as fifteen punctures being made at one sitting. It is advised to begin with the deeper injections, in order to avoid a discoloration of the tissues on the surface in the early stages. After the injections have all been made, pure pyoktanin powder is introduced into the cavity, or gauze or cotton, medicated, may be used. The tampon is left in position until the second day, when it is removed and the parts are thoroughly washed and the injections repeated. The introduction of the solution exerts an analgesic action, and also checks the profuse hemorrhage that is frequently present.

Intrapulmonary injections have also been used for the treatment of pulmonary tuberculosis. The liquid employed was a 1 to 500 solution, of which eight to sixteen minims were injected. The injections are reported to have been well borne, but when the liquid penetrated to the bronchi, a violent attack of coughing was provoked. Therapeutically, it is said to have produced a lessening of the hectic condition and reduced the number of bacilli in the sputa. *Beaumont Small.*

PYRAMIDON — dimethyl-amido-dimethyl-phenyl-pyrazolon, dimethyl-amido-antipyrin, $C_6H_3N.N(CH_3)_2.CO.CH.NCH_3.CCH_3$—is a yellowish-white, tasteless crystalline powder, which is soluble in ten parts of water. With ferric chloride it gives an evanescent deep bluish-violet color, a distinction from antipyrin which gives a red color.

Employed in smaller dosage than antipyrin it has an antipyretic action like that body and a more sedative action on the nerves. Robin et Bardet found prompt relief in trigeminal neuralgia. Laudenheimer praises it in the pains of tabes, alcoholism, chorea, neurasthenia, and hysterical conditions. Pollak notes sweating and some flushing of the face, but reports the drug specially applicable in the hectic fever of pulmonary tuberculosis. Horneffer found it effective in facial neuralgia but not in sciatica. Bertherand ascertained that doses of 0.3 gm. (gr. v.) increased the coefficient of nitrogen elimination ten per cent. in eight days. In a diabetic who was excreting 2–3 gm. (gr. xxx.–xlv.) of sugar a day, pyramidon sent the sugar up to 15–20 gm. (gr. ccxxv.–ccc.); so it is contraindicated in this disease. This investigator found the profuse sweating an objection, especially in tuberculous patients. In sciatica he obtained good results from hypodermic injection. Albrecht was able to shorten and modify severe asthmatic attacks in emphysema by doses of 0.3 gm. (gr. v.) two or three times a day for several days. In pneumonia, typhoid, scarlet and other fevers the drug has been used with asserted good results. The dose is 0.06–0.65 gm. (gr. i.–x.), and 3 gm. have been given in one day without ill effects.

The pyramidon camphorates, both the acid and the neutral salts, are preferred by some therapists in tuberculosis. Bertherand recommends these compounds for preventing the excessive sweating of pyramidon. The dose of the neutral salt is 0.5–0.75 gm. (gr. viij.–xij.), the larger dose representing 0.5 gm. (gr. viij.) of pyramidon; the dose of the acid salt is 0.75–1 gm. (gr. xij.–xv.).

Pyramidon salicylate is claimed to be especially valuable in neuralgia and rheumatism in dose of 0.75–1 gm. (gr. xij.–xv.). *W. A. Bastedo.*

PYRANTIN. See *Phenosuccin.*

PYRIDINE (C_5H_5N)—a liquid base present in coal tar and separated by fractional distillation. It is also obtained from bone oil, or Dippel's oil. It is a decomposition product of various alkaloids, and is present in tobacco smoke.

It is a colorless liquid, with a peculiar empyreumatic odor and pungent taste. It is very hygroscopic and mixes freely with water, alcohol, and oils. Its specific gravity at 32° F. is 0.9858. Pyridine resembles alkaloids in its property of forming salts with acids. In toxic doses pyridine is a powerful depressant, causing paralysis and death from failure of respiration. The blood is also altered and destroyed. Germain Sée has studied its action in various forms of asthma and recommends it when the disease is of a nervous origin. One drachm is placed in a saucer in a closed room, at a temperature of 68° to 77° F. In about an hour evaporation will have taken place, and the patient should then inhale the impregnated atmosphere for fifteen or twenty minutes, which may be repeated two or three times a day. The drug may also be inhaled by placing ten or fifteen drops on a handkerchief.

The drug has not, however, established itself as a remedy of much value, and is rarely employed in this country. It must not be confounded with pyrodine, which is a preparation of hydracetine. *Beaumont Small.*

PYROGALLOL: PYROGALLIC ACID.—Pyrogallol is a triatomic phenol, $C_6H_3(OH)_3$, producible by the action of heat on gallic acid, whence the common name "pyrogallic acid." It is official in the United States Pharmacopœia under the title *Pyrogallol*, Pyrogallol. It occurs in long flattened prisms, or in needles; colorless, odorless, but with a bitter taste. It dissolves in 1.7 parts of cold water, and very readily in boiling water and in alcohol. In solution, exposed, it oxidizes, turning brown. Pyrogallol possesses the poisonous property, more or less common to the group of phenols, of affecting the blood and bringing about hæmoglobinuria. Administered by injection to rabbits, this medicine has speedily caused chill, dyspnœa, tremor of the extremities coming on in paroxysms, and death. The urine in such cases has shown the characteristic features of hæmoglobinuria, and the blood has exhibited discoloration and destruction of the red blood corpuscles. In rapidly produced death by large doses, the blood has turned black or, in some cases, of a chocolate color and jelly-like consistence. In the human subject death has resulted, in one instance, from the application, to one-half the body at once, of a ten-per-cent. pyrogallol ointment. In this case a violent chill, with vomiting and collapse, set in six hours after making the application of the salve. The patient rallied, but forty hours later a second attack ensued, ending in coma, with great reduction of temperature. Death occurred on the fourth day. During the illness the urine was much diminished in quantity, and showed, in highest degree, the condition of hæmoglobinuria, being dark brown in color and, upon standing, depositing a thick sediment of amorphous, blackish material. The blood was found, post mortem, disintegrated, and the kidneys bluish-black and stuffed with the same material as the urinary sediment. Pyrogallol has been used in medicine almost exclusively as a local application for the relief of certain skin diseases, notably *psoriasis*—an application often successful when other remedies may have failed. Applied in solution or in ointment, pyrogallol stains the skin somewhat, but the stain speedily disappears. Linen clothing, however, may be permanently injured by the action of the medicine. To avoid this latter effect, a solution of pyrogallol in flexible collodion has been proposed (Elliot). Such preparation, when dried to a film upon the skin, seems still to exert the therapeutic action of the medicine, but, being dried, is without action upon the clothing. Pyrogallol may be applied in ointment or in solution, and strengths are used ranging from five to fifteen per cent. of the remedy. The higher percentages, in ointment certainly, may irritate severely, and should be used with caution. Applications should never be extensive at any one sitting, for fear of enough absorption to bring about constitutional poisoning.
Edward Curtis.

PYROSAL—antipyrin salicyl-acetate—occurs in colorless crystals of acidulous taste and difficult solubility in water. It contains fifty per cent. of antipyrin and thirty-seven per cent. of salicylic acid. Introduced by Riedel, this compound has been used as an antipyretic and analgesic in rheumatism, influenza, migraine, sciatica, etc. The action is prompt, and no untoward effects have been noted. The dose is 0.3–0.7 gm. (gr. v.–x.), repeated frequently. *W. A. Bastedo.*

QUARANTINE.—The term "quarantine" has its origin from the Italian "quaranta," meaning forty, this being the number of days for which vessels were, in the fifteenth century, held under observation on account of epidemic disease. It is now applied to what should more properly be known as maritime sanitation. In addition to this, it is also applied to restrictions against the advance of epidemic disease on land.

While it may be fairly assumed that all who are in anywise interested in the subject of quarantine are already fully conversant with the history of such measures as have been taken in the past for preventing the spread of epidemic disease, nevertheless, for the sake of comparison with what is now considered proper, and to set forth more clearly the great strides which have been taken in sanitary science and in the methods employed in the exclusion of exotic disease, a short *résumé* will not be amiss.

It is generally understood that the quarantine which was established by Venice in 1403 for the exclusion of plague was the first systematic attempt to exercise any kind of surveillance over commerce for the conservation of public health. It may be remarked, however, that a species of land quarantine, namely, the isolation of lepers, was certainly existent fourteen centuries before that time, possibly at a much earlier period.

The general idea in the fifteenth century seems to have been that no measures of purification were indicated, but that detentions for a period of forty days would suffice to allow the disease to die out; and in truth this was what frequently happened. The unfortunate individuals comprising the *personnel* of a vessel in quarantine had to take their chances, and these were admittedly slight, of escaping the scourge while they were huddled together with its already stricken victims, the authorities believing that the lives of a few were well sacrificed in the interest of the many, and that their duty ended with providing food for these unfortunates and keeping them within fixed bounds.

The foregoing statement may be said to sum up the maritime quarantine system as it existed five hundred years ago. Of land quarantine there seems to have been none, or, if it existed at all, it was of the same brutal character as that applied to the shipping.

When the bubonic plague swept over Europe with such appalling results in this same fifteenth century, the people fled unrestrictedly from any stricken community and scattered death in their wake. Abject cowardice and sublime courage shone out in vivid contrast to one another.

Coming down to more recent times, we find that as late as 1850 a very nebulous idea held sway in the minds of men as to proper methods for preventing the ingress of pestiferous diseases, and the forty-days detention period which was instituted by Venice four hundred and fifty years before, and which Spain adopted against yellow fever from the West Indies a century later, was still in vogue and constituted practically the sole maritime guard of most states against disease; while, on the other hand, some few advanced communities, in sheer disgust at measures which, while destroying their commerce, gave no adequate protection against the ravages of yellow fever, smallpox, and cholera, the preventable diseases then uppermost in men's minds, had thrown off all restraints and were willing to risk the disasters incident to an epidemic, rather than the ills of ruined commerce. And this indeed was a rational decision; for, however we may view the matter from a theoretical standpoint, the question practically put is this: Can a community better afford to take a slight or even a pronounced risk of disease which will destroy a certain percentage of its population, than to take the risk of commercial death which will annihilate it as a community? The former risk is the more rational, and especially when we bear in mind that all quarantine must of necessity involve a certain feature of necessary risk; for, even were it possible to evolve an absolutely safe system, no community would allow such a system to stand, involving as it would most serious hindrances to commerce.

One of the most talented editors of the American press, some years ago, denounced the then existent system as "sanitary savagery," and we must admit that there is some justification for this appellation.

The sole aim, the very *raison d'être*, of a quarantine is the exclusion of exotic disease. If it does much less than this it fails to fulfil its obligations to the community; and, by doing more than this, it retards commerce, interferes with legitimate vested right, and becomes an object of well-merited aversion.

Quarantine is the sanitary vidette and skirmish line, and it may, and often does, fail to keep out exotic disease even though carefully and scientifially conducted. Nothing short of correct laboratory methods (absolutely inapplicable to practical quarantine) could under all conditions exclude disease. Such being the case, we must view a proper quarantine, to express the matter in homely parlance, very much as a sieve, which will exclude the major part of the solids from a given volume of water passing through. Now, if we apply such a sieve to a river, so long as the water can pass by, leaving behind most of the detritus carried in suspension, all will be well; but substitute for that sieve an impervious dam, and so surely as you do, that dam will be swept away. So, likewise, if we place a quarantine of scientific accuracy at the gateway of any of our large commercial cities, we shall have built practically a sanitary dam, and we shall soon find that commerce, having submitted to what it considers a reasonable amount of obstruction, will refuse to accept further restriction, and our sanitary dam will be swept away by the overwhelming onflow of public opinion, which will, rightly or wrongly, tell us, and tell us in unmistakable terms, that the public is willing to take some slight risks for the sake of commerce, and does take these risks, and will not submit to any system which seriously interferes with the community's means of obtaining a livelihood.

We must bear in mind that while the sanitary aspect of a quarantine is undoubtedly of primary importance, commercial interests demand and should be granted consideration in such matters, and while commercial interests are secondary, they are entitled to careful thought; for we must not forget that the condition brought about by a stoppage or even a slowing of business in any large community means suffering and privation to thousands. When you stop the wages of the breadwinner, you inevitably, though indirecly, produce sickness, the very thing we propose to prevent, and it matters little to the victim whether that sickness be of an epidemic or a non-epidemic character.

When, in the early eighties, the Marine Hospital Service assumed the small quarantine functions previously assigned to the National Board of Health, and with these functions took over the quarantine stations which had been established by the National Board of Health at Ship Island, Mississippi, and Blackbeard Island, Georgia, the system of long-drawn-out detention, plus a fumigation with sulphur dioxide and some spraying with solution of bichloride of mercury, was still in vogue; but there was no clearly defined idea as to how, or why, or when things should be done.

Dr. A. N. Bell, who was at the time an officer in the United States Navy, had indeed in the fifties made a most valuable contribution to sanitary science in the shape of a report of the disinfection done by steam on board a United States man-of-war, which had become infected by yellow fever during a cruise in the West Indies, but no one seems to have taken any particular interest in the matter, and it had been practically forgotten until about 1883, when Dr. Joseph Holt, of New Orleans, the president of the Louisiana State Board of Health, inaugurated a system of disinfection near the mouth of the Mississippi River, the mainstay of which was the application of steam. It is probable, however, that the first really scientific application of live steam to the disinfection of textiles, etc., was made by Dr. H. R. Carter, Surgeon of the United States Marine Hospital Service, at the Gulf Quarantine, Chandeleur Island, Mississippi, in 1888.

He there demonstrated the principle that steam, to be practically effective, must be diffused through the matter to be treated (must circulate), or else that a vacuum must first be provided to insure the penetration of the steam, as otherwise there would be dead air spaces in which only dry heat of not more than 90° C. would be secured; in other words, these areas would not really be disinfected.

Dr. Carter, at the Gulf Quarantine, and the writer, at Blackbeard Island, Georgia, were during that year simultaneously working toward the same end, and endeavoring to bring about improvements which establish the following basic principles that are now, it is believed, universally acknowledged:

1. That a suspected ship must—if we wish to make sure that she shall do no harm—be considered to all intents and purposes as an infected ship.

2. That members of the *personnel* must be removed from possible infection as soon as practicable after the ship arrives in quarantine.

3. That so far as the ship itself is concerned, it is as free from danger five minutes after the completion of a proper disinfection as it would be in five years.

4. That the longer the ship lies without disinfection, the more infected, other things being equal, will she become.

5. That the period of incubation of the given disease having elapsed since the person was removed from possible exposure, such person can safely go at large.

These hypotheses all seem very plain and simple. Doubtless they are at the present time, but prior to the time mentioned, as a survey of the then exising state of municipal quarantine regulations will show, it had been at many places the custom to detain a vessel from a yellow-fever port for anywhere from fourteen to forty days, and to disinfect her at some time during this detention, no particular time being stated.

To Dr. Joseph Holt, of New Orleans, belongs the credit for the first real awakening to the fact that quarantine should mean sanitation and not punishment of the unfortunate victims of epidemic disease.

To Dr. H. R. Carter belongs the credit for the enunciation of the principle that detention of persons under observation must be rational, and must of necessity follow their complete disinfection or, to state the matter more clearly, their complete removal from sources of infection; that, scientifically speaking, detention applies alone to *personnel*, and not to inanimate things; that such detention need be only for the period of incubation, and must be for the *full period* of incubation. He worked assiduously to inculcate these ideas, and succeeded.

Another point of interest in quarantine, as it existed in the eighties, is the absolute inadequacy of the appliances for disinfection and for the general handling of vessels. It is true, as above stated, that Dr. Bell had, in the fifties, proved the adequacy of steam disinfection extemporaneously applied, and that Dr. Joseph Holt, president of the Louisiana State Board of Health, had announced and proved his idea of steam disinfection.

These ideas, however, were slow in taking root; and, as late as 1890, there were only three quarantines equipped with steam disinfecting apparatus. It was about 1890 that Dr. Oliphant, of New Orleans, the then president of the Louisiana State Board of Health, and Dr. Kinyoun, of the Marine Hospital Service, promulgated the idea of generating sulphur dioxide by a furnace and obtaining a higher percentage than the 4.5 per cent. (by volume) of the gas obtainable by the pot plan.

The foregoing is an amply sufficient summary of what quarantine was.

The system now in practice under the administration of the United States Public Health and Marine Hospital Service and of the most advanced State authorities is, like almost all institutions which have arisen under the ægis of our race, a conservatively constructed plan, arrived at by slow, steady advances, by careful trial of methods, by rejection of unfit and acceptance of well-proven methods, and with the end constantly in view that every protection must be given to the people, but that nothing should be done which will unnecessarily hamper the commerce of the nation or of any local community.

All methods of disinfection are thoroughly tried in the Hygienic Laboratory, and, if proven acceptable there, are then given what may be termed a field trial, *i.e.*, a test under very practical conditions, but under the eye of scientists who are able to determine their exact value. Careful investigations are made into the nature of the various infectious diseases, and the findings of all scientists regarding their causative agencies and methods of propagation receive thoughtful consideration by those who are working out the problem of how to deal with each upon the arrival of a ship in quarantine infected therewith. These investigations are going on day by day without ceasing, to the end that nothing shall be done that ought not to be done, and nothing left undone that ought to be done.

No other of the great powers has such strong reasons as the United States for the establishment and maintenance of a strict system of maritime sanitation, for the reason that no other nation of prime importance has at its very doors an endemic disease (yellow fever) constantly demanding admission. It is true that cholera and plague do on occasion threaten the nations of Europe, but this is at long intervals. One result of this necessity for vigilance has been a largely increased interest in such matters, and, as the outcome of this interest, there has been established by the United States a system (not as yet perfect or general, but widely distributed) of foreign inspection of vessels and *personnel* bound for the United States. That this foreign service is valuable there can be no denial; but equally certain is it that it can only be an outpost, and must be strongly backed up by a thoroughly efficient service at our own ports.

The United States Public Health and Marine Hospital Service has, at the present writing, inspectors stationed at the principal ports of China, Japan, the Island of Cuba, Mexico, and Central America, and it has also in the past, as occasion demanded. placed inspectors at various other ports. It is the policy of the service to meet, by detailing inspectors to that point, any exigency which arises in the shape of epidemic disease at any given point, and which threatens the sanitary integrity of the United States. As illustrative of the latter statement, it may be said that during the major part of 1893 the service had twelve medical officers stationed at those European ports from which the passenger traffic to this country was heaviest. In addition, the State of Louisiana has inspectors at West Indian and at several Central American ports, which they deem it advisable to watch on account of the large commerce between those ports and their own. As the writer has had no accurate knowledge of State inspection and the work of State inspectors, he will limit this discussion to the subject of national foreign inspection.

At Havana, Cuba, the Marine Hospital Service, for several years before the Spanish War, maintained an inspection service which was of great value to commercial and sanitary interests in that it gave data to the consul-general upon which to issue bills of health, which data, as a whole, formed an abstract of the sanitary condition of the port and vessel, and enabled quarantine officers to decide more promptly than they otherwise could, what treatment should be accorded each vessel upon her arrival in this country. It is well known that the Southern ports and New York placed great reliance upon this Havana bill of health.

At the beginning of the Spanish War this inspection service was, of course, discontinued, but at the close of that war there was established in the whole island of Cuba a regular system of maritime quarantine, providing for the inspection and disinfection of both incoming and outgoing vessels, which system was as near perfect as circumstances would permit; and this was continued until the spring of 1902, when, the Cuban Government assuming charge of its own functions, the quarantine was turned over to them, and the system of inspection which had hitherto existed was resumed.

The same class of work is now done at other Cuban ports as at Havana, and while the Havana inspection is the most important one in the inland, others are none the less valuable as giving a clean-cut idea of the status of the port and ship on the day of sailing.

The inspectors in Europe in 1893 had the difficult task of endeavoring to prevent, by strict surveillance of ports, ships, and passengers, the introduction of cholera into the United States. Whether or not this effort was worthy of being made may be judged by the facts. Two ships brought each from Europe with them cases of cholera to the United States. While this was all that came to our shores, the non-inspected ships from Europe for South America, Africa, and other continents at times had many victims of cholera, and it is doubtful if there be any sanitarian who has been interested in such matters who does not remember the dreadful state of affairs aboard the unfortunate Neapolitan steamers bound to Rio in 1893. The facts are quoted from a report written at the time from Naples:

"The four for South America, with the result in each case, were as follows: The figures are not official, but are practically accurate in every respect. All were turned back by the South American authorities: *Vencinzio Florio*, about 50 deaths; *Andrea Dorio*, 90 on way out, total not ascertained; *El Remo*, 84 deaths; *Carlo R.*, about 230 deaths.

"To summarize, then, eight ships left Naples. The water supply was the same and the food about the same; the class of passengers identical, and their places of origin similar, in many cases identical. All four leaving [for South America] without precautions became floating pest-houses. Of the four for the United States, the one leaving before cholera appeared in Naples had three deaths; the other three were made to conform to the regulations, and all escaped."

The benefits to be derived from foreign inspection, however, are not by any means comprised in the present statement of what has thus far been accomplished by this agency. An honest and well-trained sanitarian at each port, which by virtue of its unsanitary surroundings menaces our health, if he be provided with the necessary authority, can and will do a great amount of good; possibly, nay probably, not what the general public may expect, certainly not an absolute sanitation of departing ships, obviating all necessity of quarantine at home, but work of great practical value none the less. Under no condition should we accept a bill of health from these inspectors as pratique; such bills should only be construed as information, and, when properly made, as extremely valuable information.

Inspectors should have the several duties of, first, keeping themselves posted, not only as to the health of the city where each is located, but of all the country commercially tributary to that city; second, reporting at stated intervals to the home office any facts bearing on the possibility of the introduction of disease from their ports, and in extra emergencies they should make cable reports of such facts; third, supervising all vessels, cargoes, and passengers for the United States in times of actual epidemic; fourth, collating and submitting for the benefit of the health authorities at home new facts on the subject of State and municipal sanitation independent of epidemic disease; that is to say, new ideas as to drainage, sewerage, irrigation, and ventilation, and all such other matters as may bear upon the public health in any way whatever. In a word, these inspectors should develop, for sanitary purposes, as has already been done for business purposes, a full-fledged system, a medical consular system, if you choose to designate it, which may gather unto itself all matters which may in any way help us to attain to the end we have in view, and let that end be the conservation of the health of this nation. To accomplish this there is only one path open. It is assumed, in the first place, that to enable an inspector to enforce his demands and be something more than a mere spy upon commerce, much authority is needed. This authority can be conferred only by the national Government, and by it only through treaty with the nation whose ports we should inspect, unless we evade this by having our inspectors appointed deputy consuls, or by having them serve in the office of the consuls as, under the law of 1893, was done in Europe, and is now done in the tropics. Inspectors, then, to have authority, must be national inspectors, because even though their reports and their work are public property and would be for the public weal, their work is not intended alone to benefit Louisiana or New York, Massachusetts or Georgia, but every State in the Union. Ohio and Kansas have as much interest in the health of the nation as any seaboard State, and only by national service can the whole nation be fully and equally served at an equal cost to all. It is not certainly known to whom belongs the credit of first using this very valuable adjuvant to an efficient quarantine service, but it is reasonably sure that it was inaugurated by the State of Louisiana, and when we have come to learn the full value of a rightly applied foreign inspection, it is fair to say that the whole nation will owe a vote of thanks to that State.

Let us practically illustrate some of the workings of an inspector abroad, from both a sanitary and a commercial standpoint. In September, 1893, becoming cognizant of the presence of the cholera spirilla in the Elbe River at Hamburg, and consequently expecting an outbreak of cholera, the inspector began to put all emigrants for the United States under observation, and confiscated all foodstuffs whose history was not clearly known. After taking away about twenty-five bushels of such food from a lot of five hundred and seventy-five people bound for New York he permitted the vessel to sail. A case of cholera developed on the second day out. It was afterward clearly shown that this case developed from the eating of a piece of sausage which an emigrant had concealed in his shirt bosom. Now let us suppose that nothing had been done with these people; that they had not been kept under observation; that they had been allowed to take their twenty-five bushels of possibly infected foodstuff along with them, and then let us conjecture how many cases might have developed, if one developed from one joint of sausage. This is cited to show what it is believed any fair-minded man will concede, viz., that even though there are occasional errors of omission (and such will occur in all inspections), an inspection is of immense value. With the exception of the instance just narrated, and one other of a similar character, infection occurred only on one ship out of the hundreds which were given bills of health in Hamburg in 1893, and all ships sailed on time. This result forms a striking contrast with the cases of the vessels bound from Naples to South America.

Now, as to the commercial aspect of the matter. Upon the beginning of the inspection work on April 1st, 1893, it was found that a majority of articles were being subjected to a so-called disinfection—one that was absurd, uncalled for, and in some instances fraudulent, not a true disinfection in any sense; that other articles were being shipped which it was impossible to disinfect and which should not have been allowed shipment. The report of the Chamber of Commerce was promptly obtained, and from that was drawn a full list of all articles ever shipped from Hamburg to the United States. From this list the following classification was made: "A," articles to be shipped free from any inspection; "B," articles requiring a permit from the inspector and possible disinfection; "C," articles which must be disinfected; "D," articles forbidden shipment on account of the impossibility of disinfecting them. Disinfection establishments which did a reliable disinfection were then sought out and specified, and their certificates accepted. At the hour of sailing the ship was boarded and her custom's manifest presented for inspection. This enabled the inspector to see at once of what her cargo consisted. One ship only was held, and compelled to discharge her forbidden cargo; but during the remainder of the year 1893 no other such trouble occurred. The shippers expressed themselves as gratified at the facilitation of their business by, first, an exact knowledge of what they were to do or not to do; second, by the removal of an embargo on

many articles; third, by a lessening of expenses incurred through unnecessary disinfection. Although the system has been discontinued since December, 1893, the good results of this European inspection have not altogether ceased up to the present moment. One of those results was the establishment, by German authority,—at Spandau, and subsequently at Tilsit and Illowa, the latter two on the Russian frontier—of stations for the cleansing of persons and baggage of the hunted and hated Russian Jew. These stations handle nearly all of that class, and, in the event of another outbreak of cholera in Russia, they will be of untold advantage both to the emigrant and to the public. It is not unfair to claim that these stations would not have been established except for the example of American inspection abroad. A system almost identical with that at Hamburg was pursued in Bremen, Antwerp, Rotterdam, Havre, Naples, and in the chief ports of Great Britain, and it is a matter of history that only two very slight infections developed aboard ships, although three hundred thousand people were inspected, kept under observation, and embarked during the period alluded to.

We are compelled to admit that we cannot remedy the sanitary condition of any foreign port except in so far as criticism may serve to arouse a sense of shame in a municipality, just as the same weapon might compel a dirty boy to wash his face.

Of course, after the actual outbreak of disease, we can, by delaying the commerce of the infected town, compel the authorities to remedy, in some measure, the defects; but it is doubtful if we could accomplish this except at such a time, and then it would be too late.

Finally, it is probable that our strongest protection lies in stationing the best available men as inspectors at all such ports, and by this means obtaining timely warning of approaching danger. Then, when the disease arrives, we should be ready to fight it with the most approved appliances known to modern science, operated by the most skilled physicians the Government can assign to this work.

We now come to the discussion of what a maritime quarantine under the best modern conditions actually is, how it should be equipped, and how operated.

The Quarantine Itself.

In the selection of a site for a quarantine station, the following points should be borne in mind: The station should be accessible to incoming vessels, and should deflect them from their regular course, in coming into port, only to the minimum extent. There should be as great a depth of water at the quarantine station as the maximum draft of vessels entering at that port. It should be so far away from the port as not to be in the way of the further growth of the city, thus preventing any necessity for the future removal of the station, and also avoiding antagonism of public sentiment. A quarantine plant, to be complete in all repects, should comprise:

1. Boarding Facilities.—The necessities vary from a small rowboat at some stations to an able seagoing tug at others. It may be stated as a general rule that for a land-locked station, south of the territory in which harbors become icebound, a good, stanch naphtha launch, not only will suffice for boarding purposes, but will be preferable to almost any other type of vessel, because of the ease with which it can be handled.

2. Anchorages.—At a complete quarantine station two anchorages should be provided, one for infected and one for non-infected vessels, and they should be sufficiently removed from one another to prevent vessels undergoing inspection at the non-infected anchorage being infected from the other, or infected anchorage.

3. Disinfecting Plant.—The disinfecting plant may be either on a wharf or on a floating platform. It is believed that, other things being equal, a wharf is superior to the floating platform, and that the latter should be resorted to only where natural conditions interfere with the erection of a proper wharf or make such construction too expensive. The disinfecting plant itself should consist of: (1) Steam disinfecting chambers; (2) means for generating sulphur dioxide; (3) machines for generating formaldehyde gas; (4) vats for holding disinfection solutions; (5) large, air-tight wooden chambers for the application of gaseous disinfection to large quantities of material; (6) force pumps for applying disinfecting fluids.

Steam Disinfecting Chambers.—The probably most effective and mechanically as well as scientifically most perfect steam disinfecting chamber in use to-day is what is known as the Kinyoun-Francis steam chamber, devised by Dr. J. J. Kinyoun, with the assistance of Mr. Francis, of the Kensington Engine Works, of Philadelphia. When, as is now generally done, there is attached to this chamber a formaldehyde retort, it becomes a doubly useful appliance. The chamber is provided with an ejector which will produce a vacuum of fifteen inches in the largest-sized chamber—a chamber, for example, approximately five feet in diameter and sixteen feet long—in one minute. This is, according to the observation of the writer, about five times as rapid work as can possibly be accomplished in the production of a vacuum by the ordinary air pump. The chamber is double-jacketed, and by a system of pipes and valves the steam may be forced through the chamber in various directions, causing a circulation of steam, and resulting in increased efficiency in disinfection. When it is desired to use formaldehyde from the retort attached to the side of the chamber, a vacuum is produced, the pressure raised in the formaldehyde retort to about sixty pounds, and the valve leading into the vacuum barely opened. It should not be forgotten that if the valve is opened wide, the fluid contents of the formaldehyde retort will be carried over into the chamber, thus spoiling the articles to be disinfected. Lack of space forbids a more thorough description of this apparatus, which has been exhaustively described by Dr. M. J. Rosenau ("Disinfection and Disinfectants," p. 57, *et seq.*).

Means for Generating Sulphur Dioxide.—The sulphur furnace mentioned above, which was invented by Dr. J. J. Kinyoun, then a medical officer of the Marine Hospital Service, was designed to meet the existing demand for a greater percentage of sulphur than could be produced by the pot method, and in careful hands it is capable of generating a much larger percentage of sulphur dioxide than the pot method does. It has now, however, been very definitely ascertained that such large percentages of sulphur dioxide are not only unnecessary, but are so destructive in their action as to render it inadvisable to use them; consequently, the much simpler method of placing the required amount of sulphur in an ordinary pot, which in its turn is placed in a vessel of water, and the sulphur then lighted by the use of a few ounces of alcohol, has largely superseded the furnace and answers every purpose.

Machines for Generating Formaldehyde Gas.—(1) Autoclave under pressure. (2) Retort without pressure. (3) Generator, or lamp.

The above-mentioned three methods are given, and all of them, within their proper limitations and properly used, are effective. It may be well to say that, as a general rule, formaldehyde disinfection should be confined to small spaces, and not undertaken in such large compartments as the hold of a vessel, something like two thousand cubic feet of air space being the maximum limit wherein efficiency can be attained. In addition to the three appliances mentioned above there is a means, which has previously been mentioned, of applying formaldehyde and dry heat in partial vacuum in a steam chamber.

Tanks should be provided for holding solutions of carbolic acid, bichloride of mercury, permanganate of potash, or other solutions which may be desirable for use at the station.

Air-tight wooden chambers for the application of gaseous disinfectants to large quantities of material consist simply of an ordinary room having but one door, which is adjusted to fit as tightly as possible. The room itself should have a triple lining; it should be ceiled first with wood; then upon this should be placed a lining of tarred paper; and finally over this should be fastened a tightly fitting wooden ceiling. In this are arranged racks and hooks for spreading out or hanging up the articles to be disinfected.

Force pumps are simply ordinary Worthington or other pumps of equal force, made to resist, so far as possible, the action of bichloride of mercury.

Detention Barracks.—There should be provided at every quarantine station adequate quarters for the comfortable housing, without crowding, and for the segregation, if necessary, of such a number of people as may ordinarily be expected to be held in detention at any given time. These quarters should be, as elsewhere stated, very thoroughly screened to prevent the ingress and egress of mosquitoes, flies, and other insects. The plumbing should be of the best and the sewers should be so arranged as to make it possible entirely to disinfect the dejecta. The kitchen, which is to provide food for the occupants of these quarters, should be far enough away to prevent any possible risk of contamination of food; and at the same time arrangements should be provided for the disinfection—before they are returned to the kitchen—of any food carriers which may be used in the barracks or hospital.

A steam laundry is a very useful adjunct to this portion of the station.

Crematory.—The station should be provided with a crematory capable of handling a human body in a decent and proper manner, or of disposing of any contaminated material which is deemed to be beyond the reach of mere disinfection.

Inspection of Vessels.—Experience has demonstrated that, prompted by anxiety to avoid delays and to save expense to owners, the average ship master has no compunctions of conscience regarding deception, and will often deceive the boarding officer if he is not very acute. In view of this fact, many of the ablest officers in the national service make it a custom to indulge in cursory inquiries and to stroll about the ship for a few moments, asking apparently careless questions of subalterns and crew, before beginning the regular inspection. The writer on one occasion found a man in his bunk (convalescent from yellow fever), who subsequently stood in line for inspection and declared himself well.

After such a cursory glance at ship and personnel, it is customary to call for the ship's papers, including the bill of health which, under the law of February 15th, 1893, all vessels entering a port of the United States must bring from the United States consul at the port whence they sailed. The captain, and the ship's surgeon, if one be carried, are then carefully interrogated as to the minutest details of the voyage, and as to the health of the crew and passengers, if the ship has within recent date come from a suspected port. All hands are then mustered and compared with the ship's papers.

This muster is one of the choice occasions for deception by the master. He may report any missing man as being on duty with the engines, and, if told to send a substitute to duty and bring the man, will even endeavor to pass off upon the inspecting officer a man already before him. In dealing with the fire-room force of an Atlantic liner (often one hundred and fifty or more) the inspecting officer must remember that this is a trick easily accomplished.

When the inspection of the *personnel* has been completed, it is then necessary to go through the whole ship, and especially those compartments devoted to the occupancy of crew or passengers. Every hole and corner in every compartment is to be searchingly investigated. If any inspection is needed, an absolutely complete one is an imperative demand. Firemen have been known to put their belongings in the firebox of a boiler which was temporarily disused, and cover them with cinders. In view of the known occurrences of this kind, it is absolutely necessary to use the most stringent care in searching every possible hiding place, and to bear in mind another fact which, while well recognized by most quarantine officers, seems beyond belief, viz., that the article most likely to be so hidden is *always that which with greatest certainty is infected.*

The clothing of a man dead of communicable disease was secreted by his comrades in the furled sails of a bark at the South Atlantic quarantine, and only the large and badly distributed bulk opened the way for its discovery.

Fortunately, cargo is, as a rule, composed of new goods, and it is therefore hardly probable that it contains any infection. Indeed, while I am not as yet willing to subscribe absolutely to the innocuousness of cargo, I must admit that it is likely to come up for serious consideration only as regards one particular; I refer to the question of food-stuffs coming from some cholera centre. These food-stuffs, however, are not, as a rule, of such a character that they would be likely to transport the comma bacillus in a living state across the Atlantic Ocean. An examination of the ship's manifest will, therefore, show fairly well whether there is a necessity for taking any measures regarding cargo, and such measures belong to the disinfection rather than the inspection of the vessel.

Food and water supply should be investigated if such a disease as cholera is aboard, and water supply alone for mosquitoes if yellow fever is found. In the absence of either, no attention need be paid to these supplies.

Ballast has long been a bugaboo at Southern quarantine stations, and the writer confesses to having been at one time a strong believer in the transmission of yellow fever through *infected* ballast, but he is now fully convinced (through the findings of the Army Yellow-Fever Commission) that yellow fever cannot be conveyed through the medium of clean, *dry* ballast, of the character ordinarily used, be it either rock or sand. Nor would there be any danger in sea-water ballast in tanks.

There is probably no doubt that dirty and damp rubbish might convey plague or cholera, and even yellow fever by serving as a brooding place for mosquitoes; but clean, dry rock or sand would almost certainly convey nothing of an infectious nature. Dirty rubbish ballast should be debarred at all ports, and ships which insist on bringing such stuff should pay the penalty of disinfection.

The inspection of ballast and the determination of its character are, as a rule, easy of accomplishment. If the inspection satisfies the quarantine officer that the vessel can be admitted to entry without jeopardy to public health, she is given pratique and concerns him no further. If, however, it is decided that she is infected, measures appropriate for the eradication of the disease with which she is known to be infected must be taken.

In order that we may properly consider what measures are necessary for the correct treatment of a vessel infected with any given quarantinable disease, a brief *résumé* of the salient points of each of these diseases will be in order, such *résumé* to include, so far as is possible in each case, the period of incubation, the actual cause of the disease, the characteristics and viability of the causative micro-organism, when known, and its manner of spread. Symptoms of diseases will not be considered, such being out of place in an article of this character.

Yellow Fever.—Considerable space will be given to the discussion of this disease because, as above stated, it is the one perennial threat against the Southern borders of the United States. Its period of incubation varies from a few hours to five days, and in a few rare instances slightly more than five days. Its cause is as yet undetermined. Its method of transmission has, fortunately, been determined to be through the medium of the mosquito, and that it is most probably not conveyed in any other way. It is now known, therefore, that yellow fever is not a contagious disease in the same sense as scarlet fever or smallpox is contagious. Consequently there is no danger to be apprehended from a yellow-fever patient, provided the presence of the mosquito can be entirely excluded. It is evident, therefore, that our whole effort in prophylaxis against yellow fever must be devoted to the exclusion, and, wherever possible, to the extinction, of this insect.

In view of the recent findings of the Army Yellow-Fever Commission, to the effect that yellow fever is con-