaths to abstain from rum-drinking. Liberty on shore is so frequent, and the license allowed drunkenness on such occasions, through the neglect to punish its habitual occurrence, so general, that the mere abolition of the grog ration has, probably, accomplished little toward the checking of intemperance on board ship. Even under the old system, the opportunity to commute the grog for money to be spent in the bumboat or on shore was extensively embraced. On board a sloop-of-war having a complement of one hundred and sixty men, I have known only forty to drink

their grog. Nevertheless, many excellent seamen have, undoubtedly, been deterred from shipping in the Navy in consequence of the commutation of the grog, and I am well satisfied that the majority of such men were not injured by the regular consumption of the moderate quantity of spirits they received. Fortunately, tea, coffee, and tobacco, to a large extent, accomplish the same results as alcohol. Under their use the sailor better endures fatigue and the vicissitudes of climate, is more cheerful in mind, is better nourished, and in tropical regions experiences less desire to eat an excess of meat. Gasparin long ago called attention to the fact that the Belgian miners performed their arduous toil and maintained their robustness and health with a diet notoriously scant, in consequence of the daily use of coffee; and Anstie has adduced numerous instances "where the support of the organism, in the absence of ordinary food, by stimulants, (that is, agents which, by their direct action, tend to rectify some deficient or too redundant material action or tendency,) is one of the most remarkable phenomena which can be offered to the attention of the physiologist." Von Tschudi relates that an Indian, sixty-two years of age, worked for him (at excavation) for five days and nights consecutively without any ordinary food at all, and with a very short allowance of sleep, and yet, at the end of that time, was fresh enough to undergo a long journey, simply because he was supported by the coca, which he chewed from time to time. He declares that the moderate eaters of coca are long-lived men, and that they perform extremely hard labor, upon a very little food, as miners, soldiers, etc., and he mentions the fact that the custom of coca-chewing is of immemorial antiquity in Peru; and Anstie adds: "Next, perhaps, to coca, in its power of replacing ordinary food, we must reckon tobacco, and next to tobacco in efficacy as a supplementary food, and far surpassing it in its effectiveness under certain circumstances, is alcohol." I do not desire to advocate the re-issue of a daily ration of grog. Provision, however, should be made for its proper use in emergencies, as when the crew are exposed to a

long continuance of bad weather, and especially when the rolling of the vessel prevents the lighting of the galley-fire and the preparation of coffee or tea, when they have been more than thirty days at sea and begin to manifest the consequent ill-effects of the salt ration, or when they are subjected to intense mental or physical effort, as in time of shipwreck, fire, or action. There is no doubt that under such circumstances tobacco-chewers and smokers find a mental and physical sustenance for which other men instinctively and painfully crave; and we need not hesitate to refuse to join the pseudo-moral crusade which would deprive the sailor of the solace and support of his pipe and quid, when so learned a therapist as Pereira declares, "I am not acquainted with any well-ascertained ill-effects resulting from the habitual practice of smoking." A similar observation is made by Dr. Christison; and Hammond, whose carefully conducted experiments upon himself have conclusively established the physiological effects of these agents, states, "I have no hesitation in expressing my opinion that, in the great majority of cases, the moderate use of alcohol and tobacco is calculated to exert a beneficial effect upon the organism. This use, like that of every other good thing which we have, must be guided by wisdom. To transgress the laws of our being in the employment of these substances leads just as surely to punishment as the violation of any other sanitary or physiological law. Like everything else capable of producing great good, alcohol can also cause great harm. Our object should be to secure the one and provide against the other. I am decidedly of the opinion that tobacco is beneficial to those who, like soldiers, have a great deal of mental and bodily fatigue to undergo. But these remarks apply only to the moderate use. When employed to excess, there is no doubt that it predisposes to neuralgia, vertigo, indigestion, and other affections of the nervous, circulatory, and digestive organs." Dr. Gray, writing on the medical aspect of the tobacco question, states that "tobacco should be used as supplementary to food, not as a substitute for it. The season, therefore, for healthy smoking is after

a meal. Against moderate smoking, by a healthy person who enjoys it, not a single argument of any weight has yet been advanced." For those who are debarred from using tobacco and alcohol, an extra issue of coffee on turning out, and occasionally during the night watches, will supply the demand of the system when it is improperly or insufficiently nourished.

Though comparatively little fault can be found with the component parts of the ration, the same is not true of the arrangement of meals. The usual hour for breakfast is 8 o'clock; for dinner, at noon; and for supper, 4 o'clock. By this system men eat three times within eight hours, and fast all the rest of the day. The objections to it are evident. Economy of fuel is no excuse for a practice that is so contrary to the simplest teachings of hygiene and common sense. It is far more easy to provide a larger quantity of wood and coal before setting out than to teach a man's stomach to regulate its functions according to the arbitrary dictum of his "superior officer." After the supper, the sailor gets nothing to eat for *sixteen* hours, although his most arduous duties frequently occur within that period, and although the craving for food is manifest even in officers, who eat their last meal so much later, and yet universally require the caterers of their messes to provide them a lunch before going on deck during the night and morning watches. At sea the labors of the night are probably more frequently laborious than those of the day; while in port the vessel may have been brought to anchor or gotten under way, and in the morning hammocks have to be scrubbed, clothes washed, and decks "holy-stoned;" and all this with an empty stomach. In hot climates, both men and officers always feel listless and indisposed for exertion in the morning, when a slight repast would give them the energy to perform their duties properly. Hammond advises that "soldiers should always be fed before they are sent to drills, parades, or other labor," and Macleod declares that he has little doubt that, if the precaution had been taken to supply the troops in the Crimea every morning with hot coffee, much of their mortality might have been avoided. I

therefore recommend that every man may be served a cup of coffee and piece of bread immediately after turning out, and that breakfast be eaten at 7 o'clock, dinner at noon, and supper at 6 o'clock, the dinner-hour of many cabin and ward-room messes. In port all hands turn out at daylight, and should then have their bread and hot coffee; at sea, the morning watch comes on deck at 4 o'clock, and should be allowed coffee as soon as it can be made. The other watch is called with "all hands" at 7 o'clock, the hour I propose for breakfast. To give them time to lash and stow their hammocks, wash, and dress before breakfast, they should be called at ten or fifteen minutes before 7, in which quarter of an hour they will be able to do all they are required. The range should be given up to the berth-deck cooks to make scouses until fifteen minutes before 7 o'clock, which is early enough for the officers' cooks to begin their breakfast. In bad weather, unless the ship rolls too heavily for safety, or when the work is very arduous, fire should be kept in the galley and hot coffee served out to the middle and morning watches. It is getting to be the custom to light the galley-fire in the morning watch, to make the officer of the deck his cup of coffee, when the ship's and officer's cooks take advantage of the opportunity to prepare coffee, which they retail to such men as are able or willing to pay their charges; but this is done surreptitiously, at an expense to the men which they cannot always afford, and in the cases of the officers' cooks at the cost of the officers, whose private stores supply the materials used. To prevent this fraud and to enable every one of the crew to be benefited by the procedure, the Government should make it a regular daily issue;* or, if objection is urged to the increased cost of the ration, such a charge should be determined upon by the paymaster as will purchase the coffee required. I have known instances of ships' cooks who have amassed several thousand dollars during a cruise, by irregular sales, principally of coffee.

* The naval appropriation bill, approved May 23, 1872, provides, "That an additional ration of tea or coffee and sugar shall be hereafter allowed to each seaman, to be provided at his first 'turning out.'"

An improvement should be made in the furniture of the messes. Everything is repulsive about the sailor's mess-cloth, where each man is using his fingers and the jack-knife with which he may have been scraping masts or cleaning tar-buckets. A few cheap, strong knives and forks, block-tin plates, cups, etc., might be included among the paymaster's small stores. The British sailor receives his mess-utensils from the government gratis. In large ships, tables and camp-stools are provided for the men, and might appropriately be made a part of the outfit of every vessel, care being taken to stow them, when not in use, so as not to encroach on the air-space of the berth-deck.

The medical officers should frequently visit the messes and inquire into everything relating to their subsistence. This duty is especially enjoined upon the surgeon by paragraph 534 of the Regulations for the Government of the United States Navy for 1870, and which, so far as the medical officer is concerned in his character of physician, is the most important in the book. Hence I quote it, and urge upon the young assistant surgeon the necessity of pondering seriously upon the grave responsibilities it devolves upon him:

He (the surgeon) shall inspect the provisions for the crew, and report to the commanding officer when he may discover any that are unsound. He will also cause the purity of the water to be tested before it is received into the tanks, and he will make known to the commanding officer any want of care or cleanliness in the preparation of food for the crew, or any instance of personal neglect with regard to it, of which he may be cognizant. He will also make known to the commanding officer everything which may come to his knowledge as conducive to, or as militating against, the general health and comfort of the ship's company.

Although these sanitary functions are manifestly among the legitimate duties of the physician, the Navy Department, in these instructions, very properly directs particular attention to them, and every medical officer should be held strictly accountable for the consequences of any violation of a proper hygiene which he may have neglected to investigate and report.

POTABLE WATER.

Physiologists estimate that the daily loss of fluid by cutaneous and pulmonary exhalation is from one and three-quarters to five pounds; that of the thirty or forty ounces of urine excreted only two to seven per cent. are solid; and that seventy-five per cent. of the faecal discharge of the twenty-four hours, which averages from four to six ounces, is water—a total loss of fluid every day of from three and a half to seven and a half pounds. The customary allowance of water on ship-board is one gallon a day for each person, of which half is given to the ship's cook for the coppers, and the balance put into the scuttle-butt for drinking. This allowance is sufficient under ordinary circumstances, but during hot weather the water is all drank up in the forenoon, and the landsmen and boys, who have been less employed than the rest of the crew, usually drink a disproportionate share. While, therefore, the issue of water should never be less than a gallon a day in temperate latitudes, this amount should be largely increased whenever the crew are exposed to unusual fatigue or to prolonged heat. The listless, careless way in which the men go through their exercises in tropical climates is as much due to the stint of water as to the direct depressing effect of heat. According to Parkes, "the supply of water becomes a matter of the most urgent necessity when men are undergoing great muscular efforts, as it is absolutely impossible that these efforts can be continued without it. If we reflect on the immense loss of water by the skin and lungs which attends any great physical exertion, we shall see that to make up for this loss is imperative; and it is

very important that this loss should be made up continually by small quantities of water being constantly taken, and not by any large amount at any one time."

An article which enters so intimately into the composition of the animal economy, which permeates every tissue, and forms the basis of the various circulating media, which has so much to do with the reparation of the body and the normal performance of its functions, should be as free as possible from noxious qualities. The terrible mortality of the old-time vessels was due as much to the excess of saline and the presence of putrescent matters in their water as to the neglect of any other of the measures which hygiene demonstrates to be indispensable to health. To this effect Pereira quotes a report of the British secretary of state for the home department: "The beneficial effects derived from care as to the qualities of water is now proved in the navy, where fatal dysentery formerly prevailed to an immense extent in consequence of the impure and putrid state of the supplies." Though a certain amount of saline constituents is essential to good potable water, a very slight excess of any one salt will occasion grave disturbance of health. Carpenter relates an instance where serious detriment to the health of a neighborhood was occasioned by using the water of a well containing only five grains of saline matters to the pint. According to Christison one two-thousandth of its weight of saline ingredients (thirty-five grains in the imperial gallon) renders water unfit for domestic purposes. French writers have incontestably shown that the intestinal disorders, which were common among the inmates of certain hospitals and prisons of Paris, were directly traceable to the use of well-waters containing calcium and magnesium sulphates. Parkes refers to the prevalence of diarrhoea on the Cape frontier stations, under his own observations, from the use of brackish water; the deleterious effects of our western river waters on non-residents are widely known; and there is no doubt that malignant cholera is principally, if not exclusively, as Dr. Snow taught, transmitted through the medium of drinking-water.

So much, then, depending on the character of the water, it should never be received on board ship for drinking and culinary purposes until it has been submitted to the medical officers, faithfully and carefully examined by them, and pronounced potable. Notwithstanding the very serious interests involved, this subject has not received a tittle of the attention it deserves. Most medical officers, when notified that water is about to be taken on board, direct their apothecaries to add a piece of crystalized nitrate of silver to a tumblerful of the water, and if the precipitate produced is not a positive cloud filling the tumbler, and the taste not markedly brackish, consent to pass it. Frequently, this is the extent of the chemical means they have at hand, but the careless manner in which even this test is applied renders it practically useless. The taste of water, on which so much reliance is ordinarily placed, is a very unsafe guide, since, according to Parkes, "organic matter, when dissolved, is often quite tasteless; 55 grains of carbonate of soda and 70 of chloride of sodium per gallon are imperceptible; 10 grains of carbonate of lime give no taste; 25 grains of sulphate of lime very little;" yet, a potable water, according to the same authority, should never contain more than 20 grains of carbonate nor 10 of chloride of sodium, 16 of carbonate nor 3 of sulphate of lime, nor 3 of the carbonate and sulphate of magnesia.

Water, to be potable, does not require to be chemically pure. The stomach instinctively loathes water freshly distilled, rain-water recently fallen, and the water formed by the melting of ice and snow. The eminent hygienist Guerard describes good potable water as "limpid, temperate in winter, cool in summer, inodorous, of an agreeable taste. It should dissolve soap without forming clots; be fit for cooking dried beans; hold in solution a proper quantity of air, carbonic acid gas, and mineral substances; these last not exceeding 0.5 gramme to the litre, (35 grains per gallon.) Finally, it should be free from organic matters."

The river-waters, from which our principal naval stations are supplied, contain a far less proportion of saline constituents than

this. According to Professor Barker, "the purest water supplied to any city in this country is that from Lake Cochituate, which supplies Boston, which contains but 3.11 grains (solid matter) in one gallon. The Schuylkill water (Philadelphia) contains 3.50 grains; Ridgewood, (Brooklyn,) 3.92; the Croton, (New York,) 4.78; Lake Michigan, (Chicago,) 6.68; the water which supplies Albany, 10.78." European rivers are seldom so pure. The Loire, Garonne, and Danube average about 10 grains; the Rhine 12; the Rhone 13; the Seine, Scheldt, and Thames range from 16 to 30. Fonsagrives restricts the proportion of salts which a potable water should contain to from 0.10 to 0.20 gramme per litre, (7 to 14 grains per gallon;) "beyond this the water is hard, indigestible, and unfit for cooking vegetables." Christison considers a water to be hard which contains one four-thousandth part, or $17\frac{1}{2}$ grains of saline matter to the gallon, and says that that which contains not more than 14 grains will lather with soap, and may therefore be used for washing. The absolute amount of saline substances is, however, of less practical importance than the quantity of each particular salt, since a small amount of calcium sulphate will render a water harder than twice or thrice as much of alkaline carbonates, and if organic matters are also present, the reduction of the sulphate will render the water offensive from the disengagement of hydrogen sulphide.

The saline ingredients of ordinary river-water are principally the chlorides, sulphates, carbonates, and phosphates of sodium and calcium, the chloride, bromide, carbonate, and sulphate of magnesium, the chloride and sulphate of potassium, a little silica, oxide of iron, and occasionally other metallic salts. Of these, sodium chloride and calcium carbonate and sulphate form the largest proportion.

The medical officer of a man-of-war has no need to attempt a complete analysis of water, for which, indeed, he will have neither time, place, nor appliances, in conducting his examination as to its fitness for drinking and culinary purposes, but he should never give his consent to the reception on board ship of any water

which does not possess the physical properties enumerated by Guerard, which curdles a standard solution of soap, which decolorizes a standard dilute solution of potassium permanganate, and which gives more than a faint white precipitate, insoluble in nitric acid, with silver nitrate, barium chloride, and ammonium oxalate. Most common waters have an alkaline reaction from calcium carbonate, held in solution by carbon di-oxide, but this gas is expelled by ebullition, the carbonate is precipitated, and forms the ordinary lining crust of tea-kettles. "Six grains per gallon of a lime-salt gives a turbidity with oxalate of ammonia; sixteen grains a considerable precipitate; thirty grains a very large precipitate." "As only two grains per gallon of carbonate of lime can remain in solution after boiling, a large precipitate on the subsequent addition of another portion of the oxalate will show that the sulphate or chloride of lime is present." "Four grains per gallon of chloride of sodium give a turbidity with an acidulated solution of nitrate of silver; ten grains a slight precipitate; twenty grains a considerable precipitate." "Sulphates to the amount of one or even one and a half grains per gallon give no precipitate with chloride of barium; at first, or on standing, three grains give a haze, and after a time a slight precipitate; above this amount the precipitate is pretty well marked."—(Parkes.)

Fortunately, there is now very little difficulty in obtaining a sufficient supply of excellent potable water at the principal resorts of our naval vessels, to obviate the necessity of watering ship with impure water—a necessity which, in the case of steamers, of course, never can exist. In some tropical sea-ports, as Anjer, where the water is necessarily largely impregnated with vegetable matter, filtered water may be obtained at a small charge, and I was once witness of the lamentable consequences of a commanding officer's refusal, through a mistaken spirit of economy, to incur this expense. Parkes quotes as a curious fact from Davis, in reference to the West Indies, that ships' crews, when ordered to Tortola, were "invariably seized with fluxes, which were caused by the water. But the inhabitants, who used tank (rain) water,

were free ; and so well known was this, that when any resident at Tortola was invited to dinner on board a man-of-war, it was no unusual thing for him to carry his drinking-water with him."

Should it become necessary to obtain water from unknown places, the medical officer should always examine its source, means of transit, preservation, etc. It is manifestly improper to fill up from stagnant pools, shaded and sluggish streams, marshes, mineral springs, etc., nor should any springs or wells ever be completely exhausted. During the late war I have known whole tanks rendered unfit for drinking by the final addition of a cask obtained by the exhaustion of a spring. Rain-water, though largely aerated, is insipid from deficiency of salts, while melted ice and snow lack both the necessary gaseous and mineral ingredients, and require the same treatment as distilled water to be potable. Captain Cook's attempt to water ship from an iceberg resulted disastrously to the health of his crew. Snow itself does not assuage thirst, and absorbs ammonia in such quantities that its ingestion is often attended with dangerous and, in several cases of children, fatal consequences.

Boat expeditions or exploring parties on land may sometimes be compelled to use only such water as they can get, when the preferable mode of purifying it will be by filtration through sand and charcoal. Water containing principally organic matters in solution is rapidly purified by means of potassium permanganate. Calcareous waters, containing the carbonate, may be improved by the addition of pure lime-water which combines with the solvent, (CO_2), and precipitates it as carbonate, along with the rest of that salt which it had held in solution. Water containing calcium sulphate in excess is more objectionable than that holding an excess of carbonate, for though the addition of bicarbonate of sodium will likewise throw down the lime carbonate, the sodium sulphate left in solution gives the water a disagreeable taste and unpleasant laxative qualities. The objection to the popular French plan of purifying turbid water, entitled "*alunage de l'eau*," which simply consisted in the addition of a small

quantity of alum, was that, while clarifying the water, it merely converted the lime carbonate into sulphate, which remained in solution, and rendered the water worse than before. Youatt says that the horse, "through instinct or experience, will leave the most transparent and pure (?) water of the well for a river, although the water may be turbid, and even for the muddiest pool."

A common source of impurity in water brought on board ship is the leakage of the water-boat, casks, or tanks, in which it is conveyed from shore. These are frequently old, are seldom or imperfectly cleansed, not properly calked and lined, or are open to salt spray or to the swashing of salt-water into the pump-well. A pint of sea-water contains from three hundred and six to three hundred and fifteen grains of saline substances, while less than two grains in that quantity are the most that can be drank any length of time with entire impunity; consequently a single gallon of sea-water will render unfit for drinking more than a hundred of otherwise pure water. Hence a sample of water should be examined out of every tank, and several tests should be made, if it remains alongside of the ship any length of time. Where the young medical officer is in doubt whether the water examined falls far enough below the standard to be rejected, let him always decide against and decline to approve it.

The greater part of the water used on board steamers is distilled from the sea, and the attention of engineers and constructors has been directed to the production of an apparatus which shall accomplish this in the most satisfactory manner. The disagreeable empyreumatic odor and flavor usually attending water from this source, its chemical purity and consequent insipidity, are the principal faults which have to be remedied. The first depending on defective process of distillation, has been gotten rid of as this has improved. Perroy's apparatus, as modified by Bourel-Roncière, in use in the French naval service, is probably the best yet devised; the steam generated by the boilers of the engine being condensed by the water of the sea surrounding the vessel, in the midst of a current of air, by which it is aerated, and deprived of empyreuma

by filtration through granular animal charcoal. The filter consists of a tinned sheet-iron box, divided internally into four compartments, separated by vertical partitions pierced with alternate holes, so that the water produced traverses successively the entire mass of charcoal contained in the four compartments, and becomes immediately potable as it leaves the apparatus. The condenser is a simple tinned copper tube, placed on the outside of the keel, about a metre below the water-line, secured firmly to the vessel, and covered up so as to prevent its injury by the grounding of the vessel, but not to hinder her steerage-way. After running a certain distance outside, it enters the ship's side and discharges the fresh water obtained by the condensation of the steam under the cooling influence of the sea-water. Cocks at the two extremities regulate the admission of steam and the discharge of water. A minute analysis of the waters obtained on board *La Circe*, where Bourel-Roncière performed his experiments with distillatory apparatus, was made at the naval medical school at Toulon, by M. Fontaine, *premier pharmacien en chef*, and demonstrated that at the first working of the apparatus they contained sodium chloride in sensible quantity, a few sulphates, and traces of organic matters; but Bourel-Roncière claims that as the apparatus is worked the water becomes purer, and the quantity of saline matters is much diminished, and, after leaving Perroy's filter, it is sufficiently aerated to be healthy and salubrious. "The problem of the distillation of sea-water," adds A. Tardieu, from whom I have obtained these facts, "may thus be considered as practically settled." Fonssagrives proposes to supply the deficiency of saline matter in distilled water by the addition to every hundred gallons of a mixture containing about half a drachm of sodium chloride, a scruple of sodium sulphate, six drachms of calcium carbonate, a drachm and a half of sodium carbonate, and two scruples of magnesium carbonate, the aggregate amount of salification amounting to 5.4 grains per gallon. Besides the mechanical means for aerating the water, if the tank is only filled to the extent of two-thirds its capacity, the motion of the vessel will agitate it sufficiently to

cause it to dissolve a larger proportion of the gaseous constituents of the atmosphere. A crystal of green ferrous sulphate will not produce the characteristic ochreous discoloration unless air is present. Condensed water should always be cooled before it is passed into the tanks. When this is neglected, the consequent elevation of temperature hastens the decomposition of the provisions usually stowed upon the tanks.

Not infrequently water, unobjectionable when brought off or distilled on board, is seriously impaired after it has been placed in the tanks. This is the case when the latter have been white-washed inside, a practice that cannot be too severely condemned. I sailed from Boston, in the autumn of 1858, on board the *Dolphin*, of which the tanks had been treated in this way, and, with every other officer and man, I was tormented with burning thirst, dryness of mouth and fauces, nauseous taste, epigastric heat, etc., until we arrived at Buenos Ayres. The tea, coffee, and soups were also spoiled. Still another cause of the deterioration of water on board ship is overlooked. It is a very general custom to fill the tanks as soon as they have been emptied, with seawater, either to preserve the trim of the vessel or to prevent capsizing, though on board steamers provided with distilling apparatus there can be no possible pretext for using salt-water for this purpose. With the greatest care it is difficult to remove the effects of this procedure, and the destruction of the brackishness of the water by the chemical action of the iron is inconsiderable; but usually, the only cleansing attempted is to pump out the salt-water, wash the tanks with a few gallons of fresh, and then replenish them. The tanks of some small vessels will not admit a boy, and frequently the beams of the berth-deck partly cover the man-hole openings, so that it is not possible to reach but a small portion of their surface. The substitution of iron tanks for casks is one of the greatest improvements hygiene has effected in modern naval establishments, and its satisfactory results should secure attention to other suggestions emanating from this department of the medical profession. Tanks, however, require considerable

care. They should always be thoroughly cleansed when emptied, scraped, well rinsed with fresh, preferably distilled water, and waxed before they are refilled. Galvanizing the inside of the tanks is opened to the objection that it will add another foreign substance to the water in the shape of a salt of zinc. The scuttle-butt ought also to be of iron; it should be cleansed and waxed every month, and provided with a filtering diaphragm of sand and charcoal, which must be occasionally removed and renewed. I have known vessels on which the scuttle-butt was not disturbed during the whole cruise.

Instead of the ordinary mess-pot holding nearly a quart, such as is used for tea and coffee, which is filled and emptied at a draught, and oftenest by the landsmen, writers, boys, etc., who require it least, a small tin drinking-cup, of the capacity of a gill, should be attached by a chain to the faucet of the scuttle-butt, and allowed to be filled but once at each drinking. This quantity is as much as should be swallowed at any one time, and will enable the man to get from ten to fifteen full draughts a day. The sentry on post should be instructed to prevent any particular set of men from using an undue share. The whole daily allowance should not be pumped into the scuttle-butt at one time, but at intervals, during the day; thus, if the entire daily amount is one hundred gallons, let fifty be introduced at 9 a. m., thirty at 2 p. m., and the balance at 8 p. m. The tea and coffee will supply its place at intermediate times. The addition of oat-meal to water is customary with engineers and firemen, a smaller quantity thus more effectually relieving thirst. At general quarters, not only the scuttle-butt should be filled, but the mess-kettles of the berth-deck cooks, which should be convenient to be passed on deck by the powder division. Similar provisions for an extra supply of water should be made whenever any other protracted or exhausting labor is undertaken.

S L E E P .

The graphic descriptions by reporters of the filth of some of the unclean and degraded poor of our great cities would find a parallel on the berth-decks of many of our men-of-war at night. It is a place that few officers but those of the medical corps ever visit at that time; and the close bulkheads of the comparatively well-ventilated ward-room exclude the foul and stifling odors of the adjoining apartment. It is impossible to remain many minutes among the hammocks without experiencing a sensation of suffocation and nausea; indeed it is only necessary to lean over the main-hatch, toward the close of the first watch, to recognize the heavy mawkish odor that arises and betokens the over-crowding of human beings. That these beings are injuriously affected by what appeals so forcibly to our senses and excites disgust, does not admit of question. I have referred incidentally to this subject of overcrowding when speaking of ventilation, and have shown the evil of the system which fills vessels with more men than they can berth, even with hammocks swinging so closely together that the movement of one man disturbs all those among whom he is wedged. The berthing capacity of every vessel should be determined by a commission of officers, in part of the medical corps, and should be the guide to the regulation of the armament, rather than that a certain number of guns should be put on board and a certain allowance of human muscle, like that of tackle and breechings, be subordinate thereto. The ship carrying a small battery, manned by a hundred athletic, healthy men, will be far more efficient than one bristling with

cannon and encumbered with twenty or thirty daily sick, and twice as many more enfeebled convalescents.

At sea only one watch sleep below; but all the advantages derived from the increased breathing-space thus afforded are counterbalanced by a horribly disgusting and abominable practice which is enforced on board many—probably a majority of vessels—of compelling the watch that come from deck to turn into the hammocks of the men who relieve them. Perhaps an officer, who never visits the berth-deck at night, and whose own bunk is clean and dry, can thoughtlessly issue such an order and reply to any remonstrance made that “men must not expect to get all the comforts of life with eighteen dollars a month;” but the medical officer, who is ever mindful of the solemn responsibilities of his profession, will denounce this practice with every expression of abhorrence. Fancy the loathing with which a clean man must regard the compulsion to sleep in the bed of a fellow of unclean habits, diseased with venereal, affected with cutaneous eruptions or vermin, whose skin is naturally offensive, or whose blankets are always wet from incontinence of urine or spermatorrhea, or the equal repugnance he must experience at having his own clean bedding soiled by such a beast. There is never the shadow of necessity to excuse this detestable custom. In pleasant weather each watch should be compelled to “lash and carry.” The unoccupied hammocks should not be left below, except when they would get wet by being stowed in the nettings, and then they should be allowed to remain on their appropriated hooks or be piled up in some convenient place.

I have already insisted that the watch coming below should remove their wet clothes before turning in, and that if they have exhausted the three changes which a proper outfit would allow, that they should remove their outer shirts and pantaloons, and hang them on their hammock-hooks. In this way the contents of the hammock may be kept dry and clean. No wet articles should ever be stowed either in the hammocks or hammock-nettings.

All bedding should be exposed in the rigging to the air and sun at least once a week, if the weather will permit. The blankets and mattress should be well shaken, and the latter should be repicked once or twice during the cruise. Hennen, writing on military hygiene, advises the daily exposure of soldiers' bedding to the sun. I have known vessels in which bedding had not been opened for this purpose for several months, where there was no care taken to prevent men turning in wet, and where the gonorrhœal, the syphilitic, the eczematous, those incontinent of urine, and those affected with diarrhœa, slept alternately with the clean in each other's bedding. Opportunities should be improved of compelling the men to wash their blankets, one or both at a time, and their mattress-covers, in fresh water. These articles become quickly soiled with blue dye-stuff during the first weeks that new flannel is worn. Although we have often imitated or adhered to the customs of the British service with questionable profit, I cannot refrain from expressing a hope that our Government will adopt the course of the lords commissioners of the British admiralty, who "being desirous that the seamen, on entering, as far as practicable, may be freed from the necessity of incurring debt, are pleased to direct that all men and boys, on first joining one of Her Majesty's ships, shall be supplied with a bed, blanket, and bed-cover free of charge." As they are the property of the Crown, and have to be returned, paymasters are interested in having them kept in good order; and the care taken to this end thus indirectly assist to a result which, with only hygiene recommending it, would never have been attained.

The greasy black hammock-lashing is a relic of old-time customs, which should go the way of others of its kind. The neat white "tie-tie," or stop, does not soil the hammock, lessens the task of cleaning, and does not break the mattress. Hammocks are adapted for it with very little trouble, and the bedding may be more expeditiously tied up and taken on deck than when a lashing has to be adjusted.

In pleasant weather the greater part of the watch on deck

sleep on the spar-deck, wherever they can find places. Unless the decks are perfectly dry, this should be interdicted. Care should also be taken that the men never lie down where they will be exposed to dew or to currents of air through air-ports and scupper-holes. A large proportion of the aural diseases which appear on the medical returns of the service is occasioned in this way.

The necessary interruptions of the sleep of the sailor affect his health, but many of the needless discomforts and sources of disease may be abolished with great benefit to the service, as when "all hands" are called during the night in consequence of clumsily executed maneuvers or to punish a few lazy and inefficient men.

EXERCISE.

Among other "non-naturals" which require attention from the naval hygienist is want of exercise. The sailor's occupation furnishes occasion enough for physical development, but there is a numerous class of persons on board vessels of war, intrusted with special duties, who do not share the open-air labors of the mariner. These are the apothecaries, nurses, yeomen, schoolmasters, writers, masters-at-arms, ship's corporals, captains of the hold, permanent berth-deck cooks, officers' stewards, cooks, and servants, musicians, printers, painters, tailors, etc. They are recognizable at the weekly muster on Sunday by their pallid countenances, faltering gait, and untidy, slovenly dress. They are unclean and indolent as a class, are scantily provided with clothing, and form a large proportion of the sick. The dark and lonely corners where they abide are the favorite haunts of those guilty of those secret practices that are so rife on board some men-of-war. Many yeomen pass the entire day in the store-room, which sometimes is without a scuttle overhead, or even an auger-hole in the door, where they breathe a confined and stagnant atmosphere, still further impoverished and heated by two or three constantly burning oil-lamps or candles. The captain of the hold whiles away his leisure hours in the main hold, where he keeps his ditty-box, and the regular cooks seldom quit the vicinity of the galley before night, when the fires are extinguished. The system of steady berth-deck cooks reduces eight, ten, or more of the crew, according to the number of messes, to this etiolated condition, and it ought, therefore, to be discounte-

nanced. Every man, except the higher petty-officers, should be required to perform the duty of mess-cook or caterer (for the former term is a misnomer) in rotation, changes being made at least monthly, and while attending to this duty he should not be excused from the regular exercises of his division or station, an alternate performing his mess-work. All others whose special duties confine them below should be compelled to pass a certain portion of each day, during the hours of daylight, in the open air. They should either be attached as supernumeraries to the regular divisions, or be exercised together at the great guns, at small-arms, single-sticks, rowing, or going aloft. No conflict of departments need occur in this if officers of the various corps are actuated by proper feelings toward each other and toward the service. It is not presumed that the surgeon will be deprived of the services of the apothecary or nurses whenever these may be required; nor that the paymaster will have to subordinate the business of his department to his writer's exercise; nor that the captain of the hold will have to neglect his work to play at top-man or loader and sponger; nor that the cabin and ward-room dinners shall become cold or go uncooked, and Mr. ——'s boy lay down his razor and leave the lathered chin unshaven whenever small-arm men are called away. The special duties for which these individuals are respectively employed must be attended to in preference to everything else; but then the officer who directs or controls this special duty should not throw obstacles in the way of exercise, however distasteful it may be to the subordinate, by requiring untimely and unnecessary services, but prompted by a desire to promote the general interests, should cheerfully co-operate to this end.

The multiplicity of officers' messes crowds our naval vessels with a superfluous number of ineffective, worthless, and troublesome individuals, who eminently deserve the designation "idlers." A flag-ship may have a separate mess for the admiral or commodore, one for the commanding officer, (and I have heard another advocated for the fleet-captain,) one for the ward-room, (and for

a while there were two of these,) one for the starboard and another for the port steerage, and one for the warrant-officers; each with its own steward, cook, and servants; each occupying the galley, which consequently becomes a theater of confusion and contention; each encroaching on the air-space of the ship by its independent store-rooms and pantries, and deteriorating its atmosphere by its accumulation of destructible stores, often in widely apart localities. I have known a brig-of-war so small that officers and men elbowed each other on deck, on board which the show of class distinctions was still kept up by four officers' messes. I am aware that the time has not yet arrived for expecting any reform in this matter, though more than one commanding officer has agreed with me that there is no good reason why a general officers' mess, presided over by the captain, should not be established, as in the Army, where the colonel sits at the head of the regimental mess-table. The ship is the analogue of the regiment or battalion, and experience has demonstrated that where military officers dine *en masse* their demeanor is no less gentlemanly and dignified, and their polite and friendly intercourse no more subversive of discipline than in the Navy, where inferiority of position is unremittingly indicated by the relative coarseness of the table-cloth, the number of the viands, the impudence of the steward, and the behavior of the mess-mates. On the contrary, many arguments may be adduced in favor of the former practice. The expense of entertaining foreign officials is wholly defrayed from our own officers' personal means; and when this is on a large scale, falls chiefly upon those of the ward-room. Many of our commanders have dined with foreign regimental messes, in company with cornets as well colonels, without abasement of their own dignity, and visiting admirals and generals would doubtless feed with equal complacency in the presence of midshipmen, masters, and assistant surgeons. The objection of the inability of the junior officers to bear an equal share of such expenses could be overcome, first, by the Government providing an outfit of table and kitchen furniture for every ship, and,

secondly, by its assuming, as in other services, all extra expenditures certified by the commander to have been incurred in the legitimate entertainment of foreign officials and the necessary return of civilities received from them; an outlay more than counterbalanced by the saving in wages, subsistence, and sick-care of the attendants no longer required. The monthly cost to each individual of maintaining a general officers' mess in superior style would be actually less than that now expended and wasted by the inexperienced caterers of many midshipmen's messes. Furthermore, the young officers of the Navy would, from the commencement of their career, be beneficially influenced by the courteous and gentlemanly association and the exemplary conduct of their seniors. Most steerage-messes, and lately not only these, are often scenes of unbecoming turmoil and indecorum. The absence of restraint, which induces even the younger officers themselves to object to a common mess, is merely a license for conduct which their parents would not tolerate at their own tables, and which would not be permitted in any gentlemen's club on shore. The general mess, therefore, would advance the *morale* of the service, while the hygiene of the ship would be benefited by the consequent diminution of the servant class. It is not, of course, proposed to deprive the commander of his private quarters and offices, where he can regulate discipline and discuss the weighty affairs of state with foreign dignitaries, nor any other officer of the seclusion of his own apartment; but the common mess-room would be found an agreeable place for friendly and unofficial commingling, which would lead to the re-establishment of those intimacies, once the bond and pride of the Navy. The absorption of the steerage-messes would, moreover, allow clerks—commander's and paymaster's—to be dispensed with. The duties of the former could appropriately be performed by the midshipmen or ensigns in rotation, whom it is desirable to have acquire a knowledge of the methods of official correspondence and who ought to be as trusty repositories of State secrets as the irresponsible parties now appointed. An assistant

paymaster should be attached to every vessel for clerical duty and instruction, and the pharmaceutic work of the apothecary, whom I have elsewhere, assuming the permanence of existing conditions, advised to be made a steerage officer, would naturally and properly devolve upon an assistant surgeon. Nor need the warrant officers stand in the way of this scheme. They are few in number, inconsistent with the size of the naval establishment, and in a majority of the vessels of the Navy their duties are actually and efficiently performed by their mates, who could supply their places in all, except in the case of the gunner, whose more important responsibilities ought to pertain to commissioned officers especially educated and skilled in ordnance. These mates would partake in that improvement of dress and privilege which I have asked for the petty [preferably, non-commissioned] officers, and thus be assimilated to the corresponding grades in the Army; while sufficient employment on shore could be found for the present holders of warrants, many of whom are estimable gentlemen, far superior to their enforced humble surroundings on board ship, as was done with the former master's corps, until their extinction by death or resignation.

CLIMATIC INFLUENCES.

The exposures incident to the sailor's life are supposed to fit him to endure with impunity extremes of temperature or any inclemency of season. It is a popular belief that no amount of soaking in salt water will give one cold, though an old salt who is not also a chronic rheumatic is a rarity. The carelessness consequent upon these ideas has its result, as shown by statistics, in shortening the seaman's life. However slow to contract disease or to be affected by ordinary vicissitudes, the unnatural circumstances under which he lives give an unfavorable character to all his complaints, and maladies of equal severity in their incipiency are, therefore, more fatal at sea than on shore. The most potent causes of disease in the seaman are not accidental exposure to cold, occasional getting wet, gluttonous eating of unripe fruit, not indulgence in unrestrained debauch; but they are those which gradually undermine his constitution, and result from the neglect to adapt his diet, dress, and duty to the hygienic requirements of the climate in which he lives. Sailors are made up of the same tissues as princes and gentle folk, and though habit may modify the effects of natural causes, it cannot altogether nullify them. Darwin declares that "it is certain that with sailors their manner of life delays growth," as shown by the great difference between the statures of soldiers and sailors. It is now very generally believed that certain races were created for certain localities, if not created in or by them. Acclimation is no longer regarded as a fact, for such excellent authorities as Johnson and Martin assert that "residence confers only certain immunities and privi-

leges, and that so far only is there truth in the doctrine of acclimation." Even this tolerance, created by a residence of a year or two in a foreign climate, is at the expense of constitutional vigor. Dr. Bloodgood writes with respect to Panama what is equally true of many other inter-tropic pest-holes entered by our national vessels: "Acclimation is impossible; no one of whatever race or country, who becomes a resident of the Isthmus escapes disease; not even beasts are exempt, and nothing but change of climate can eradicate the effects of the poisoning from that malaria." The Government has, therefore, acted wisely in abandoning the practice of long cruises. Three years are the most that can be safely passed on any one station notably unlike the native climate, since, with every attention to hygienic precautions, there will be such a general loss of constitutional strength among the crew that they will become ill from slight causes, and such permanent organic injury will be received by many officers as well as men as to unfit them for future energetic duty. A British steam sloop-of-war, cruising on the Caribbean coast of Central America, in 1859, had had nearly three complete crews during the five years she had been in commission, and her commander told me that those officers and men who had remained from the beginning were becoming stultified in mind. A liberal government like our own has no excuse in the saving of expense, if there really be any such, to commit the inhumanity of compelling its men and officers to remain so long from their families and country. The best American merchant sailors will not enter the service while they are kept away beyond two years, and officers are not made better citizens and members of society if they are exiled until the recollection of home becomes almost a dream of the past.

Of extreme climates, the cold are more readily borne by our crews than the hot, being more like the rigorous winters to which they have been accustomed. The effects of cold, moreover, can be better guarded against, not only by proper clothing but by the observance of a strict hygiene, especially in the matter of diet

and ventilation. Raw fat meat seems to be the appropriate food, though the scurvy of the frigid zone is not merely the result of improper alimentation, but of neglect of all the laws of health. Instinct and appetite guide to what should be eaten, but foul air and filth are submitted to despite the frightful havoc they assist in causing. What an intelligent observance of sanitary laws will accomplish under the most unfavorable circumstances was markedly demonstrated in the Arctic expedition commanded and directed by Dr. Hayes.

The combined influences of protracted exposure to the elevated temperature, moisture, and organic growth and decay, which characterize tropical climates, and of an almost universally neglected hygiene, occasion serious functional disturbances, which lay the foundation of irreparable structural lesions, the peculiarities of which are, of course, familiar to the educated physician. The lungs and kidneys are brought into fuller activity under a low temperature, while the liver and skin are excited to greater functional effort under a high one. Zymotic fevers, diarrhoea, and dysentery are the most intractable of the complaints of the torrid zone, but they are so fully described in the current medical literature as to render unnecessary any special reference to their technical history. When the interests of the service require the visit to or prolonged sojourn in any unhealthy place, the advice and judgment of the medical officer must be relied on to provide for the special necessities of the time. The prophylactic administration of the salts of quinine, the diminution of the ration of meat and increase of the proportion of vegetables, the purchase of fruits, and the issue of spirits or its substitution by wine, are among those measures that should be left to his individual discretion. I have only to indicate a few precautions of universal applicability.

Although the permanent squadron on the west coast of Africa has been discontinued, vessels of the European fleet occasionally resort there, and the sanitary regulations of Secretary Preston, issued January 23, 1850, are still in operation, (*vide* paragraph

832, Regulations for the Navy, 1870,) and should be enforced on all other stations, where similar climatic conditions prevail, as in the East and West Indies, and on the coast of Central America :

1. No officer or man will be permitted to be on shore before sunrise or after sunset, or to sleep there at night ; this rule to apply not only to the continental coast but to the Cape de Verde Islands.

2. No United States vessel will ascend or anchor in any of the African rivers, except upon imperative public service.

3. Boat excursions up rivers, or hunting parties on shore, are forbidden.

4. Vessels, when possible, will anchor at a reasonable distance from shore ; far enough not to be influenced by the malaria floated off by the land-breeze.

5. Convalescents from fever and other diseases, when condemned by medical survey, are to be sent to the United States with the least possible delay.

6. When the general health of a ship's company shall be reported as impaired by cruising upon the southern or equatorial portion of the coast, the earliest possible opportunity will be given them to recruit by transferring the ship for a time to the Canaries or other windward islands of the station.

7. Boat and shore duty, involving exposure to sun and rain, is to be performed, so far as the exigencies of the service will permit, by the Kroomen employed for that purpose.

8. All possible protection from like exposure is to be afforded to the ship's company on board ; and *the proper clothing and diet of the crew, as well as the ventilation and care of the decks, will be made a frequent subject for the inspection and advice of the medical officers.*

9. These regulations are to be considered as permanent, and each commanding officer of the squadron, on retiring from the station, will transfer them to his successor.

The danger of sleeping or remaining on shore after dark in malarial climates, on account of the greater activity of the morbid cause or the greater susceptibility of its deleterious effects at that time, is generally understood ; while the universally admitted atmospheric contamination implied in the use of the word *malaria*, though its particular character is not known, points to the prime necessity of keeping as far away from its influence as possible by avoiding anchorages in narrow streams and inlets and to leeward of prevailing winds, and by intervening such a surface of water as has been practically found to confer immunity, through the surmised absorption of the aerial poison. Ham-

mond quotes the following paragraph in point, from Sir Gilbert Blane: "I have known a hundred yards in a road make a difference in the health of a ship at anchor, by her being under the lee of marshes in one situation and not in another." This has often been remarked in the bay of Rio de Janeiro. Surgeon Bloodgood, United States Navy, has shown that it was the case in the harbor of Panama, when the Jamestown was so terribly scourged by yellow fever; and I learn from Medical-Director Beale that the Boxer lay twenty miles up the Congo, the most unhealthy of the African rivers, without detriment to the health of the crew, by merely anchoring three miles off shore. In the British admiralty health reports it is stated that "the Hibernia, at Malta, during the cholera, was moored within one hundred yards of the infected districts, and the ship remained throughout the whole pestilence free from any fatal attack."

The fifth, sixth, and seventh of Secretary Preston's regulations are so exceedingly important that every infraction of them should be visited with the severest censure of the Department. Invalids should be sent home without delay; vessels should temporarily change their cruising-grounds; and crews should be relieved as much as possible from duty, especially menial drudgery, involving exposure to sun and rain. Moseley and other writers on tropical climates advise that all merely laborious work should be performed by negroes, lascars, coolies, and others inured to the climate. As the Government authorizes the employment of Kroomen on the coast of Africa for boat and shore duty, many vessels of the Asiatic fleet have been provided with Chinese "fast-boats," manned by natives; but some commanding officers, either to save expense, or because they inconsiderately imagine that "men are shipped for any work, and if they die their places can be supplied by others," compel their crews to do this duty, at all hours of the day, in any weather, and at any season. The cost of the fast-boat, however, will be many times defrayed by the saving of health. Admit that only ten men become ill from exposure to the heat of a single tropical summer,

would it not have been more profitable to have had those men well and in efficient condition, than encumbering the deck with their cots, incommoding their shipmates, and interrupting the ordinary routine of exercise? Probably half of them will require to be invalided and returned to the United States, and the cost of passage home, the payment of wages for services never performed, and those of the green recruits, who supply the invalids' places, the subsistence of the latter for months at a naval hospital, and their subsequent pensioning for the balance of their lives, would have employed a score of native boats with crews unaffected by the climate, and given to the Government the strength and spirit of these five men to fight its battles. The other reason for not employing natives is too inconsistent with the liberal character of our naval establishment to be for a moment entertained. That it is not the theory of the Government is evident from the general order of January 23, 1850. The seaman is hired for other purposes than those of pulling pleasure parties of officers to and from the shore when the thermometer stands above 100° F. He has devoted his life to the service of his country, and stands ready to shed his blood in its cause. The ship's batteries are that country's defenses, and he should be kept in a condition to man them. Without his strength and bravery, what will avail all the skill of the navigator, all the science of the ordnance officer, or all the planning and maneuvering of the commander?

Besides avoiding the exposure of men by not sending them out of the vessel at improper hours, they should be protected on board ship from intense tropical heat both at sea and in port. Awnings ought always to be kept spread, forward and aft, when the temperature exceeds 80° F. They should protect not only the poop and quarter-deck, but the main-deck, fore-castle, and head. As the awnings in port are usually very high from the deck, the protection they afford will be insufficient unless curtains are attached. They should be set before the spar-deck is perfectly dry, if it has been washed, that the slow evaporation may assist

in keeping down the temperature; and if the deck becomes dry and hot during the day, it should be occasionally irrigated. Painting the hull of a vessel of a light color very materially affects the temperature of the covered decks. The tops should be provided with awnings, that those men on duty aloft may find a shelter when not on the yards nor in the rigging. The lookout on the topsail-yard should also be screened and relieved every half-hour, or, in calm weather, at shorter intervals, and, if this is impossible, should be dispensed with, except when imperatively necessary for the safety of the ship. Many men are victims to the routine of keeping lookouts aloft, when it would be sufficient to have them in the tops or even on deck. The sentries on post in the gangways should be protected by small awnings or flies, and they should be frequently relieved. Numerous cases of *coup-de-soleil* occur among this class, who are made to parade a gang-plank two hours at a time, dressed in a closely-buttoned uniform, and carrying a heavy musket and accouterments, without any more attempt at shelter than would be afforded in their own temperate climate. A pensioner on the navy-list, some time since residing in New York, who is affected with hemiplegia, consequent upon insolation, was disabled under precisely such circumstances; and several other cases which resulted less seriously, occurred on board the same vessel in the East Indies. When boats are required to be sent away in the hot part of the day, their awnings should be spread, and this manifestly applies to the very largest launch and smallest dingy, as to those ordinarily used.

In very hot weather (above 85° F.) no work nor exercise of any kind should be performed after 9 a. m. nor before 5 p. m., unless absolutely indispensable at that time, and then only under shelter, and the reasons for such unavoidable work or exercise should be entered on the log. Tarring rigging, scraping spars, scrubbing copper, painting ship, divisional exercises, small-arm drill, etc., at such a time, are inexcusable because perilous. The dangers that are sought to be avoided are neither imaginary

nor exaggerated. I have seen a new fore-topsail bent at 11 o'clock on a calm morning, the thermometer indicating 126° F. in the sun, and followed by the fatal sickness of the captain of the top, and the serious illness, within forty-eight hours, of seven of the men who had been at work upon the yard. The weather was pleasant all day long, and others concurred with me that the work could have been as well done early in the morning or late in the evening. Dr. Maclean, in Reynolds' "System of Medicine," relates several historical instances of insolation occurring in the field or barracks, among the most striking being the following: "The two wings of Her Majesty's thirteenth regiment marched, after some very ill-judged exposure and drilling in the sun, from Nuddea to Berampore, in the midst of the hot weather, and, as the result of one march, the day closed with a sick-list of sixty-three, and eighteen deaths in all." "The sixty-eighth regiment, quartered in Fort St. George, Madras, which attended the funeral of a general officer, and paraded in full-dress at an early hour in the afternoon, in one of the hottest months in the year, their tight-fitting coats buttoned up, their leather stocks as stiff and unyielding as horse-collars round their necks, heavy cross-belts, so contrived as to interfere with every movement of the chest, heavy shakoes on their heads, made of black felt, mounted with brass ornaments, with wide, flat, circular tops, ingeniously contrived to concentrate the sun's rays on the crown of the head, and without protection in the way of a depending flap for the neck; so dressed the men marched several miles. Before the funeral parade was over the soldiers began to fall senseless; one died on the spot—two more in less than two hours. Men suffering from insolation in various degrees were brought into hospital all that night and part of next day." "The ninety-eighth came from England in the Belleisle, an old 74-gun ship, and suffered from overcrowding. On the 21st of July they took part in the attack on Chin-Kiang-Foo. The men were dressed precisely as those of the sixty-eighth. In this condition they had to take possession of a steep hill exposed to the fiercest rays of the sun

shining out of an unclouded sky. A great many were struck down by the heat, of whom fifteen died." The most recent instance of criminal disregard of sanitary teachings has occurred since I began writing. The first battalion of the tenth regiment of British infantry was marched from its camp at Yokohama after parade on the morning of August 8, 1871, to the French Hatoba, where it embarked. The men were heavily armed and accoutered, and though exposed to the sun less than three hours, the thermometer at 92° F., shade temperature, six cases of sun-stroke occurred, of which three, two sergeants and a private, died. Three of the marines who relieved them, and who were landed immediately afterward and marched to the camp they had vacated, also succumbed to the heat.

The symptoms of insolation (heat-stroke) often occur among men not exposed to the direct rays of the sun—in the fire-room of steamers, on board the monitor class of armored vessels, in small, ill-ventilated cells. Dr. Kitchen informed me that while surgeon of the monitor Dictator it was common for men to be brought to him for treatment with coma, stertorous respiration, great heat of skin, full quick pulse, and often convulsions. The cause was manifestly enough the exhausting labors of a watch in the fire-room, where the temperature averaged 145° F., and where the ventilation was exceedingly defective, air that had been already respired being repeatedly returned. Maclean states that "insolation has frequently been observed on board ship, but almost always under conditions similar to those in barracks—that is, where overcrowding and impure air are added to the influence of excessive heat. Insolation is not uncommon on board the mail-steamers in the Red Sea in the hot months of August and September; it has been observed that most of the cases occurred while the sufferers were in the horizontal positions in their ill-ventilated cabins," and he quotes the following: "Assuredly," says Dr. Butler, surgeon of the third cavalry, "those barracks most crowded, least ventilated, and worst provided with punkahs and other appliances to moderate excessive heat, furnished the greatest number

of fatal cases." Surgeon Longmore, of the nineteenth regiment, notes that one-third of his cases and nearly half the deaths occurred in one company of the regiment quartered in the barrack, which was manifestly the worst conditioned as to ventilation, and, indeed, in every sanitary requirement. M. Bassier, a surgeon in the French navy, reports that the man-of-war brig *Le Lynx*, cruising off Cadiz, in the month of August, had eighteen cases of insolation out of a crew of seventy-eight men. The heat was excessive (91-95° F.) and much aggravated by calms. The ship was overcrowded, offering little space for the berthing of the crew. M. Boudin quotes the case of the French man-of-war *Duquesne*, which, while at Rio de Janeiro, had a hundred cases of insolation out of a crew of six hundred men. Most of the men were attacked, not when exposed to the direct heat of the sun, but at night when in the recumbent position—that is, when breathing not only a hot and suffocating, but also an impure air. Other morbid conditions often attend or follow heat-exhaustion. I have had two marines on my sick-list with abscesses developed during confinement in "sweat-boxes," in the months of June and August, in the tropics. In one the collection of pus was located in front of the neck; the man was comatose, and, on recovering consciousness, complained of no pain. In the other it was developed on the upper arm, and was attended with throbbing pain and greatly increased heat of surface. In both the pulse was full, hard, and strong, the respiration labored, and the body drenched with sweat, showing that the heat was as active a cause of disease as the impoverished air.

After a long and stormy passage through the Indian Ocean, the *Levant* arrived at Anjer Roads, in Java, on the 25th of March, 1856, when the heat was intense. Her crew were enfeebled and many of them exhibited evidences of the scorbutic cachexia, in consequence of the deteriorated and unsuitable character of their food, which the insufficient daily issue of wood did not allow to be properly cooked; of their short allowance of water, which was impure; of their confinement on board ship since the

previous October, when she went into commission ; and of their unusually arduous labors in the high southern latitudes, where they were exposed for several weeks to a continuance of cold, damp, and rainy weather. Notwithstanding their condition they were laboriously employed, working from daylight until dark for two days, getting on board wood which was wet and green, and water, white from organic impurities, and which had run through a series of dirty wooden troughs into an equally dirty reservoir. The vessel sailed on the evening of the third day, and within a few hours that night twenty-four cases of cholera communis were reported, two of the lieutenants among the number. Few of these men were ever able afterward to do their duty properly. As events proved, this was their preparation for a tedious passage of forty-six days across the China Sea to Hong-Kong, a distance of only twelve hundred miles, but entirely within the tropics, (latitude 8° south to 20° north,) at the season of the change of monsoons, when the high temperature is not moderated by any breeze nor the scorching heat of the tropical sun scarcely ever shielded by a clouded sky, and when the glassy surface of the sea reflects and concentrates the heat upon the ship, whose black sides greedily absorb it. The deck-load of freshly cut green wood added an unwholesome moisture to the atmosphere, and the unfiltered water, with which the tanks had been filled, preferred for cheapness, soon decomposed and became offensive and unpalatable. The men had gorged themselves with oranges, mangosteens, and other fruit during their short stay at Anjer ; but the supply of chickens, vegetables, and fruit which they brought away with them was soon exhausted, and they were again fed with the mahogany-like "salt horse," green fat pork, worm-eaten bread, weeviled beans, and musty rice, which they had had to eat in the chilly regions of the Southern Ocean. The paltry interval of three days in ninety-seven had brought no relief to their jaded and debilitated bodies ; but they were occupied with the still severer labor of working ship for every "cat's-paw" under the additional morbid influence of a vertical tropical sun.

Most of the intractable cases of diarrhoea and dysentery, and the large majority of deaths during the cruise, can be directly traced to this period. The asthenic habit of constitution, which rendered these complaints fatal, was evidently fixed upon them by the various concurrent circumstances in operation thus early in the cruise. After her arrival on the station, this vessel did not, like the rest of the squadron, employ a Chinese fast-boat, and the results of this and other violations of hygienic mandates were plainly shown in a sick-list of *thirteen hundred and forty-five* cases during the thirty months of her commission. Nor were the sickness and inefficiency of the crew the only consequences of this utter disregard of sanitary laws. One of the officers, who inspected her at the end of her cruise, told me that she was the most unclean and ill-conditioned vessel he had ever seen.

Much of the sickness which is attributed to visiting infectious ports arises from the foul condition of the holds and limbers of the vessels themselves. Although the fever might not have appeared but for the visit to the port, it is equally true that it would not have been developed but for the uncleanness of the ship itself. The decay of the wood of the vessel and of the chips under the ceiling, the leakage of brine from provision-casks and of molasses and vinegar from the spirit-room, the drippings of oil from the machinery of steamers, the sifting of coal-dust from the bunkers and of ashes from the fire-room, the influx of salt water, its admixture with fresh spilled from the tanks and the consequent death of the microscopic organisms which inhabit it, together form a putrescible mass, the malarious emanations from which pervade the vessel and occasion a general predisposition to zymotic and paroxysmal febrile affections; therefore, while so much attention is being given to the avoidance of unhealthy localities, let some little be paid to the smouldering pestilential fire—the artificial marsh over which so many human beings are living in fancied security. On this point very valuable testimony is borne by the annual report of the Health of the Navy, issued by the British admiralty, for the years 1865-'66: "The Mada-

gascar was long infected with yellow fever at Rio de Janeiro, and when inspected it was discovered that the sides of the ship and the lining were in many places decayed, damp, and rotten, and on lifting the limber boards a quantity of black, offensive mud was discovered, the smell of which caused nausea, vomiting, and diarrhoea in several persons present." It is also stated in the case of the Isis, at Sierra Leone, that "there can be no question that the existence of the fever poison in that vessel did not depend on the locality, but on the vessel itself;" the latter even becoming a focus from which infection spread to other vessels, since "within six or seven weeks no fewer than twenty-eight deaths among the crews of two ships-of-war, from this malignant fever, were clearly due to communication with the Isis; all these deaths occurring exclusively among men who had gone on board that vessel." It is a point of great practical interest in respect to severe outbreaks of yellow fever on board ship, that "nearly all the vessels which have been most scourged in late years were unmistakably unhealthy ships, as evidenced by their larger number of cases of general sickness, not only during the yellow fever years, but also in those which preceded or followed them. This was the case with the Aube, Icarus, Éclair, and the same holds true of other vessels which have sustained fatal attacks of fever." The reputation of the Éclair was such that to efface the remembrance of the terrible disease the admiralty changed her name to Rosamond. Undoubtedly, the ultimate universal substitution of iron for wood in ship-building will be productive of immense sanitary advantages on account of the freedom from the noxious products of the decomposition of the material of the vessel and of the *débris* of its construction, and the greater facilities for keeping it clean and admitting air to the interior of its frame-work.

There is no question of the propriety of preventing access to a vessel of which the crew is affected with malignant, communicable diseases; neither is there any doubt of the urgent necessity of removing every individual of that crew without delay to some healthy and isolated place on shore. The system of quarantine, however, which proposes to imprison both sick and well upon the

infected vessel until the endemic exhausts itself for lack of new victims, is a barbarous relic of popular ignorance and superstition. The sanitary regulations of the United States and Great Britain are sufficiently liberal, and at the large sea-ports are generally judiciously interpreted by the health officers; but in Portuguese, and especially in Spanish ports, the most annoying, frivolous quarantines are still exacted. I have known a man-of-war to sail from Philadelphia in midwinter, arrive at Cadiz after a passage of forty days, and be quarantined for having no bill of health; another, provided with the proper document, to be placed under observation because it did not bear the *visé* of the Spanish consul; and a third, coming from a port where there was no such official, to have the same fortune because the law did not provide for such a contingency. On another occasion I protested, ineffectually, to the health authorities of Fayal against the placing in quarantine of a detachment of officers and men who had gone to rescue a sinking merchantman, one hundred and fifty days out of port. Occasionally similar annoyances are experienced in our own country. During the period of my official connection with the United States navy-yard near Portsmouth, New Hampshire, I had serious trouble with the local health officers, who refused to consent to the immediate debarkation of the crews of vessels sent north from the Gulf of Mexico, often with only mild pseudo-yellow fever, though abundant opportunities existed for isolating not only the invalids and convalescents, but the unaffected crew and the abandoned vessel. The various health authorities of New York and the other municipalities fronting on the bay have been but lately engaged in disgraceful wrangles over their several rights to grant *pratique* to vessels from suspected ports. Hence, it would be in the interests of commerce and humanity if the whole subject of quarantine were placed under the control of sanitary officers appointed by the General Government. Assistant Surgeon Harvey E. Brown, United States Army, in an elaborate report on quarantine on the Southern and Gulf coasts of the United States, just issued by the War Department, recommends the assumption of quarantine by

the National Government, advising that "the general management of affairs should be confided to the Surgeon-General's Bureau, and be under his supervision, aided by such inspectors as he might consider necessary, who should be detailed from the officers of the medical corps;" but the Surgeon-General of the Army, without indorsing the suggestion, states that even if existing vacancies in the Army medical corps were filled, "it would be impossible to furnish officers from it for quarantine duty, without serious interference with their military duties, and detriment to the interests of the service." Under these circumstances, the cooperation of the two services would, perhaps, supply the requisite number of sanitary inspectors, although the peculiar nature of the naval medical officer's training, doubtless, especially qualifies him for dealing with diseases incident to ship-life. Michel Lévy and Fonssagrives, in their respective works on hygiene, have protested energetically against the useless and ridiculous impositions of the system of quarantine in vogue, and the medical officers of every navy are agreed that, no matter what the disease, both sick and well should be immediately removed from the vessel, which should be thoroughly cleansed and renovated. The health reports of the British admiralty state: "Within the last ten or twelve years cases of yellow fever have, on more than one occasion, been landed from ships of war in Plymouth and Hasler hospitals without any but good results. The results in Jamaica, in 1860, were eminently satisfactory. The same seems to have been the case in 1856, the most sickly year, when fever was prevalent on shore at Port Royal and Kingston." In the numerous instances of late years where crews, sick and well, have been landed at the island of Ascension, the disease seems to have speedily much abated, and in no instance to have extended to the garrison and other residents, always provided that direct communication with the infected ship was prevented; and Inspector-General Smart, Royal Navy, relates striking proofs of the utility of landing the sick in suitable hospitals at Bermuda.

MORAL INFLUENCES.

The sailor of to-day is not the brute of fifty years ago. The barefooted, abject, illiterate being whose back bore the scars of the cat is not recognizable in the well-dressed, tidy, manly-looking seaman who receives his letters and papers regularly from home, and signs his name legibly to the shipping articles. The many foreign officers and civilians who witnessed the memorable inquiry into the circumstances attending the loss of the *Oneida*, at the British consulate at Yokohama, were impressed with the intelligent, fearless, and manifestly truthful manner in which the surviving lookout and helmsman gave their evidence, and particularly with the graceful style in which they affixed their names to the record. While it was once almost unnecessary to inquire whether a man could write his name, it is now the exception that "his + mark" appears on the rendezvous returns. The well-filled condition of the various ship letter-bags, and the general allotment of half-pay, attest the commendable home interest of the modern sailor. The quiet, dignified old quartermaster, who off duty sits conning his Bible; the young quarter-gunner reading stories and travels to a crowd of listeners; the ambitious ordinary seaman working out problems from the *Bowditch* borrowed from the navigator, are now to be seen on board every vessel of war.

There are some naval officers, generally themselves antiquated, who insist that the social improvement of the sailor has been at the expense of discipline and nautical knowledge; but there are others of equal experience, and brighter minds, who candidly acknowledge the contrary. The abolition of the cat was a nat-

ural consequence of this moral advancement; therefore the advocates for its restoration are only attempting to re-inoculate a convalescent body with the virus of the disease from which it has recovered. The necessity of former times, if there ever were such, has ceased, as witness the testimony of Fonssagrives, whose exhaustive work on naval hygiene establishes his authority: "We do not believe that the sailor of to-day is that of 1790; he has changed with the public character, and to desire to treat him in the same manner is to commit a flagrant anachronism. Physical suffering is, moreover, a bad appeal to make among men who are neither degraded nor vicious. This punishment excites hate more often than repentance, and has never reformed any one. The abolition of flogging, therefore, is a judicious measure. Besides, this punishment, like that of 'keel-hauling,' may be followed by grave accidents—sometimes mortal; and that alone should suffice, without any motive of moral propriety, to justify its abandonment." What is true of the soldier is also true of the sister profession of arms. "The day when soldiers were regarded as mere machines has passed away. An intelligent man, who knows what he is fighting for, and who is capable of appreciating the responsibility that rests upon him, is incomparably a better soldier than one who is incapable of such intelligent action."—(Hammond.) It is not claimed that all sailors are so exemplary; nor is it expected that all the profane, licentious, and drunken will ever be transformed into upright, intelligent, well-conducted individuals. Although the general character has improved, great numbers are as depraved as they can become by unrestrained indulgence of their passions. The low haunts of maritime cities are still crowded, and the man-of-war's man, though distinguishable by dress and bearing, often lends himself to the general debauchery, and becomes as helpless a victim of the land-shark.

What can be done to correct these evils? Though it be no more possible to confer on every one the boon of moral health than to bring their bodies all into a condition of physical eucrasia, enough good may be achieved to reward all our efforts bounti-

fully. Teach the sailor that he is a man, with a man's duties and capacities. Treat him as such, and require him to act as such. Develop his mind, which has been subordinate to his physical instincts, and that mind will do for him what legislative action or individual beneficence cannot. Ethical hygiene is a field in which every naval officer, and those of the medical corps particularly, should not be ashamed to labor.

I would first suggest, for the moral improvement of the sailor, that every vessel should be furnished with a library—not such as is now found in the cabin, behind a glass case, but a library to which every man on board can have access. Exclude sensational novels, and let it consist of works on natural history, general history, historical romance, travel, geography, popular science, biography and navigation; of encyclopædiæ, magazines, and school-books—some rudimentary, and others for advanced students. If these are not supplied by the Government, as is desirable, they can always be obtained, without much trouble, by subscription. They should be placed under the charge of the schoolmaster, or some other intelligent petty-officer, as the apothecary or paymaster's writer. Arrangements may readily be made with publishers to have files of newspapers mailed to vessels on foreign stations. Many officers considerately send their papers out on the berth-deck after having perused them. Religious associations, interested in the moral amelioration of the seaman, occasionally make donations of packages or boxes of books to sea-going vessels; but these are always so unattractively pious and devotional that the sailor, with evident disappointment, lays them aside, after endeavoring to read a page or two, and returns to his dominoes or checkers, when an interesting tale or travel or adventure pleasantly told, or an intelligible account of natural phenomena or scientific facts would have secured his attention, and contributed as well to his moral as to his mental culture. Men should be encouraged to write home, and I have, therefore, advised that ditty-boxes should be allowed in preference to bags, since not only can writing materials be better preserved in them,

but they also serve as writing-desks. Some competent person should be appointed schoolmaster, to instruct not only the boys, but such others as desire to learn reading, writing, arithmetic, and geography, and should never be diverted from his legitimate duties to act as "executive officer's clerk." Commodore C. R. P. Rogers informs me that on board the Franklin, while under his command, a reading-room, fitted with tables, and well lighted at night, was established, where men could read, study, and write, and where they enjoyed so much real comfort that many voluntarily relinquished their turns to go on shore, although the vessel was cruising in European ports, where dissipation wears its most attractive garb.

It is not enough, however, to increase the comfort of the seaman on board ship, to supply him with reading matter, and to provide for his instruction. He will not be well if he never leaves the vessel. Hygiene demands nothing more important, not merely for their physical well-being, but for their mental and moral healthfulness, than that the men should be allowed frequent liberty on shore. I have known a whole ship's company, except the boats' crews, servants, and a few privileged petty-officers, to be confined eight months on shipboard, without, in all that time, having once touched foot on land. Is it a matter of wonder, then, that when liberty was granted for forty-eight hours, at such long intervals, when old and young, adults and boys, were hurried on shore together, and told if they returned before the expiration of that time, they would forfeit the remainder of their liberty, that in the delirium of finding themselves outside their prison-walls, they abandoned themselves to unrestrained debauchery? Was the spectacle of bruised and bloated countenances, of which the ship was full for a fortnight after this season, calculated to improve the younger portion of the crew, or, as often happened when these youngsters were themselves the most riotous offenders, did their display, ironed, gagged, and bucked upon the poop, in the full view of the harbor, convince them of their folly and sinfulness? Dr. Wilson relates an instance which exemplifies the

utter thoughtlessness with which some officers deal with these matters: "After a ship had been at anchor for several months in a foreign port, without any of the crew having been permitted to visit the shore, in a summary court trying a culprit I heard one of the members express his views by suggesting that the prisoner be sentenced to the seventh punishment, 'deprived of liberty on shore in a foreign station.'" The mysterious laws of health, psysical and physical, require that a man should visit the land, walk upon the earth, breathe its atmosphere, and inhale the odor of its trees and flowers. Let him see something more of the place to which he sails than the glimpse he catches through the bridle-port or over the rail, (for strict discipline does not permit a head to show above it,) that he may not have to make the mortifying admission when he returns home that he has never been on shore. Let him have an incentive to read, study, and inquire about the countries he visits, and with what interest will he visit them. Make the visits to the shore no longer a novelty and a recognized occasion for plunging into orgies and dissipation, but an opportunity for rational enjoyment, instruction, and exercise. That this is not a visionary's scheme was demonstrated by Commander, afterwards Admiral, Foote, on board the sloop-of-war *Portsmouth*, during her cruise in the China and East India seas in 1856-'57 and '58, when this system was pursued. Was this a well-disciplined ship? On none in the squadron were there so little need, and so small a record of punishment. Was she clean and well-conditioned? Her executive officer, Lieutenant, the late Commodore, Macomb, well deserved the flattering report of the board of inspection on these points. Was she efficient as a man-of-war? The conduct of her officers and men at the attack and capture of the Barrier Forts, near Canton, is a matter of official record, and certainly bore comparison with that of a sister-ship on which a different practice prevailed. Did she maneuver well? There are many still in the service who were then on board other vessels, and who remember the pride they experienced whenever she entered the crowded harbor of Hong-Kong, threaded her course through the

many sail of every nation there congregated, and anchored, without mishap, wherever her commander desired. Was she a happy ship? Those who were fortunate enough to be attached to her agree that that cruise will be memorable, not only for its general interest, but for the harmony that pervaded the ship forward and aft, from the time of going into commission until the flag was hauled down. I do not desire it understood that this is an isolated case in the practice of our Navy. The book of Regulations for the Government of the Navy, issued in 1870, directs in paragraph 1429 that "petty-officers and men will be permitted to visit the shore on suitable occasions when it can be done without injury to the public service;" but the interpretation of the terms "suitable occasions" and "injury to the public service" depends entirely on the will or caprice of the commanding officer. I believe that those commanders, without exception, who are pre-eminent for professional skill and broad and liberal views of their duties and obligations to those under their command, authorize the granting of frequent leaves of absence to their crews, though I have had but two opportunities of personally witnessing the effects of this system on board the men-of-war to which I have been attached during the eighteen years of my service in the Navy. These were the brig *Dolphin*, commanded by the present Admiral Steedman; and the sloop-of-war *St. Louis*, when under the command of Captain George Henry Preble. Men seldom look back with any great satisfaction upon the months they have passed away from home and country on a foreign cruise; but I think few who were attached to these vessels, whether as men or officers, do not often recall the happy associations connected with them. Throughout the many months the latter ship was anchored in the harbor of Lisbon there was seldom a day that some of the crew were not on shore, and I remember not only the encomiums their conduct elicited, but on one occasion, when a disturbance at the circus was attributed to some of her men, with what promptness the journals of the city contradicted the charge, indicated the young gentlemen who had

actually caused the difficulty, and intimated that these sons of wealthy and influential citizens might profitably imitate the behavior of the St. Louis sailors, who, of all the crews of the thirty men-of-war of various nationalities then in port, were welcomed on shore by the people.

Liberty should not be granted to too many men at one time, else the half-dozen incorrigibles who are found in every crew will make it an occasion for revenging private injuries or instigating disorderly conduct. Let it be understood that every day in port a single mess will be allowed to go on shore, and that whoever returns drunk, dirty, disfigured, or with clothes torn or missing, shall forfeit his right to go when it next comes his turn. Let such offender, after one deprivation, be again allowed liberty when his turn arrives a third time, and if again offending be permanently deprived the privilege. Let it also be understood that whoever overstays his leave compels the whole of the next mess to remain on board until he returns, and there will be few who will care to encounter the ill-will of their shipmates by so doing, and whose punishment will not be gladly witnessed by them. Opportunities for visiting the shore might also be multiplied by changing boats' crews weekly or semi-monthly, the coxswains only remaining the same. All hands would thus be able to partake of advantages now enjoyed only by a few. The institution of the system of frequent liberty, besides the sanitary good it accomplishes, serves to reward the meritorious and punish the worthless, and operates as a more powerful check to intoxication than pledges, lectures, or enforced abstinence.

As in many foreign ports efforts are being made to eradicate venereal disease by subjecting the public women to sanitary examinations, it is important that similar inspections be required of men going on shore. Unless very frequent leaves of absence are granted, men invariably indulge in sexual intercourse, whether diseased or not, and those affected with chronic gonorrhœa deliberately do so with the object of transferring the disease from themselves to the woman, a therapeutic effect which Jack has

undoubtedly often observed, though he mistakes the rationale of the cure effected. Similarly well founded is his horror of the doctor's attempt to prevent the suppuration of his "blue ball;" for though ignorant of the distinction between chancre and chancreoid, he knows that a bubo that does not "break" will be followed by the horrible train of constitutional symptoms. As long as the sexual impulse exists it will be gratified, and, if not naturally, by such expedients as can be adopted, and the ingenuity will be exercised to devise novel modes of excitation. I have never been attached to a ship in the service on board which manustupration and pæderasty were not practiced, the latter, of course, more rarely than the former. Other officers may deny that they have heard of them, but I know these vices to be common, and generally unknown only because uninvestigated or undiscovered. "It is not to be denied that, however purified and fortified, the sex-passion, in a healthy, continent adult, is very powerful; very different from the sickly craving of the voluptuary, or the mad, half-poetical desires of a boy." "How much severer occasional incontinence makes the necessary struggle to remain continent at all appears from the sexual distress which widowers or those married men to whom access to their wives is forbidden suffer."—(Acton.) It can, therefore, scarcely be expected that the humble wearer of blue flannel will excel him in blue broadcloth in that mastery of his desires which theologians enjoin as necessary to that purity of heart which is among the promised beatitudes, and hence the naval hygienist has no other alternative than to recommend frequent liberty on shore as the only practicable means of preventing the commission of secret sexual vices, though when these habits are established even this will not serve to eradicate them, as witness certain cases well known to medical officers in our own and the British navy among officers of high rank. Among the causes which formerly operated to enfeeble the sailor's constitution and shorten his life, I have no hesitancy in including celibacy. Reveillé-Parise states that "amid the abundant statistics which have been collected lately, it has been dem-

onstrated that bachelors live a shorter time than the Benedicts;" and Dr. Stark, as quoted by Darwin, declares that "bachelorhood is more destructive to life than the most unwholesome trades, or than a residence in an unwholesome house or district, where there has never been the most distant attempt at sanitary improvement." In former days, in our own service, and even now, where the systems of long enlistment and infrequent leaves of absence prevail, the man-of-war's man was virtually a celibate. I have known him return from an absence of three or four years, reship for another cruise, sometimes on the morrow, often the same week of his discharge, and thus pass years within the narrow compass of a ship's hull. Marriage, under such circumstances, was only a form, and even with officers was little better. A friend now high on the list, out of the first eleven years of his married life had not passed a sum-total of eleven months at home; and another, a British naval officer of rank, told me that though he had been married twenty-two years, he had lived less than an aggregate of one with his family. Instances like these will probably never again occur, at least in our own Navy, since every officer is by regulation entitled to a period of shore duty after each full cruise at sea, and sailors who obtain honorable discharges are also allowed three months' full pay on shore.

As an additional reward for good behavior, a liberal allowance of money should be made, and withheld from the undeserving, for the purchase of books, curiosities, or presents for friends at home. Most men have some dear relative or friend, for whom they desire to obtain some gift, and any expenditure for such an object should be sanctioned and encouraged.

There is so little to stimulate the ambition of the sailor on board a man-of-war that the superior class of native Americans are deterred from entering the Navy. In the merchant service the seaman aspires to become a mate or master, and, if industrious, temperate, and qualified, he succeeds; while in the Navy he may be twenty years a petty-officer without enjoying any increase of privilege over the ordinary seaman or landsman of

as many days. His duties are more responsible, greater confidence is reposed in him, greater deference paid to his opinion; but he dresses as he has always done, he squats at the same mess-cloth, and is as much a prisoner on board ship. The Army offers opportunities for advancement through the non-commissioned grades to the line of promotion, and all such meritorious preferments are welcomed to their new station with the cordiality and public spirit characteristic of this arm of the national defense. It is a great defect in our naval organization that more distinction is not made between petty-officers and the rest of the crew. Their dress should be strikingly distinctive; they should constitute a totally separate mess; they should be granted greater indulgences, among them that of going on shore three or four at a time when their duties permit, without reference to the liberty allowed the other messes. They would then feel that the title officer was something more than a farce, and less deserving the adjunct "petty," and the silk-embroidered eagle on the arm would carry with it more respect than it does now under its familiar designation of "buzzard." The positions of mates and warrant-officers should be recruited from this class, and special effort should be made to ascertain and report all men qualified for and ambitious of obtaining such situations. The condition of the non-commissioned officers of the Marine Corps, who on shore are treated with the same consideration as the corresponding grades in the Army, is a peculiarly distressing one when they come on board ship and are subjected to the same restrictions and exactions as the petty-officers with whom they are there classed; and many very excellent sergeants have been degraded and ultimately ruined by the humiliations which they have suffered in consequence of this system. The apothecary and yeoman, (the latter an unmeaning title, for which storekeeper should be substituted,) the one requiring a semi-professional education in pharmacy and the other intrusted with important pecuniary responsibilities, and probably also the schoolmaster, when one is allowed, properly belong to the class of appointed officers with

the clerks of the commander and paymaster, and should mess with them in the steerage, unless, as I have advocated in another place, that apartment, with this entire class of officers should be dispensed with. Their duties require a far higher order of ability, for the clerks are only copyists, and their positions would become attractive to young men in the same genteel station in life were they removed from the coarse associations of the berth-deck. Much of the illicit treatment, especially of venereal complaints, by which the apothecary, unless closely watched by the medical officer, will attempt to eke out his inadequate salary, will be checked by giving this officer a status correspondent to the nature of his calling, as in the French, Brazilian, and other foreign navies. A still more important gain will be the getting rid of the class of imperfectly educated and broken-down drunkards, who now accept the position because their habits keep them from employment on shore, and of the still worse set of incompetents provisionally rated from the deck, who, however carefully the hospital liquors may be kept under lock by the medical officer, will steal part of those issued to the sick, or drink or sell the alcohol from the spirit-lamp or that from the percolator while making tinctures, or even the tinctures themselves, and who never compound a pill of calomel or quinine without running the risk of putting up corrosive sublimate or strychnine, or who add half an ounce of some potent liquid to a mixture when the prescription calls for half a drachm. A most shameful instance of criminal incompetency of subordinates has recently disgraced our service, when an invalid, who was allowed access to the dispensary, was fatally poisoned by swallowing a quantity of impure carbolic acid, which he mistook for his own draught.

The act of Congress establishing honorable discharges and the institution of honorary badges indicative of every such discharge have accomplished excellent results. Care should be taken that every man entitled to the distinction receives it, and further that none is issued except in meritorious cases. I have seen an honorable discharge presented at a rendezvous by a man who de-

sired to reship as a seaman, that being the rate he bore on the discharge, who, when examined, was found unable to send down a top-gallant-yard or reeve a top-sail buntline, and who finally admitted that he had not been in a top the whole cruise, but had been coxswain of the barge and arbitrarily rated seaman. The presentation of medals of honor, authorized by Congress, for conspicuous heroism during the rebellion, should be made a permanent institution. The pride with which Frenchmen display their little pieces of ribbon, and the emulation excited among Englishmen by their Victoria cross and medal, ought to have some parallel in the naval service of our own country.

Ennui and home-sickness affect the sailor less than the officer, but the monotony of his occupation and the protracted confinement on board ship ultimately cause him to become despondent and indifferent to his duties. Frequent occasions of visiting the shore and an abundance of reading-matter will do much to dissipate these enervating feelings; but I would suggest, without intending to interfere with the business of any other department, as a further means of occupying and interesting him, that more attention be paid on board ship to the minor works of nautical manufacture. Every one has observed the general interest excited by the occasional weaving of sword-mats and the crowds that cluster around the sailmaker's seat, the carpenter's bench, and the armorer's forge. Would it not be instructive as well as interesting to multiply these occupations, even though no immediate necessity existed for them? I do not suggest this, however, with the object of simply finding work for the crew. Spars, masts, and coamings have been scraped and painted, rescraped and repainted, and bright work, introduced whenever possible, blacked and polished, reblacked and repolished merely for the sake of keeping the men all the time occupied. Such unnecessary and distasteful work makes every one discontented and unhappy, particularly when accompanied with the announcement that "there will be no Sundays" on board the ship. The sailor has a considerable religious element in his character, and, though

restive under long church services, he entertains a respect for everything sacred. In most vessels of the Navy the Sabbath is scrupulously observed. Saturdays also are very properly appropriated to the crew, that they may take their bags on deck, sew, arrange, and air their clothing, and examine their little possessions.

The depressing influences of sea life are to be further overcome by encouraging amusements and diversions. Music has its influence upon the sailor, as upon the dweller on shore. Witness how the fife causes him to redouble his exertions at the capstan when almost exhausted with fatigue. A ship with singers and instruments on board is always cheerful. The sounds of music, dancing, and laughter, which are heard toward sundown, indicate the contented crew, and wherever there are mirth and gayety there are not apt to be animosity and quarreling. Dominoes, backgammon, and draughts are also sources of amusement. On foreign stations many crews endeavor to enliven their time by organizing theaters, glee-clubs, and negro-minstrel companies, whose performances are often exceedingly creditable, while considerable ingenuity is displayed in getting up costumes and scenery. At other times they decorate their vessel for fancy balls, in which they themselves assume the characters; and I have known a dinner to be given by one ship's company to another, at which speeches were made that could not have been excelled by the officers. Often a little interest, encouragement, and pecuniary assistance from the officers will lead to undertakings of this kind, which might not otherwise have been originated. A magic lantern, with a proper set of slides, would be invaluable for the occasional entertainment of the crew, particularly if its exhibitions were accompanied with explanatory remarks by some of the officers.

Boat-racing, gymnastic feats in the rigging and on deck, swimming, fishing, hauling of the seine, and, when the circumstances of the place will permit, athletic games, as base-ball, on shore, washing clothes there, etc., will afford sport and diversion of incalculable benefit to the health of the crew, and contribute to the

diffusion of a spirit of happiness and contentment among them. Target-firing, boat-racing, and sailing, and the landing of the men for company, battalion, and howitzer drill, are not only recreations but beneficial exercises. Some divisional officers infuse so much interest in the ordinary exercises of the vessel by the enthusiastic, earnest, and vivacious manner in which they impart their instructions, and by the zeal with which they perform their duties, that their men always work with alacrity and pleasure.

While rewards, honors, and diversions are thus multiplied, they must not be deprived of their value by inattention to the necessity of punishing evil-doers. Discipline is the soul of a man-of-war, and implicit obedience to the constituted authorities is the prerequisite to discipline. It should be exacted of every man and officer on board, and the example of submission to superior authority should be set their crews by commanders and other officers themselves. Every regulation of the Navy Department, every order of the honorable Secretary of the Navy, and every act of Congress should be faithfully and fully obeyed, in the spirit and according to the letter, else the officer violating them cannot conscientiously punish those who infringe his rules. Frederick James Brown, M. D., late of the royal navy, in a valuable little work entitled "Questions and Observations in Hygiene, recommended to the consideration of naval medical men," thus answers the question: "Is the general discipline of the ship strict or lax; and have you noticed, as a consequence of either system, distinctly referable to such, an increase of the real sickness of the ship, independently of the number merely on the list?"

"The answer to be returned to this question will be: I believe both health and comfort suffer under a lax state of discipline. And this is my reason for handling subjects which may be considered beyond my province by many who will read these pages.

"If the commanding officer should permit offenses, even the slightest, to be committed with impunity, and does not support the officers serving under him in the execution of their duty, both the officers and the petty-officers will become remiss and careless,

and the men idle, dissipated, insolent, and refractory. Disease is the consequence of the indolence, filth, drunkenness, and badly-disposed mental condition of such a crew."

There will be bad men on board all ships, who will interrupt order and harmony unless they are promptly and effectually punished. The act of Congress specifying the various allowable means of punishment was wisely and humanely framed. The penalties prescribed are efficacious, affecting the moral nature rather than causing physical suffering which may do permanent injury to the offender's health. The same spirit should actuate officers in imposing their lesser punishments. He who complains that he cannot manage a ship's company without his instruments of torture, only admits his unfitness for his position. A man of proper mental resources will find abundant means of bringing shame and mortification to the culprit by the withdrawal of privileges, the deprivation of spending money, the restriction of liberty, the imposition of extra duties, particularly those of a disagreeable kind, etc. The bad are also indirectly but effectually punished whenever the good are conspicuously rewarded. Although forbidden by law, recent courts-martial have disclosed that confinement in "sweat-boxes," or, as they are euphemistically termed, "the cells," is still inflicted on board ships, at the risk of the life or jeopardy of the health of the man or boy who may have been guilty of some trivial offense. Besides its illegality, it is of a class with bucking and gagging; tricing up by the thumbs, the toes only touching the deck; or lashing on the inside of the rigging, the bare soles on the rattlins and rope yarns cutting into the wrists and ankles—barbarities unworthy the nineteenth century. As drunkenness is the source of most of the disturbances on board ship, if carefully guarded against there will never be occasion for gagging a man raving with alcoholic mania. When such cases do occur, rather than resort to means which aggravate the nervous symptoms and may occasion irreparable injury, let them be handed over to the medical officer, who by a little judicious treatment can soon quiet them. Punishment

is thrown away on men whose brains cannot perform their functions. When reason and consciousness are restored, it will be appreciated and be of profit. No one thinks of gagging the noisy victim of delirium tremens, yet it would be as rational to do so as to try to smother the voice of the yelling inebriate. A further good from this method of treating these cases will be the avoidance of those scandalous scenes which are so pernicious in their effects upon discipline, when some half-crazed "liberty-man" defiantly resists the attempt to confine him, and arouses the whole crew from their slumbers by the curses and obscene epithets which he couples with officers' names.

THE SICK-BAY.

It is, of course, the paramount duty of the medical officer to provide for the comfort of the sick. In frigates the forward portion of the berth-deck is assigned to the sick-bay. This apartment is always disproportionately small, usually badly ventilated, imperfectly lighted, sometimes very wet, often foul and offensive from leakage from the head-pipes, which lead through it, and disturbed by the noise of the chain-cables in coming to anchor or getting under way. The *Guerriere** and *Tennessee* are representatives of the finest and largest of the vessels of the modern navy. The former is a first-rate of about 2,500 tons, carrying twenty-one guns; the latter a second-rate of 2,135 tons, with a battery of twenty-three guns; and both are manned by crews ranging from three hundred and fifty to five hundred men. The length of the berth-deck of the *Guerriere* is 310 feet, its average breadth 28 feet, and its height between decks 6 feet 11 inches; the corresponding measurements of the *Tennessee's* berth-deck are 334 feet 4 inches length, 27 feet 9 inches average breadth, and 7 feet 3 inches height; yet the sick-bay of the former has a cubic capacity of only 2,275 feet, scarcely properly accommodating three patients; and that of the latter 4,867 feet, not more than is required by five. Important as is this portion of the vessel, its dimensions are rather a matter of accident or subordinate to other considerations, than regulated by the fitness of its loca-

* No longer on the Navy list, having been badly injured by getting onshore.

tion, the numerical size of the crew, the nature of the cruising-ground, and the probable amount of sickness. Unless the sick-bay can be removed to its proper site aft, it should be very much enlarged and made as comfortable as possible. Two or more air-ports should open into it on either side, and a scuttle or hatch-way should be cut through the decks overhead for the admission of a wind-sail from either the spar-deck or, weather permitting, from the forward gun-deck ports. Several thick glass deck-lights should also admit light from the gun-deck. The entire bulkhead of the sick-bay should be made of light gratings, which should not be furnished with thick woolen curtains, as is commonly done. This apartment should be as impervious to water as it is possible to make it, and no pretext should ever sanction the discharge of the men's water-closets through its interior.

In sloops-of-war, brigs, and other single-deck vessels, the midship portion of the berth-deck is appropriated to the sick. Where there are midship lockers the mattresses are usually spread on top of them; but this is inconvenient if the lockers require to be frequently opened, and as the hawsers, etc., which are usually stowed there, can be placed elsewhere, this space should be kept free from obstruction and devoted exclusively to the sick-bay.

To insist upon the cleanliness of this apartment would be to impugn the professional qualification of the medical officer, who on board ship as in the bed-chamber on shore, regards this as a most important part of the treatment of every case. Everything should be scrupulously clean about the invalid. The canvas screen which isolates him, and the cot or hammock in which he lies, should be of natural whiteness, not soiled by grease and dirt; his head should rest upon a white-cased pillow, not be propped up by his boots or pea-jacket; and a comfortable hospital mattress and clean sheets and counterpane should be substituted for his own rough, soiled blankets. The patent close-stool, now supplied all vessels from the Naval Laboratory, admirably answers its purpose of preserving the atmosphere of the sick-bay and berth-deck free from contamination. One or two cots should always

be in readiness for the use of the sick. Even when ill but a few days, it is a great relief for the sailor, who has been bent like a bow in his hammock, to lie in a horizontal position, and be able to stretch himself out at full length. The wooden cot-frame now in use is a clumsy affair that ought to give way to a light iron one easily gotten ready for service. The ambulance-cot devised by Surgeon Gorgas, United States Navy, for the especial purpose of transporting wounded men, ought to be supplied to every vessel. The cots containing fever invalids and other cases of serious illness should always be slung on the gun-deck of vessels with covered batteries, and, when the weather will permit, such patients should be placed under the top-gallant fore-castle of single-deck sloops.

The medical officer must decide how far the healthy members of the ship's company are to be inconvenienced by the sick. Usually the humanity of the sailor and officer prompts them to sacrifice every selfish interest in behalf of their invalid shipmates, but occasionally a churlish fellow is met who boasts that he has never been sick an hour in his life, and only grudgingly assents to or flatly refuses the requests of the medical officer. If the latter is known to be zealous, devoted, and self-sacrificing in the performance of his duties to the sick, he will seldom have any difficulty in having them properly cared for. I have had charge of cases of low fever and dangerous operations where the successful issue was largely, if not entirely, due to the assiduous and intelligent watching of the volunteer nurses. Occasionally an officer will insist on the blind adherence to routine duty, notwithstanding the urgent representations of the medical officer of the risk thereby occasioned to critical cases of sickness. Fortunate if no harm is done; but I was a witness some years ago of death under peculiar distressing circumstances of this nature. A marine, exhausted by a severe pulmonary hæmorrhage on the previous evening, was lying in a cot on the berth-deck on a Saturday morning, the usual day for holy-stoning the deck. Although the danger of removing the man was fully represented, he was car-

ried on deck and placed under the top-gallant fore-castle, the removal being followed within less than ten minutes by a hæmorrhage which quickly terminated fatally.

Other circumstances the same, food, air, light, and attendance, I am satisfied that invalids will recover more rapidly on shore than in the best possibly regulated hospital-ship. The most extensive experiment of this sort, which had then been made by our Government, was the Idaho, to the medical charge of which I was appointed in September, 1867. She was a steamship of the first rate, from which the machinery had been removed, and was stationed at Nagasaki, Japan, "to be used in part as a store and hospital-ship for the vessels of the Asiatic squadron." Although one of the largest vessels in the Navy, (2638 tons,) she proved unfit for this double and incongruous purpose. It was originally contemplated to devote the whole main (berth) deck to hospital purposes, but the part actually under medical control for the use of the sick only extended forward from the main-hatch to the water-closets, an area containing twenty thousand one hundred and sixty cubic feet of air space, within which the plan provided for fifty iron bedsteads. I erected, however, only forty, of which thirty were usually occupied, each invalid even then having only six hundred and seventy-two cubic feet of space. This was subsequently further largely intrenched upon by the erection of prison cells for the criminals of the squadron on the forward portion of the hospital-deck. Sir J. Ranald Martin states, in this connection, that "each man should have from fifteen hundred to two thousand cubic feet of air space; in very airy and exposed situations the smaller space will suffice." Among the most celebrated modern hospital establishments, the Lincoln Army General Hospital supplied fourteen hundred and forty-seven cubic feet of air space per man; the Herbert Military Hospital at Woolwich furnishes from twelve to fourteen hundred; the Blackburn Hospital at Manchester, seventeen hundred and ninety-four; the Lariboisière, at Paris, from seventeen to nineteen hundred; the Boston Free Hospital, sixteen hundred, and the

Episcopal Hospital at Philadelphia, two thousand. Furthermore, according to Hammond, a ward containing twelve hundred cubic feet should have its air completely renewed every hour, being at the rate of twenty cubic feet per minute, while a supply of thirty or forty is preferable. The ventilation of the Idaho was altogether insufficient, being effected solely through the ordinary small round air-ports, high from the deck, and through the hatchways, wind-sails being usually conducted through the latter, but very often led into the hold beneath the hospital, where an immense quantity of provisions and steamer-coal were stored, of which the gaseous products of decomposition stained the paint-work, created noisome bilge-water, and rendered the atmosphere offensive. Large square ports through the ship's sides would have supplied a greater abundance of fresh air and mitigated these evils, but permission to have them cut could not be obtained. The sick were further inconvenienced by the incessant noises attending the daily evolutions of a man-of-war, which were regularly and completely carried on; by the working of the great guns and howitzers; by the exercise of small-arm men and with broad-swords and single-sticks; by the tumult and uproar of divisional and especially of general quarters; by the receiving and discharging of coal and provisions for the squadron which had no other outlet nor inlet than directly through the hospital; by the tramping of men overhead; by the frequent drum-beats; by the shrill whistling and loud bawling of the boatswain's mates; by the trumpet-sounded orders of the officer of the deck; by the piping of the side when officers came on board or left the ship; and by the loud clanging of the bell striking half-hours in tones heard at every bungalow on the neighboring hill-sides. For a vessel to be as efficient as possible for hospital purposes it must be absolutely disconnected from every other duty, and even then it will lack the advantages of the hospital on shore—the quietude, space, lightness, airiness, the shaded gardens for exercise, and that indescribable influence of the land itself, to which I have elsewhere referred.

When invalids must be treated on board ship, they should be sent on shore for exercise, under proper surveillance, as soon as convalescent. They who have this privilege will return to duty much sooner than those restricted to the ship. I have seen men slowly lingering weeks and months in a dark, stifling sick-bay in the bows, hanging in a greasy hammock, wrapped in soiled blankets without sheets or other pillow than their boots or pantaloons, a dull-looking tin pint-pot of cold, nauseous tea or coffee and a piece of hard-tack, or a black tin pan containing a chunk of salt meat, stuck on a beam beside them, who were ultimately invalided and discharged from the service, who, comfortably circumstanced on a light airy deck, in a clean cot, between white sheets and properly bathed and fed, would soon have been able to have been carried on deck in a chair, for an hour's exposure to the sunshine, then taken on shore by a nurse for daily exercise, and finally discharged to duty. The medical officer should not detain a man on the sick-list a day longer than is necessary. His paramount duty is to maintain the *personnel* of the vessel in the most efficient condition, and when this is deranged to restore it without delay. No man, however, should be returned to duty until fully able to perform the work required of him, and any physician who could be guilty of such a violation of professional trust would justly deserve the contempt of his brethren and the scorn of all good men.

The practice of indiscriminate invaliding is exceedingly demoralizing. Men in order to get away from ships which they dislike feign sickness, or, when really ill, endeavor to retard their recovery; and, if discharged from the sick-list, present themselves again and again at the dispensary, seeking to establish such a reputation for physical inability or worthlessness as will accomplish their object of getting surveyed and sent home. There are not a few officers in the Navy, professing valetudinarians, who offer themselves as candidates for survey whenever disagreeable, arduous, or dangerous duty is assigned them, and who, through the good nature, credulity, or negligence of the medical boards,

generally gain their end. Not the least evil attending the invaliding of numbers of a crew is the necessity of shipping other men on a foreign station to supply their places, and experience has shown that a very large proportion of such recruits very soon themselves come under treatment for constitutional diseases which were undiscoverable, and which they swore did not exist, at the time of shipment. During the summer of 1871 I received a letter, dated at Callao, from the late Dr. John S. Kitchen, the surgeon of the United States steamship *California*, *en route* to join the Pacific fleet, stating: "We have on board six chronic diarrhœas and two epilepsies from the *St. Mary's*, all enlisted on this coast within six or eight months. Every one of them acknowledged that he had the disease before enlisting." Hence, a system of properly organized temporary hospitals on shore, at the headquarters of the several stations, will save the Government a large expenditure of money, and an enormous waste of excellent physical material. Men, however, who have actually succumbed to climatic influences, should be sent home, not by "the first public conveyance," which may necessitate months of waiting, but by the earliest opportunity, without regard to expense; since the sooner they are removed from the deleterious climate, the sooner they will be able to do duty elsewhere.

The proper treatment of malingering, which is especially common on board ships to which inexperienced medical officers are attached, should occur to every educated physician.

SANITARY REGULATIONS FOR THE NAVY.

I have epitomized the proposed set of sanitary regulations which follow from the suggestions briefly tendered in the foregoing pages, and submit them to my associates in the medical corps, and to such commanding officers as may be willing to apply to them the test of experiment, with a view to the ultimate institution by the Department, if not of these rules, of others which may better accomplish the hygienic objects desired.

Dryness, coolness, fresh air, sunshine, cleanliness of body, clothes, and bedding, good food, pure water, temperance, refreshing sleep, occupation, exercise, cheerfulness, and contentment of mind are not only the best anti-scorbutics, but anti-dysenterics, anti-febrifics, and anti-morbifics in every sense. The hygienic precautions I have suggested receive an indorsement of unquestionable value from the following recommendations by Hennen, which, though intended for soldiers, are based upon those same general laws of health by which the human body is governed as well at sea as on land: "The true preventives to disease are shelter from the heat of the day, and from the dews and cold of night, avoiding the neighborhood of marshes, allowing men natural sleep, allowing vegetables in due proportion, a comfortable breakfast before duty in the morning, the daily exposure of bedding to the sun, the change of clothing after hot and rainy weather, flannel waistcoats or cotton shirts, frequent bathing, daily washing of the feet, and the serving out of spirits only in the evening." "If it be true, as it undoubtedly is," concludes

Guy, in a review of the meliorating influences exerted by sanitary science upon the British navy, "that by improvements in diet, water supply and ventilation, in clothing and cleanliness, aided by superior medical treatment, and especially by vaccination, and by an improved discipline, tempered by mental culture and amusement; if it be that these improvements and reforms have saved life and prevented sickness to such an extent, that the effective force of our Navy has been more than doubled, that one ship, for every purpose of navigation and warfare, is at least equal to two of the same size and force, that a vessel can now keep the sea for twice or thrice the time that was possible less than a century ago; if it be true that, at the old rate of mortality, all Europe could not have furnished the seamen necessary for our defense and safety during the great revolutionary war, then it is a mere waste of words to argue that health, which is the strength of all who work, is the great source of power to nations in their peaceful labors as in their warlike struggles." Blane early in the century attributed the improvement in the health of the British navy, which even then began to be notable, to the cessation of impressment, the issue of an anti-scorbutic ration, the increased encouragement to surgeons, and the better enforcement of medical regulations; and Inspector General Smart, one of the most distinguished of European sanitary authorities, further adds: "Since that era, the prevention of diseases among seamen has not been neglected; medical influence has continued its exercise with immense advantage to the sea-service. Peculiar hurts, wounds, and accidents, from which landsmen are exempt, must remain forever the special casualties of seamen; but even these may be deprived of much of their fatality. Scurvy and typhus have been banished from our Navy returns; but there still remain, with undue prominence, the reports of yellow fever, syphilis, rheumatism, and phthisis, which are, however, being reduced under hygienic measures more nearly to general ratios; and when that has been effected, the seaman's life, always hazardous, will be acceptable on account of its superior healthi-

ness." If, therefore, commanding officers will listen to and be influenced by the advice of medical officers, berth-decks and gun-decks will not be incumbered with cots and hammocks, division officers will not have to complain that their gun's crews are incomplete, the efficiency of the vessel will be promoted, and when emergencies arise, as during the rebellion, when the national honor has to be vindicated, there will be a strong, stalwart set of zealous men to fight side by side with their officers, and repay tenfold those who have had such anxious regard for their health and comfort. "But an army in hospital," says Sir Ranald Martin, "as at Walcheren, at Rangoon, and in the Crimea—what availeth it to the statesman or the commander? It is an incumbrance—a waste—almost a nullity."

PROPOSED SANITARY REGULATIONS FOR THE NAVY.

I.

The greatest care must be exercised in keeping all parts of the vessel, especially those below the spar-deck, clean, dry, well lighted, and thoroughly ventilated.

II.

The berth-deck and covered gun-decks will never be wetted, except for thorough cleaning, and then only on very dry days, and not oftener than once a week; and the operations of cleaning and drying will always be conducted as expeditiously as possible. Those men only engaged in the work will be allowed upon them, until they are perfectly dry. Hot water will be used, wind-sails set, ventilators operated, air-ports and gun-ports opened, when not dangerous, and drying-stoves heated. Mere wet-swabbing of the deck will be strictly forbidden at all times, and scraping resorted to instead. When a continuance of bad weather keeps the berth-deck wet, drying-stoves will be frequently lighted, and it will be sanded, as will also be done when any unclean work is about being undertaken.

III.

Particular care will be exercised in keeping the hold and spirit-room dry. They will be thoroughly whitewashed every month, and be frequently ventilated by the introduction of wind-sails and ventilators. Whitewash will be used on the beams, bulk-heads, and ship's sides of the berth-deck in place of paint.

IV.

No casks, boxes, or other articles will be stowed in the hold, unless clean and dry. No wet coal, nor wet or green wood will be ever sent below the spar-deck. Dry days will be selected for provisioning and coaling, unless the urgent necessities of the service positively forbid delay.

V.

All hatches, gratings, and ladders scrubbed or washed on other days than those for the general cleaning of the berth-deck, will be cleaned and dried in the open air.

VI.

Awnings and boom-covers will be promptly spread or housed on the occurrence of rain. The men will be required to protect themselves by water-proof clothing, and will not be permitted to sleep in wet clothes. The watches, when relieved at night, will be required to remove their wet clothes, and deposit them in tubs, provided for their reception, where they will remain until piped up to dry. Boats' crews, returning wet, will also be required to change their clothing.

VII.

Particular care will be exercised in sheltering "the head" by a hood in rainy weather, and by an awning when the heat is intense.

VIII.

All wet or damp clothing and sails will be exposed to be dried without delay.

IX.

When bilge-water has formed, it is to be entirely discharged, and if the bilges are not directly accessible for cleaning, but *in this case only*, fresh water may be allowed to flow into the vessel. After the lapse of an hour this is to be again discharged, and these operations will be repeated until the water is brought up free from odor, but the quantity of water introduced should never exceed the minimum indicated by the soundings of the well.

NOTE.—If the bilges are so foul that this process does not suffice, solution of lead nitrate, or of impure carbolic acid with ferrous sulphate may be introduced.

X.

Air-ports will be opened and wind-sails set whenever not attended with positive risk, and the latter will be kept carefully trimmed. All the lowermost parts of the vessel (including sail-room, yeoman's and officers' store-rooms, etc.) will be frequently opened for ventilation. Every effort will be made to maintain a free circulation of air forward and aft on each deck. All bulk-heads separating apartments or marking subdivisions of the vessel will be latticed or grated, above and below, when not at the sacrifice of strength.

XI.

Ventilators will be placed on board every vessel in the Navy, and will be put in operation every night and morning; and in narrow tide-ways vessels will be kept sprung broadside to the prevailing wind.

XII.

Awnings will be kept spread while the temperature of the atmosphere exceeds 80° F., except after a continuance of rainy weather or during the operation of cleaning the lower decks.

XIII.

The exposure of the crew to the intense heat of the sun, especially in tropical climates, will be avoided by the performance of all labor or exercise not imperatively called for between these hours, before 9 a. m. or after 5 p. m.

XIV.

Every man will be required to possess sufficient clothing to change twice if exposed to wet.

XV.

Flannel or woolen garments must be worn next the skin at all seasons; and frequent changes of under-clothing and habitual neatness and cleanliness of dress must be insisted upon.

XVI.

When the weather will permit, at least two wash-days will be allowed every week.

XVII.

Cleanliness of person will be required of every man. Swimming will be allowed when practicable; if dangerous, a tub will be placed under the top-gallant fore-castle, or the head-pump, or port-side of the manger, will be screened and used for general ablution. Any unclean man will be compelled to bathe under the supervision of the master-at-arms.

XVIII.

Firemen and coal-heavers will be afforded especial facilities for bathing, which, however, will be interdicted immediately after leaving the fire-room.

XIX.

Fresh food will be obtained every day, when possible, except the stay in port be prolonged, in which case it may be issued four or five times a week. Berth-deck messes will be allowed to carry potatoes, turnips, onions, etc., as sea-stores.

XX.

The crew will breakfast at 7 a. m., dine at noon, and have supper at 6 p. m. Hot coffee and biscuit will be issued immediately on turning out. All meals, including tea and coffee, will be carefully inspected as to character of preparation, and will be eaten on deck whenever the weather will permit.

XXI.

During a continuance of inclement weather the galley fire will be kept lighted all night, and hot coffee issued to the watches.

XXII.

No water for drinking will ever be received on board, nor that distilled ever be issued, until it has been examined by a medical officer and pronounced potable, and no condensed water will ever be passed below into the tanks until properly cooled.

XXIII.

Every man will be required to sleep in his own hammock, each watch to "lash and carry." In bad weather the hammocks of the watch on deck will be kept down on the berth-deck on their appropriate hooks or in some dry place. No damp clothing will ever be stowed in the hammocks or hammock-nettings.

XXIV.

All bedding must be shaken and exposed in the rigging on dry, clear days once a week, if possible.

XXV.

The watch will not be allowed to sleep on deck in rainy weather, nor exposed to dew and currents of air through ports and scupper-holes.

XXVI.

The system of steady berth-deck cooks will be discountenanced. The yeoman, master-at-arms, ship's corporal, captain of the hold, writers, nurses, stewards, cooks, servants, and all others whose duties confine them below, will be required to pass a certain portion of each day in the open air during the hours of daylight. Special exercise at great guns, small-arms, single-sticks, rowing, and going aloft will be assigned to each of them.

XXVII.

Amusements, singing, dancing, gymnastic exercises in the rigging, sports on deck, boat-sailing and racing will be encouraged.

XXVIII.

Vessels will avoid notoriously unhealthy ports, rivers, or other localities, unless upon imperative public service, and in such places will anchor a sufficient distance from the shore to be protected from malarious influences; and all boat excursions, hunting-parties, or visits of men and officers on shore after sunset or before sunrise, or continuance there all night, will be strictly forbidden; and all boat and shore duty involving exposure to sun and rain will be performed, whenever possible, by the natives of the country.

XXIX.

When the general health of a ship's company shall be reported by the medical officers as impaired from anchoring or cruising in unhealthy localities, the earliest possible opportunity will be given to recruit, by transferring the vessel to some invigorating station, and invalids and convalescents from diseases induced by climatic influences will be sent to the United States without delay.

XXX.

Medical officers are strictly enjoined to exercise an unceasing vigilance over the sanitary condition of the vessels of the Navy, and of the officers and men on board them, and to this end to inquire diligently and report to commanding officers, or to the Department, everything conducive to, or militating against, the health, comfort, and efficiency of each ship's company.

SANITARY REGULATIONS FOR TRANSPORTS.

The causes that operate to make men-of-war unhealthy exist in greater force on board of vessels engaged in transporting troops. There is a greater accumulation of filth from the evacuation of the contents of the stomach by the sea-sick and of fæces and urine by those too lazy or unable to go to the water-closets; there is a more considerable impoverishment of air by the overcrowding of men; and the depressing influences of discontent, disappointment, and home-sickness, operate to a more powerful degree upon the soldier than the sailor. The steamers that carried three-months' volunteers to Annapolis in April, 1861, arrived, after only three day's passage from New York, in the most filthy condition imaginable, and, had the weather been hotter, or the passage a few hours longer, three-fourths of the troops would certainly have been disabled. As the military surgeons who accompany transports are frequently unused to the special exigencies of ship life, their labors will, probably, be somewhat facilitated by the following suggestions:

PROPOSED SANITARY REGULATIONS FOR TRANSPORTS.

I.

A spacious, convenient, light, well-ventilated part of the vessel should be selected for a sick-bay or hospital, which should be under the special care of the hospital steward and

nurses, and whither all invalids, excepting trifling cases able to go on deck, should be transferred as soon as reported ill.

II.

Besides the regular attendants upon the sick, two or three men, not subject to sea-sickness, should be detailed from each company to act as a *sanitary police*, who are to be under the immediate control of the medical officers. They should be divided into three watches and be kept alternately on duty, both night and day, in the ordinary succession of sea-watches. They should be required to patrol the sleeping quarters of the men, and be constantly on the alert to prevent any act of uncleanness. Sea-sick men who vomit or discharge their urine and excrement on the deck or in their bunks, should be immediately removed to the spar-deck, and the excreted matter at once cleared away. The sea-sick should be compelled to remain on deck all the time and be placed on mattresses, if too ill to sit up. Compulsory exercise by being walked between two men and the compulsory ingestion of hot soup will hasten their recovery.

III.

All hands should be called at daylight, and be compelled to make up their beds neatly, rolling back the upper blanket to expose the interior, and then go on deck. The bunks should be carefully inspected every morning, and all wet blankets and clothing sent on deck to be dried on clothes-lines.

IV.

Clothing and accouterments should be kept in places assigned them and not be allowed to encumber the bunks. A certain hour should be appointed for changing under-clothing, and access denied to it at all other times, except in special cases.

V.

The men should be kept on deck all day when possible, but never be allowed to lie down or sleep on a wet deck. Awnings should be spread forward and aft in hot or rainy weather, and the men should be further protected from rain by water-proof overcoats, which should never be placed in their bunks, but be hung up on their bunk-posts, or in a place appointed.

VI.

All air-ports should be kept open whenever possible, and wind-sails should be set all the time and pointed to every change of wind. In rainy weather tubs should be placed under them to collect the water. Every transport should be outfitted with ventilators operated by hand or machinery.

VII.

If the troops remain more than a few days on board, their bedding should be exposed to the sun and air at least once a week.

VIII.

The men should be required to wash their bodies every morning, stripping perfectly nude when the weather will permit. If the transport cannot supply condensed steam for the purpose, salt-water soap should be provided for the ablution of the body and for washing clothes.

IX.

If the berth-decks are kept perfectly clean they will not require to be washed oftener than once a week, and this should be done only in dry weather and with hot water, which should be removed as rapidly as possible by swabs, squillgees, drying stoves, etc. The beams, bulk-heads, and bunk-posts should be whitewashed at the same time.

X.

Hot coffee and biscuit should be issued on turning out. Breakfast should be served at 7 a. m.; dinner at noon, and supper at 6 p. m.; and all meals should be eaten on deck, except in very inclement weather.

XI.

The men should be occupied with their proper military exercises as much as possible, as well as be obliged to assist in working ship, hoisting anchors, getting up anchor, etc.

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