entry is always the tracheal wound. Indeed, contamination is so rapid that if the bacteriological examination is not made on the day of admission the true nature of the case may be completely misunderstood. Whenever hoarse cough and aphonia, with obstructed respiration, are present, some mucus should be scraped from the pharynx as near as possible to the laryngeal opening, and transferred to culture tubes of sterilised blood serum. In 24 hours the nature of the case is established. It is of no use to scrape the tonsils, as they often yield no diphtheria bacilli when plenty are found in the pharynx. A point of great practical importance is to thoroughly disinfect the tracheotomy tubes by prolonged immersion in water at 100 deg. to 115 deg. C. In several instances it was found that the Löffler bacilli had survived immersion in boiling water, probably because they had been protected by an albuminous coat.

Among the cases observed there were 28 in which laryngitis was present without membranes; of these 21 were diphtheritic. Broncho-pneumonia, as is well-known, is a very common cause of death after tracheotomy; it appears to be more frequent where the diphtheria bacillus is associated with other bacteria. Bacteriological examination affords valuable indications for prognosis as well as diagnosis of diphtheritic angina and croup. For these we must refer our readers to the original paper.

The mortality in the croupous cases is shown by the following table:—

Pure diphtheritic, with angina	...	33	deaths	26
without "	...	16	"	6*
Diphtheritic, with other microbes,				
with angina	...	31	"	19
Diphtheritic, with other microbes,				
without angina	...	5	"	4
Non-diphtheritic	...	7	"	1
becoming diph-				
theritic by contagion	...	7	"	3

* Three admitted in a dying state.

The mortality was considerably heavier in tracheotomised cases, both diphtheritic and non-diphtheritic.

A new method of treatment has lately been brought before the Acad. de Médecine, originally devised by Dr. Goubeau, but tested by three different doctors during five months in the Hôp. Trousseau, and favourably reported on. It consists in the application of strong solutions of corrosive sublimate in glycerine to the affected parts, the strength used being 1 in 40 for infants under one year, 1 in 30 under two years, and 1 in 20 at greater ages. Before applying the solution the parts are cleansed by nasopharyngeal irrigation, and dried with a tampon of cotton wool. The surface is then lightly touched with another tampon gently squeezed out of the sublimate solution, and quickly dried with a third tampon. This is done twice in 24 hours, or in bad cases three times. Although the hygienic arrangements at the Hôp. Trousseau are said to be far from perfect, the

method succeeded well, 261 cases being treated with a death rate varying from 5 to 18 per cent. according to the nature of the attack. The solution is said to be easy to make with the application of a little heat, and to keep well. Since it was shown by Ruffer that the diphtheria bacillus is confined to the superficial parts of the membrane, it seems reasonable to expect a cure wherever a powerful parasiticide can be thoroughly applied; but all such local methods must necessarily fail where inaccessible parts are affected.—*Gaz. des Hôp.*

THE HYGIENE OF MERCHANT SHIPS, WITH ESPECIAL REGARD TO SEAMEN.*

By HENRY E. ARMSTRONG, D.Hy., Medical Officer of Health for Newcastle-upon-Tyne and the River Tyne Port; Lecturer and Examiner in Public Health in the University of Durham.

THE invitation to contribute a paper under the above title affords an opportunity of which I avail myself with pleasure to plead the cause of a section of the community on whom much depends, and of whom hygienically—except to experts and themselves—too little is known.

The subject of ship-hygiene is one of international interest. It is also one of the principles of which are in a sense more universally applied than is the case of house-sanitation. For as regards dwellings or land each country works out its own ideas according to its interpretation of its local requirements; whereas ships of different nationalities have, sanitarily speaking, much more in common, and, trading as they do from country to country, are brought successively under the varying sanitary regulations of each. Hence an interchange of ideas between medical officers of health of the ports of different countries is calculated to be of service to all concerned.

The claims of the subject, as I understand it, to consideration, may be stated as follows: The mercantile marine of the world demands a very large number of persons as sailors and firemen, all of whom need to be healthy, of good physique, and efficient in their duty. That of Great Britain alone requires not less than a quarter of a million of men. To obtain and retain the supply, the service must be attractive. But our merchant seamen complain that they "work longer hours, receive less pay, and endure more hardships, than any other class in the industrial world." Their ordinary duty exposes their lives to great danger, which is becoming day by day greater through the keenness of business competition, the efforts of ship-owners in the race for wealth, and, in consequence, the altered circumstances under which much of

*A Paper read at the International Congress of Hygiene and Demography, Section XI., at Budapesth.

the shipping trade is carried on now as compared with past times.

The older ships were made strong and seaworthy. Modern ones are too often built with a special eye to lightness of construction, both for economy of material and reduction of tonnage. The large ships, now so common, seem to be attended with greater danger to crews than smaller ones, especially when carrying homogeneous cargo (coal, grain), etc., from greater liability to shift in them than in others.

Vessels and their cargoes are generally fully insured. It was said by a London newspaper of a large ship lost early in the present year through overloading and undermanning, together with insufficient food and bad cooking, that "to the owners it mattered little or nothing from a pecuniary point of view whether the vessel went to the bottom of the sea." It is complained that whereas formerly owners trading with their own ships took a personal interest in their crews, such interest is rarely shown at the present day.

There is no *manning law*. A sailor refusing to come home in an undermanned or unseaworthy ship has had his wage stopped.

With respect to the extent of the *Danger to, and Loss of Life at, Sea*, "although seamen do not number more than about one-sixteenth of all the rest of the workers put together, yet the loss of life at sea is about 10 per cent. more than it is amongst the whole of the trades and labourers in the country."* A list of British ships missing after the gales in November last comprises crews numbering 215 persons. From the year 1877 to the year 1893, there were lost 4,678 vessels belonging to the United Kingdom, and the number of crews drowned from them was 27,010, an annual average of 1,688 seamen,† or, calculated on the Return of seamen employed on British registered vessels in 1892, 241,735 persons, equivalent to a rate of almost 7 per 1,000.

The sailor's occupation renders him specially liable to certain diseases, some of which are undoubtedly due to, or aggravated by, his insanitary surroundings. The healthful and invigorating effects of sea-air are more than counterbalanced by exposure to wet and cold on deck, the insanitary conditions of fore-castle life, and the defects of diet and cooking to which he is too often condemned. "The rate of mortality of the British mercantile marine, calculated on the deaths reported in 1886 and the total crews in 1887, is for sailing vessels 21·0 per 1,000,‡ a high rate for male adults of any class."

For some years past I have kept a register of the general sickness on voyage or in port reported by ships arriving in the Port of Tyne. During the

last two years (1892-93) 1,395 cases of sickness were so recorded, including the following:—

	Cases.
Infectious Diseases	138
Diarrhoea and Dysentery	351
Yellow Fever and Malarial Diseases... ..	208
Venereal Diseases	48
Alcoholism	7
Rheumatic Fever and Rheumatism	72
Pulmonary Consumption	17
Diseases of Brain and Nervous System	5
Heart Diseases	26
Scurvy	8
Diseases of Respiratory System	59
Catarrh and Influenza	142
Diseases of Alimentary System	32
Diseases of the Kidneys	2
Accident... ..	135
Other Diseases	145
Total	1,395

The total number of crews to which the above statistics refer is 311,366.

My Annual Reports for the years 1890 and 1891 show that 32 and 40 per cent. respectively of the cases of diseases registered as having occurred on ships visiting the Tyne were consumption, lung diseases, or colds.

Supply of Seamen, Efficiency, &c.—That the supply of efficient English sailors for the merchant service is short of the demand does not admit of question. More than half of the crews of British ships are foreigners, a large proportion being Scandinavians. Apprenticeship is practically a thing of the past, the number of sea-apprentices on British ships having fallen from 16,000 in the year 1845 to only 2,000 at present. There seems to be very little inclination on the part of parents to send their boys to sea; on the other hand, masters do not care to take them. Men are sometimes engaged as ordinary seamen who have never been to sea before.

Intimately associated with the questions of supply and efficiency are those of the pay of the seamen, including his housing and feeding, and of undermanning and unseaworthiness of ships. These different points combine to form a very complex problem, which I do not propose to discuss. It is, however, one which very seriously affects national prosperity through the merchant service.

Accommodation.—The housing and food of the seaman claim attention not only as parts of the remuneration to which he is entitled for his services, but as means whereby his efficiency is maintained.

One very objectionable feature of most crew-spaces is the *fore-castle*. The topgallant fore-castle has at least the advantage of being above deck, and is therefore capable of ventilation and lighting. But the lower fore-castle has no such redeeming feature to save it from utter condemnation. As regards hygiene and comfort, either form of fore-castle is, in point of sanitation, greatly inferior to the deck-house amidships and above board.

* *Seamen's Chronicle*, 17th March, 1894.

† *Ibid.* 7th April, 1894.

‡ "Treatise on Hygiene," edited by Stephenson and Murphy. Art: Marine Hygiene, vol. ii. p. 576.

In order to indicate as faithfully as possible the character of the accommodation provided for seamen, I have taken a series of photographs on board of ships of different nationalities lying in the Port of Tyne. These, although possessing little or no artistic merit, have at least the virtue of being strictly truthful. Those of interiors show very fairly some of the defects I wish to emphasize. Several of the photographs, owing to the dark, dingy, confined places they represent, were taken with difficulty, and will serve me as lasting personal mementos of the cramped attitudes, disagreeable smells, and vermin with which their taking was associated.

Figs. 1 and 2 represent the exterior and interior of the deck-house of a German schooner, and Fig. 3 that of a small Russian schooner. Fig. 4 shows part of the deck-house of an English merchant ship, originally built for the passenger trade, the deck cabins of which have been converted into quarters for the seamen. Here, of course, the accommodation is exceptionally good. Contrasted with it are the lower forecastles pictured in Figs. 5 to 8. Figs. 5 and 6 show different sides of the same fore-castle. The approach is through a hatchway or square hole overhead,* and leading down a steep ladder. The only light comes through the hatchway (which is closed by a lid in rough weather), and a small deck-prism, imperfectly shown in Fig. 6. The coats of the men, wet or dry as the case may be, hang in the fore-castle. The anchor chain passes through it. At the time of my visit some withered cauliflowers were lying on the floor, and the fore-castle was dirty. The men sleep in hammocks, one of which is shown hanging.

Figs. 7 and 8 respectively illustrate the bunks, or sleeping berths, in the lower forecastles of a Norwegian and an English schooner. The former are, in my experience, unusual, Norwegian traders generally having deck-houses for the men. Each of the forecastles is dark, there being no means of lighting except by the hatchway. The entrances to the bunks are small; those in Fig. 8 are barely enough to creep in by. I have met with some measuring less than two feet square each. The head of the occupant of the bunk is, of course, in a deep unventilated recess. Fig. 7 shows a quantity of clothing hanging about, and a coil of rope on the floor. The upright beam to the left of Fig. 8 is the Paul Bitt connected with the windlass overhead. It interferes greatly with the accommodation and comfort of the sailors.

Fig. 9 represents the crew-space (or "deck," as it is called) of a Scotch fishing boat. It is occupied by the entire crew, which usually consists of seven persons. It is ventilated and lighted by a hatch 6 ft. long by 18 inches or so in width, which

* One of such hatchways, which I measured, was 2 ft. 2 in. in length, by 2 ft. in breadth. Sometimes the hatch is raised a foot or two above the deck.

receives the lowered mast during the fishing, but which is open whilst the mast is upright. This "deck" is approached by a door from the hold. A view from above of the partly open hatch is given in Fig. 10.

The accommodation is often very bad in the smaller class of vessels, and occasionally so in those of larger size. In an iron screw steamer from the River Plate, 290 ft. in length, and having a crew of 25 hands all told, which I examined lately, the men were housed in a deep lower fore-castle with iron sides and deck overhead. This metal was sweating, *i.e.*, moisture condensed from the breath of the occupants was dripping from it. The metal itself was rusty, and had evidently not been painted for years. The boots of the men were mouldy. The fore-castle was very dirty and dark. There was direct communication with the bilge through drain inlets in the floor, covered by bell traps only. The men complained very much.

The captain of an ocean "tramp" recently in public described the state of the forecastles as "in many cases abominable." In wooden ships they often abound with fleas and other vermin. I have seen cockroaches literally swarming on the walls and floors. The crew-space is often damp from leakage through the sides or seas washing in. Wet clothing will not improve this state of matters. Improper articles, such as oils or paints, are not unfrequently stored inside the fore-castle, as are generally bread, butter, cheese, &c. The air of crew-spaces is often polluted by offensive effluvia from cargo, bilges, or waterclosets abutting on them. The ventilation is seldom adequate to the requirements of hygiene.

If the accommodation is often very bad—what there is of it—there is not much of it such as it is; for the Board of Trade Regulations require only 72 cubic feet per man, that is to say, a space measuring say 3 ft. by 4 ft. by 6 ft. This, which is about one-quarter of the amount provided for a workhouse inmate, is all the housing-room a British sailor can legally claim. The Local Government Board, who control matters relating to overcrowding of dwellings on shore, have no jurisdiction in similar cases on shipboard. The Medical Officer of Health though instructed, under the Public Health Act of England, to consider ships the same as houses, cannot interfere in respect of cubic space unless the gross overcrowding permitted by this regulation of pre-sanitary date be exceeded. He is thwarted by corresponding restrictions of the Board of Trade in other sanitary directions.

With the unwholesome condition of forecastles as above described, can it be matter for surprise that seamen are subject to chest diseases, rheumatism, and other ailments?

The closets are frequently in improper situations, and in small vessels there is often no "convenience" at all for the crew except the ocean.

Such things as bath-rooms and separate lavatories

for the crew are beyond the range of my experience. A proposal to seek compulsory power to provide them was received with derision.

The men do not like to complain about their insanitary surroundings, as they may gain their discharge by so doing.

Cargoes in relation to the Health and Life of Seamen.—Cargoes have a definite relation to the health and life of the seaman who helps to convey them. The nature of the merchandise, the method of its disposal, its weight in proportion to the carrying power of the ship—each of these has an important bearing on the salubrity or the safety of the vessel on its voyage. The carriage of rags is attended with a certain degree of danger of infection of cholera or smallpox. Cargoes of living animals or organic substances, such as guano, bones, manure, fish, fruit, grain, onions, potatoes, are liable from putrefaction to become very foul and injurious to health. Cargoes such as sugar, greasy wool, cotton, etc., may, from spontaneous combustion, cause explosions or conflagrations on board. Others again, from their homogeneous nature (grain, coal, etc.) are apt to shift in stormy weather and sink the ship. Lastly, the lives of the crew may be endangered by overloading.

The protection of crews, as of the public generally, from risk of infection by rags, rests mainly with the governments of nations. Danger to health or life from the decomposition or combustion of merchandise may be considered to be best guarded against by the pecuniary interests at stake. But arrangements for the prevention of the shifting of cargoes involves expense to which the more speculative owners do not care to go. The same principle (or want of it) leads to *undermanning* and *overloading*. In each of the latter cases risk of ship, cargo, and life is run for the sake of profit. If the ship and cargo are fully insured, there is no risk, *except to the owners of life*. Actuated apparently by similar ideas, some British shipowners have, it is said, not long ago declared their intention to put their ships under foreign flags in order to escape home restrictions.

What the risk to seamen in this way really means may be gathered from the statistics previously quoted and the accounts in the *Seamen's Chronicle** by Mr. J. H. Wilson, M.P., and others, on the *Loss of Life at Sea* and its causes. Mr. Wilson gives particulars of seven British screw steamers lost in the Bay of Biscay or North Sea during the gale of the 18th and 19th of November last, of which four were homeward bound laden with grain, and three were outward bound laden with coal, and asks if it is not strikingly singular that these vessels were all carrying homogenous cargoes. The same authority gives a list of 97 missing coal-laden iron sailing ships, of which 43 refer to the last ten years, supplemented by another list of six

"recent cases," in which the loss of the ships is positively attributed to the shifting of the cargo. There is an English statute for the regulation of the carriage of grain, and occasionally shipmasters are convicted and fined for contravening it. An instance of this kind occurred a few weeks ago, in which the master carried grain in the holds without having proper shifting boards and beam fittings. The vessel arrived with a heavy list to starboard from the shifting of the cargo.

Food and Cooking.—One of the great grievances of the seamen, (and it is one that has led to mutiny), is the quality and quantity of the food supplied to him. The safety of a ship and all on board may depend on the proper feeding of the crew. Instances are only too common of disabled ships in storms at sea, with the men growing daily weaker and less fit for duty owing to scant rations, made worse by bad cooking. The food of the sailor, as I have seen it before, during, and after preparation, is generally unappetizing and often disgusting. I have found beef putrefying in the "harness cask" from which the men were being fed. The almost unavoidable absence of fresh meat and vegetables from rations at sea is not sufficiently counterbalanced by variety in available articles. Now that tinned meat, etc. is easily obtainable, it should to a large extent replace salt beef and pork. There is not yet a regulation dietary for the British merchant service. It is to be hoped that the dietary drawn up by the Victualing Committee appointed by the shipowners of London in the early part of the present year will shortly be established by law. Not only should there be a food scale for long-voyage ships, but coasters and "weekly boats," as they are termed, (*i.e.* steamers trading between Great Britain and near Continental ports) should be put on the same footing. In the last-named ships the men provide their own food, which is at best an expensive plan, and commonly results in improper feeding. In such cases the food is stored in the fore-castle, and even if wholesome at first, soon becomes unpalatable. The system of provisioning in long-voyage ships is not always what it should be. The captain frequently contracts directly with the ship chandler for the provisioning of the crew. Occasionally, as I have been informed, the contract for all food is as low as 9½d. per man per day. The captain is allowed 1s. 6d. per head by the owner. If the food is bad and the men complain, they may get their discharge from the person who profits by the cheap food he gives them. Unprincipled captains have been said to make more money by the food of the men than by their salary. With a crew of 20 hands the profit between 1s. 6d. and 9½d. per day represents £21 5s. per month, whereas the average captain's salary is £20 per month.

Sometimes the owners contract with the ship chandler for the food of the crew. In such cases

*May and June, 1894.

the captain will not hesitate to complain when the food is bad, and *may* do so without reason in order to get the contract into his own hands.

A case was reported in June last, where the ship's steward was alleged to have signed for no wages, only for one shilling per month, he to "find the ship" for 1s. 6d. per head fore and aft, out of which he was to pay his own wages and those of the cook and engineer's steward, the two latter receiving respectively £4 and 35s. per month.

The sale of condemned navy stores (old pickled beef and pork, etc.) at prices sometimes as low as 1½d. per pound, was exposed by Plimsoll. But we have still no satisfactory regulations to exclude meat unfit for food from our merchant ships. In the case of the putrid beef referred to above, the only power I had in relation to it, was to deal with it as an ordinary nuisance, and have it destroyed as such under the Public Health Act, which I did. The Merchant Shipping Act, 1892, provides for Inspectors of Provisions for Seamen; but these officers are under the Board of Trade, and not the Port Sanitary Authority, as they ought to be.

This part of my subject cannot be covered within the limits at my command. Sufficient, however, has been said to show the importance of it.

Sea Cookery and Cooking Places.—Closely related to the food of the sailor is its preparation. This depends on the appliances provided, and the skill of the cook. As examples of the former on schooners and similar craft, I submit photographs (Figs. 11 to 16) of the galleys and cooking utensils of six ships. Seeing these, the wonder is not that the cooking is bad, but that it is not worse than it is (if that were possible). In the best of these galleys—which are fairly representative of their class—there is not room to stand upright. Two of the "galleys" are merely open stoves. How the food is prepared in such stoves in bad weather is beyond my comprehension. Fig. 16 is very poor as a photograph, but has a special interest from the fact that its indistinctness is principally due to the smoke, which issued in volumes through the short dilapidated funnel and filled the air, not sparing the uncooked food deposited on the hatch in front to wait its turn on the fire.

The cooking appliances of ships—especially of the smaller class—are scanty and insufficient for the preparation of a comfortable meal.

In Figs. 11, 12, and 13 are seen different types of *sea-cooks*. Fig. 14 represents the *cook's assistant** reposing on the floor after his labour.

Training of Sea-Cooks.—Through the efforts of Miss Fanny Calder, aided by the Ship Owners' Association and County Council, a school of nautical cookery has been established at Liver-

pool for the training and certification of seamen in three grades, and is doing good work. The men value the lessons. Other schools are at work at the London docks, and in Glasgow. For upwards of three years tuition in sea-cookery has been given at North Shields, under the direction of Alderman John Foster Spence and the Technical District Committee. The instruction was begun, in the form of demonstrations merely, at the Sailors' Home, and in the hands of Miss Effie E. Bell, and under the auspices of the Technical Education Committee of the Northumberland County Council, soon developed into a six months' course of practical lessons, followed by examination. This work is answering admirably, and will probably be continued and extended in the near future. As urged by Dr. Collingridge in his recent address to the Ship Masters' Society of London,* there should be a school of this kind established at every considerable port.

In conclusion, I offer for the consideration of all who are interested in the welfare of merchant-seamen and the prosperity of the service they are engaged in, the following desiderata:—

1. That forecastles should be replaced by deck-houses amidships.
2. That bunks and hammocks should be replaced by cots or trays having mattresses of chain with spiral springs, or of the "Lawson-Tait" pattern.
3. That not less than 150 cubic feet of crew-space be required for each seaman, with adequate lighting and ventilation to the satisfaction of the Port Sanitary Authority.
4. That all iron parts of crew-spaces be covered with a coating of granulated cork in paint, to prevent "sweating," and that the crew-spaces be cleansed and painted at least once every year.
5. That each ship be provided with bath and lavatory accommodation for the crew, with a place for washing and drying their clothes apart from the crew-space proper.
6. That the crews of merchant-men should wear a distinctive uniform.
7. That there should be a fixed dietary scale for use on merchant ships, whether for long or short voyages; and that sea-cooks should be trained and certificated.
8. That the control of all sanitary arrangements on merchant ships, including the inspection of the provisions, should be transferred from the Board of Trade to the Local Government Board.

JEVE'S FLUID.—This disinfectant has just had awarded the highest award of the Manchester British and Colonial Industrial Exhibition, bringing the total number of awards up to 65.

* A dog, which had been licking out the dishes.

* See *Lancet*, 5th May, 1894.