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QUARANTINE.

BY

WALTER WYMAN, M.D.,
SURGEON UNITED STATES MARINE-HOSPITAL SERVICE.

REPRINT OF CHAPTER XXII

DR. GEO. H. ROHÉ'S "TEXT-BOOK OF HYGIENE."

*Second Edition; Thoroughly Revised and Largely Rewritten,
with many Illustrations and Valuable Tables.*

—1890—



F. A. DAVIS,
MEDICAL PUBLISHER AND BOOKSELLER,
PHILADELPHIA.

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W. W. W. W.

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CHAPTER XXII.

QUARANTINE.

(By WALTER WYMAN, M.D., Surgeon United States Marine-Hospital Service.)

BY quarantine is meant the adoption of restrictive measures to prevent the introduction of diseases from one country or locality into another. The term itself conveys no definite idea, being derived through the Italian from the latin "quadraginta," meaning "forty" and implying forty days, the period of detention imposed on vessels by the first quarantines established at Venice in 1403. The old significance of the term is entirely lost in its present application, which is quite general. Thus, besides regular maritime quarantine, mention is often made of land, railroad, cattle, shot-gun, house, and even room quarantines.

The name of a disease or article of merchandise may be used in prefix, as in "yellow-fever quarantine," small-pox, cholera, or rag quarantine. Moreover, quarantines are described as properly beginning at the port of departure, and as quarantines of inspection only, the fumigation and detention being imposed at some neighboring station. The term, therefore, is applied not only to establishments, but indifferently to persons, animals, diseases, localities, and measures.

There is need of a clear understanding with regard to the term, for when, as occasionally, quarantine is ridiculed, or the assertion is made that the English disbelieve in quarantine, a wrong impression will be received, unless it is understood that only particular and obsolete forms of quarantine are meant, and not quarantine in the broad sense just mentioned.

The subject admits of two natural divisions—maritime and land quarantine; but before describing them attention is called to the following table, containing a list of diseases that are ordinarily found in official quarantine proclamations:—

QUARANTINABLE DISEASES.—TABLE XXIX.

| DISEASE. | PERIOD OF INCUBATION, IN DAYS. | | | Authority and Remarks. |
|-----------------------|--------------------------------|----------|---------|------------------------|
| | Shortest. | Longest. | Usual. | |
| Plague | .. | .. | | Bristow. Undetermined. |
| Yellow fever | 1 | 9 | 2½ | Da Costa, Bartholow. |
| Cholera | 2 | 14 | 2 to 4 | Bartholow. |
| Typhus fever | 1 | 21 | 5 to 14 | Bristow. |
| Small-pox | 5 | 20 | 10 | Da Costa. |
| Measles | 7 | 14 | 10 | Da Costa. |
| Diphtheria | 2 | 10 | 2 to 5 | Bartholow. |
| Typhoid fever | 7 | 28 | 21 | Bartholow. |
| Scarlet fever | 1 | weeks. | 4 to 7 | Da Costa. |
| Relapsing fever . . . | 5 | 7 | 6 | Bartholow. |
| Dengue | 1 | 10 | 5 | Bartholow. |
| Leprosy | .. | .. | | Undetermined. |

The above list illustrates the growth of the sanitary idea and belief in quarantine. For many years, as now at some ports, the list was limited to yellow fever, typhus, cholera, and small-pox. It was thus limited at Boston prior to 1881, since which date diphtheria, scarlet fever, typhoid fever, and measles have been added. The statutes of New York define as quarantinable "yellow fever, measles, cholera, typhus or ship fever, small-pox, scarlatina, diphtheria, relapsing fever, and any disease of a contagious, infectious, or pestilential character, which shall be considered by the health officer dangerous to the public health."

At Gibraltar, the English sanitary authorities include dengue and epidemic rose-rash among the diseases subject to their quarantine regulations.

The most recent addition to the list in this country is leprosy, to prevent the introduction of which, and in accordance with a resolution of the American Public Health Association, a prohibitory circular was issued by the Surgeon-General of the Marine-Hospital Service, December 23, 1889.

Other diseases which may properly call for quarantine are mumps, whooping-cough, chicken-pox, epidemic dysentery,

glanders, tetanus, beriberi, epidemic influenza, and pulmonary tuberculosis.

Influenza may be considered quarantinable under certain circumstances, a successful quarantine being reported by Dr. Trudeau, whose cottage sanitarium, in the Adirondacks, New York, was thus kept exempt during the epidemic of 1890.

With regard to pulmonary tuberculosis the ground is taken by the writer that this disease, at least among immigrants, should be excluded from the United States by quarantine.

MARITIME QUARANTINE.

In describing a maritime quarantine it should be borne in mind that the details in the plant must vary in accordance with the special demands of each port.

Thus, it is not to be expected that at Charleston, where immigration is limited, there should be the same provisions for detention of immigrants as at New York, through whose portals more than one-third of a million of immigrants pass each year; or San Francisco, where enter the throng of travelers and immigrants from the far East.

We should not expect that Boston, in the more salubrious North, would have the means or adopt the practice of emptying, cleaning, and fumigating every vessel from an infected port, which process has proven to be the *sine qua non* of exemption to the State of Louisiana.

Nor should we expect Pensacola, with a completely-equipped national refuge-station near at hand (at Chandeleur Island), to erect an expensive disinfecting-house, with modern steam disinfecting-chambers, as has been recently done for the port of Galveston by the health authorities of Texas.

But, leaving these variations for subsequent notice, the first thing to be considered in the establishment of a complete maritime quarantine is proper location. This must be at a point remote from city or village boundaries, and not likely to be encroached upon by urban growth. It should be more or

less removed from the channels of commerce, and yet be easily accessible. Indifference to proper location could readily make the quarantine a source of danger instead of a protection. After proper location, the main requirements may be stated as follows:—

1. A boarding-station. This includes a boat-house with boatmen's quarters, so located as to avoid possible infection from the lazaretto and to be within easy reach of passing commerce.

2. A boarding-boat, preferably a steamer.

3. An anchorage. The anchorage is the place of detention of the infected vessel. It should be conveniently removed from the main establishment and safely remote from the track of commerce. Its position should be sheltered, and good holding-ground for vessels' anchors is of the first importance. The channel to the anchorage, and, if necessary, its boundaries, should be plainly marked by buoys.

4. A fumigation steamer, to be described under "Quarantine Contrivances."

5. A wharf. The wharf should be in water of at least 20 feet depth, and there should be constructed upon it a warehouse, tanks for holding disinfecting-solutions, and a disinfection-house containing steam disinfecting-chambers.

6. A lazaretto or hospital for treatment of contagious diseases.

7. A hospital for treatment of non-contagious diseases.

8. Barracks for the detention in groups of "suspects," or persons who have been exposed to contagion or infection.

9. Quarters for medical officers.

10. A cremation-furnace.

No better understanding of the subject can be had than by a brief survey of the several varieties of maritime quarantines that are now maintained on the coasts of the United States. First should be mentioned the national quarantine stations, eight in number, established at points of danger where either local quarantine is defective, or where, by reason of peculiar advan-

tage in location, protection is afforded to several States by one station. These stations are as follow:—

Delaware Breakwater Quarantine Station, Lewes, Del.; Cape Charles Quarantine Station, Fisherman's Island, Va.; South Atlantic Quarantine Station, Blackbeard Island, Sapelo Sound, Georgia; Key West Quarantine Station, Tortugas Islands, Fla.; Gulf Quarantine Station, Chandeleur Island, Miss.; San Diego Quarantine Station, San Diego, California; San Francisco Quarantine Station, Angel Island, San Francisco Bay, California; and Port Townsend Quarantine Station, Port Townsend, Washington.

Most of these stations will be complete in plant and equipment within a short time, but pending completion active quarantine is maintained the whole year through 'at all of them, San Francisco excepted,—there being a local quarantine at this port.

The estimated cost of the national quarantine station at Angel Island, San Francisco Bay, is \$175,000, exclusive of the site, which was in previous possession of the government.

Surgeon-General Hamilton, in a recent report, says:—

“It is evident that a few complete stations of this kind will take the place of the many municipal quarantines. The latter will become, eventually, simply boarding-stations, and vessels requiring treatment will be sent to the nearest government quarantine station.”

No fees are exacted at the national stations.

Many of the local quarantine establishments, while entirely effective for ordinary quarantine, the occasional detection and care of a few contagious cases, would prove insufficient and become, in fact, more dangerous than beneficial in the presence of a heavy inroad of an epidemic disease, such as the appearance of a ship with a thousand emigrants aboard, having a history of many deaths at sea from cholera, and cholera still prevailing among them. Deficiencies in the plant and the want of modern appliances and proper accommodations would create embarrassment, while the location, once remote from populous centres, but now

no longer isolated, would at once be recognized as hazarding the safety of the neighboring population.

It is in recognition of these facts that the health authorities of the various States and cities interested have contributed their influence to the establishment of the national quarantines, using them as refuge-stations.

Among the State and local quarantines, variety of type is presented by those of Boston, New York, Louisiana, Galveston, Philadelphia, Baltimore, and Charleston. The first four of these are complete in themselves, and independent of extraneous aid. The others make use of the national stations, particularly for the anchorage and cleansing of foul ships. The city of Charleston, for example, has a complete plant of approved modern design for the disinfection by steam of clothing, baggage, and bedding, but use is made of the neighboring national station at Blackbeard Island for the treatment of the infected vessel.

To complete this description of maritime quarantines it only remains to mention the special characteristics of the State quarantine establishments of New York and Louisiana.

THE NEW YORK QUARANTINE.

This consists of—

1. A ship, or hull, anchored in the lower bay,—the bay farthest from the city. The hull is anchored about 4 miles inside of Sandy Hook, and about 11 miles from New York. This is the boarding-station from May until November, vessels being visited by means of a row-boat.

2. Swinburne Island,—called also Dix Island,—located two or three miles from the boarding-station, nearer to New York, with an area of two or three acres, on which are erected the hospitals for the treatment of the sick, and also a cremation-furnace.

3. Hoffman Island,—like the former, an artificial island,—still nearer to New York by about one mile, on which are buildings for the accommodation of two thousand immigrants, with

interior arrangements for their division into groups, while awaiting the development of any contagious or infectious disease among them. A steam disinfecting-apparatus for the dry or moist heat disinfection of baggage, clothing, etc., has been established upon this island.

4. Residence of the health officer, on the "Narrows," near Clifton, Staten Island, 6 miles from New York.

5. The Anchorage, where infected vessels are treated. This is also in the lower bay, which is of so great area that a safe location of the vessel is easily effected.

THE LOUISIANA QUARANTINE.

To the Louisiana State Board of Health and its successive presidents, Drs. C. B. White, Samuel Choppin, Joseph Jones, Joseph Holt, and C. P. Wilkinson, is due the credit both of combating the pernicious theory of non-quarantine and of perfecting a system of quarantine that is recognized as the most extensive and efficient ever devised, and from which a number of others have been modeled. Though utilizing the devices of others, notably that of Quarantine Officer Dr. Perry, for generating and forcing into vessels' holds sulphur dioxide, and though his plant has been improved by his successor, nevertheless the credit of this new and thorough system is justly given to Dr. Joseph Holt, President of the Board of Health from 1884 to 1888, to whose determined energy and genius sanitary and commercial interests are equally indebted.

The improved quarantine consists of, first—

The Mississippi River Quarantine Station. This is located about 90 miles below New Orleans and 4 miles above the "Head of the Passes," or point where the river divides into its three main outlets.

The plant consists of five buildings exclusive of out-houses, viz., a disinfecting-shed and boiler-room, quarters and mess-hall for the disinfecting-crew, boat-house and boatmen's quarters, and two residences for the quarantine officer and his assistant.

The disinfecting-shed immediately adjoins a wharf built in water of sufficient depth to allow the largest vessels to be moored alongside.

The following description is from the report of Dr. C. P. Wilkinson, President of the Louisiana State Board of Health:—

The disinfecting apparatus consists of three cylindrical steel chambers and appurtenances, each cylinder being 50 feet long and 8 feet in diameter. The ends are spherical, and that facing the river or front end is movable, swinging open by means of a crane. At a point 50 feet in front of each cylinder commences a double, iron, elevated track, which, by a movable section, continues into and throughout the length of each cylinder.

On this track rolls a truck 48 feet in length, and from this truck are suspended thirty clothes-racks of 5 bars each. The interior of each cylinder contains an arrangement for the employment of moist and dry heat, separately and together. The necessary heat is supplied by a 40-horse-power steam-boiler at 85 to 100 pounds' pressure.

Surmounting the shed is a cypress cistern, the bottom of which is 41 feet above the river-surface, capable of holding 7000 gallons of fluid. In this cistern is stored a solution of mercuric chloride, 1 part to 1000 of water by weight. Pipes lead from this cistern to the outer edge of the wharf, and at that point have rubber-hose attachments of sufficient length to lead to all parts of a very large vessel, and the hoses terminate in hard-rubber roses of 6-inch face.

The fumigating apparatus, heretofore on a tug, but now proposed to be erected on rail-cars on the wharf, consists of a reverberatory sulphur-furnace, with 250 feet of galvanized-iron conductors, 12 inches in diameter, and a steam fan. The furnace, 24 inches wide, 48 high, and 40 deep, is provided with four cast-iron pans, 30 inches long, 23 wide, and 4 deep, each pan having over $1\frac{1}{2}$ cubic feet capacity, or about 175 pounds of sulphur. The pans are set on split brick, and are so placed that the current of air driven by the fan into the bottom passes over each pan of burning sulphur alternately, out through the top and along the conductors down into the holds of vessels.

The process of disinfection of vessels consists in placing all baggage, bedding, curtains, carpets, linen, etc.—in fact, all textile fabrics of vessel, crew, and passengers,—on the suspended clothes-racks, which are then drawn into the cylinders by a windlass, and applying dry heat until the thermometers mark 185° F. (85° C.), at which point moist heat is turned on, the temperature rapidly rises to 215° to 220° F. (102° to 105° C.), and

the gauges usually record a pressure of 7 pounds to the square inch, at which point the blow-off valves open, preventing any danger of explosion. The contents of the chambers are kept at this temperature and pressure for thirty minutes, the cylinders are then opened, and the goods turned over to their owners. The vessel in the meantime is washed down—cabins, forecastles, decks, and holds—with the mercuric-chloride solution, and fumigated by means of the furnace and fan. In the case of loaded vessels, washing the interior is omitted, on account of danger to cargo. The holds are, however, thoroughly fumigated, and, by a special arrangement of "cargo wells," the gas penetrates every interspace of cargo. These wells are constructed at port of departure, and consist of a long wooden box about two feet across, and reach from the bottom to top of holds, the cargo being stowed around them at loading-point. The conductor from the sulphur-furnace is led into the well, the hatches are tightly closed, and, under pressure, the fumes of sulphur are driven into the vessel, the gas passing around every package envelope, no matter how tightly packed, and chemical examination showed that in the case of sugar-bags it penetrated to the depth of three-fourths of an inch. The character of cargoes arriving here from infected ports is almost exclusively coffee and sugar, the former always, and the latter nearly always, in bags, neither offering obstacles to good and sufficient fumigation *in situ*.

When necessary, the cargo is shifted to lighters for more thorough disinfection.

Passengers are required to don their disinfected wearing-apparel to permit disinfection of that they may be wearing on arrival.

Most all of the quarantine work is accomplished at this Mississippi River Station.

The second or Lower Quarantine Station is situated in Pass à L'Outre, an unused outlet of the Mississippi, a few miles below the Head of the Passes. At this station is the lazaretto, or hospital for infectious diseases, and it is the anchorage also for infected vessels.

Other stations are the Advance Guard Inspection Station at Port Eads, 110 miles below New Orleans, where the waters of South Pass are jettied into the Gulf, and the Rigolets and Atchafalaya Stations. The two latter control the two lateral approaches to New Orleans, and, as the shipping coming through these two channels is light in tonnage and mostly from domestic

ports, by imposing a quarantine of forty days' detention the two approaches are practically closed, compelling all vessels to seek the Mississippi as the only available route to New Orleans.

The following description is for the most part *verbatim*, from the pen of Dr. Joseph Holt (see "Transactions of the American Public Health Association," 1887, vol. xiii):—

When an inward-bound vessel comes into the offing, she is immediately boarded by a thoroughly skilled medical officer, and a careful inspection is made of her sanitary record and present condition. If from a non-quarantined port, and all is well, she is given *pratique* and goes on to the city. If from a quarantined port, but presenting a clean health-record of voyage and no evidence of sickness of a dangerous or doubtful character, she proceeds to the Mississippi River Quarantine Station, where she is subjected to a full course of sanitary treatment, and is detained such length of time, not exceeding five days (except in rare instances wherein further observation may be deemed necessary), as the Board of Health may provide.

If, upon inspection of a vessel entering the river she is found to be foul,—that is, showing positive or suspicious evidence of infection either in a person then ill or in a foul health-record of voyage,—she is at once remanded to the lower station in Pass à L'Outre. The sick, if any, are at once removed to the hospital, where every provision has been made. The vessel with the well on board is dropped down-stream a few hundred yards and anchored. The quarantine tug-boat, with its complete disinfecting outfit, comes alongside, and the work of disinfection begins, and does not cease until the vessel has been subjected to the most vigorous application of the solution of bichloride of mercury, her atmosphere below deck completely replaced with one heavily charged with sulphurous oxide, and every article of baggage and ship's wardrobe has been saturated with the mercuric solution.

A ship known to be infected with one of the three great pestilential diseases—small-pox, cholera, or yellow fever—can stand and must endure extraordinary treatment, even if clothing is wetted and some articles damaged.

The immediate segregation of the sick and the well and disinfection of the ship and all baggage (in the case of a cholera-infected vessel, extended to the disinfectant washing out and refilling of the water-tanks, destruction of the food-supply, and revictualing the vessel) constitute the treatment of an infected vessel at this station. The ship, together with all on board, is held for observation a period of ten days or more,

according to circumstances, when she is released and proceeds to the Mississippi River Station, where the processes of sanitary treatment are repeated, with the addition of the use of moist heat applied to baggage, ship's apparel, etc.; and the vessel is then allowed to proceed to the city.

The tug-boat mentioned is of sufficient power to move a vessel to or from the wharf, and is equipped with a complete outfit for generating and applying germicidal gas for the displacement of the entire atmosphere within the ship, transported, perhaps, directly from some infected port. In the hold of this tug is constructed a wooden tank of 2000 gallons capacity, to hold the bichloride-of-mercury solution, for treatment of vessels in the lower quarantine. This tank is furnished with a steam-pump made of iron (on account of the greater resistance of that metal to amalgamation), supplied with a $\frac{3}{4}$ -inch rubber hose.

The quarantine procedure at the Louisiana quarantine stations may be further understood through the following quarantine proclamation by the Governor of the State, May 1, 1890:—

EXECUTIVE DEPARTMENT, STATE OF LOUISIANA.

In conformity with the provisions of Section 3049 of the Revised Statutes of the State, and upon the advice of the State Board of Health, requesting the Governor to issue his annual proclamation of quarantine against the hereinafter enumerated and mentioned ports, to take effect from and after the 1st day of May, A.D. 1890, to wit:—

All vessels arriving at the several quarantine stations in this State, together with their crews, cargoes, and passengers, shall be subjected to inspection by the quarantine officers at said stations.

All vessels, together with their cargoes, crews, passengers, and baggage arriving at the Mississippi River Quarantine Station from inter-tropical American and West Indian ports shall be subjected to thorough maritime sanitation according to the following schedule, to wit:—

First Class.—Vessels arriving from non-infected ports.

Second Class.—Vessels arriving from suspected ports.

Third Class.—Vessels arriving from ports known to be infected.

Fourth Class.—Vessels which, without regard to port of departure, are infected; that is to say, vessels which have yellow fever, cholera, or other contagious or infectious disease on board at time of arrival, or have had same on voyage.

Vessels of the first class to be subjected to necessary maritime sanitation at the Mississippi River Quarantine Station, without detention

of either vessel or persons longer than may be necessary to place such vessel in perfect sanitary condition.

Vessels engaged in the tropical-fruit trade and coming from known non-infected localities, and whose sanitary condition and health-record are satisfactory, may be allowed to pass the quarantine station after inspection, subject, however, to such regulations and sanitary treatment as the Board of Health may prescribe.

Vessels of the second and third classes to undergo the same conditions as those of the first class, together with detention for observation for a period of five full days from hour of arrival in quarantine.

Vessels of the fourth class to be remanded to the Lower Quarantine Station, there to undergo sanitation and detention of vessel and persons such length of time as the Board of Health may determine.

All vessels arriving from ports known or suspected to be infected with cholera or small-pox, or which may hereafter become infected, shall be subjected to maritime sanitation and such detention as the Board of Health may determine.

Vessels arriving from the above-named ports and places, and belonging to the second, third, and fourth classes, as is set forth in the above schedule, shall not be allowed to pass the Rigolets, the Atchafalaya, or Lake Charles Quarantine Stations, or other State quarantine stations which may hereafter be established, without having undergone a period of detention of forty days and thorough cleaning and disinfection.

Now, therefore, I, Francis T. Nicholls, Governor of the State of Louisiana, have thought proper to issue this, my annual proclamation of quarantine, directing that quarantine shall take effect from and after Thursday, the 1st day of May, A.D. 1890, against the above-mentioned ports, and as contained in the foregoing schedule.

Quarantine officers at the several stations in this State are especially charged and required to strictly enforce the execution of this proclamation, and the Board of Health in the city of New Orleans is requested to prosecute vigorously all violations of the same, as well as the quarantine laws and regulations of this State.

In testimony whereof I have hereunto affixed my signature, authenticated with the seal of the State of Louisiana, at the city of Baton Rouge, this eighteenth day of April, in the year of our Lord one thousand eight hundred and ninety.

FRANCIS T. NICHOLLS,
Governor of Louisiana.

By the Governor:

GEO. SPENCER,
Assistant Secretary of State.

Special Suggestions to Owners, Agents, Masters of Vessels, and Passengers.

The Louisiana State Board of Health recommends the following suggestions to agents, owners, masters of vessels, and passengers for the purpose of facilitating the work of quarantine officers and reducing the period of detention to a minimum:—

1. That vessels should be stripped during the quarantine season of all woolen hangings, carpets, curtains, and such-like materials, and upholstered furniture as far as practicable. Hair or moss mattresses to be replaced by wire or wicker beds.

2. That as far as possible vessels trading with tropical ports should be manned with acclimated crews.

3. Masters of vessels and ship and consular agents are earnestly requested to instruct passengers from quarantinable ports to dispense, as far as possible, with baggage which may be injured by wetting, in case of pestilential outbreak on board, while undergoing disinfection. Such passengers are especially warned against bringing silks, laces, velvets, and other fabrics of delicate texture, as they will be compelled to assume all risks of injury.

4. While in ports infected with yellow fever, vessels should be anchored out in the harbor, when this is possible, and the crew prohibited from going ashore, especially at night.

5. When practicable, cargoes should be loaded in such a manner as to allow access to the pumps, and also to enable the quarantine officials to pump out and wash the bilge.

6. Special attention should be given to cleanliness of vessels and persons, and provision should be made for all possible ventilation of the entire vessel. The best disinfectants and instructions for using the same can be obtained by application to the Board of Health or any of its officers.

7. Masters should, before arrival, see that the bilge is thoroughly pumped out and cleansed, and that the entire vessel be put in such good sanitary condition as to permit of the least possible detention. Fruit vessels, particularly, should be kept thoroughly cleansed for the purpose of avoiding delay at the quarantine station.

8. Vessels observing the above recommendations will receive special consideration at the quarantine station, detention and cost of cleaning, disinfecting, etc., being materially lessened thereby.

QUARANTINE CONTRIVANCES.

Of modern contrivances first should be mentioned the disinfection steamer. This must be a powerful boat on the

general plan of a tug-boat, about 85 feet in length on the water-line, provided with iron tanks of at least 2000 gallons' capacity for holding the solution of bichloride of mercury, to which may be attached a steam-pump and rubber-outlet hose. To prevent contact of the mercury with the iron the tanks may be painted with three coats of red lead and two of paraffine paint (Holt).

The steamer is also provided with a steam-fan, by means of which fresh air may be made to displace foul air in the hold of the vessel under treatment. A sulphur-furnace is also provided for the generation of sulphur dioxide, which is conveyed into the hold of the adjoining ship after displacement of the foul air.

The improved pattern of sulphur-furnace is the design of Assistant-Surgeon Kinyoun, Marine-Hospital Service, who states that it is on the principle of a reverberatory furnace, consisting of a series of shelves arranged one above another, each shelf holding a pan of burning sulphur. A forced draught is kept up by means of a fan-blower connected at the bottom. The draught of air charged from the burning sulphur of each shelf is made to reach and pass over the shelf above by means of apertures made by shortening the shelves alternately at their rear and front extremities. With an experimental furnace Dr. Kinyoun states that "repeated experiments gave from 14 to 16 per cent. of SO_2 , temperature 21°C ., while burning sulphur in a closed place gave only 6 per cent. at 21°C ., *i.e.*, it would not support the combustion of sulphur above that percentage.¹

The furnace belonging to the fumigation vessel of the Louisiana Board of Health is of a special pattern. Dr. Salomon, secretary of the board, states that for each vessel 200 to 800 pounds of sulphur will be used, according to the size of the vessel, and the fumes will be allowed to remain in the hold, with hatches sealed, twenty-four to thirty-six hours, or longer.²

¹ See Abstracts of Sanitary Reports, Marine-Hospital Service, vol. iii, pages 347 and 348.

² See Transactions of the American Public Health Association, vol. xiii, for Dr. Holt's description of his system, and vol. xiv, page 113, for Dr. Salomon's reports and improvements thereon.

The amount of sulphur used at the New York Quarantine by the pot method (pots of burning sulphur lowered into the hold) is 50 to 100 pounds, according to the vessel's size).¹

At Pensacola about 12 pounds of sulphur are used to every 100 tons' register, and the fumigation lasts twelve hours.

At the Delaware Breakwater 4 pounds are used to each 1000 cubic feet of space, and the fumes are kept twenty-four hours in the vessel's hold. At Chandeleur, 35 pounds in hold to 100 tons.

STEAM DISINFECTING-CHAMBERS.

The principle of disinfection by steam was first advocated by Dr. A. N. Bell, of Brooklyn, but the contrivance about to be described was first used by Dr. Joseph Holt, and improved by Dr. Wilkinson and others. These chambers, two or three at one station, consist of jacketed, cylindrical shells, made of strong boiler-iron, each shell being 40 or 50 feet long and 7 or 8 feet in diameter, inside measurement, furnished with doors at each end.²

The jacketing is for the purpose of using the chambers with either dry heat or with superheated steam.

Articles of clothing, bedding, etc., are arranged on trucks, which are run into the chamber at one end and taken out at the other. A bacteriological test made by Dr. Kinyoun at the Louisiana Quarantine Station showed that all germs were killed after exposure to a dry heat of 79.4° C., obtained in sixteen minutes, steam then being turned on for twenty minutes.³

Another and simple contrivance for fumigating is the "Liquid Sulphurous Dioxide," the compressed gas furnished in metal reservoirs, which, being opened, the gas rapidly escapes. By this means any proportion of SO₂ can be introduced in a vessel without any apparatus. It is manufactured in Hagenau and in Oberhausen, Germany, and may be purchased in New

¹ See Report by Dr. John H. Rauch upon an Inspection of the Atlantic and Gulf Quarantines, State Printer, Springfield, Ill., 1886.

² See description under "Louisiana Quarantine."

³ For plans and specifications, see Annual Report Marine-Hospital Service for 1889, and Abstract of Sanitary Reports, vol. iv, page 443. For Dr. Kinyoun's experiments, see Abstract Sanitary Reports, vol. iii, pages 117 to 147.

York, and of Finlay & Brunswig, wholesale druggists, New Orleans, at a cost of five cents per pound when not less than one ton is taken. It has been suggested that this may take the place of the sulphur-furnace and appliances on the steamer. The cost by this method is thought to be but little, if at all, greater than by the furnace method, if the interest on the plant is added to the latter. This method has been occasionally used at the Grosse Isle Quarantine, in Canada, but to establish its complete practicability will require further test.

ADMINISTRATION OF MARITIME QUARANTINE.

The following are the rules and regulations of—

1. The National Quarantine Stations.
2. State Quarantine Service of Texas.
3. The Local Quarantine at Pensacola, Florida.

In these three types will be found all the ordinary administrative regulations, which are, however, subject to minor changes yearly.

1. REGULATIONS FOR THE NATIONAL QUARANTINE STATIONS.

(From the Regulations of the Marine-Hospital Service, 1889.)

328. At ports where quarantine may be established by special statute or by the Secretary of the Treasury, every vessel, before being permitted to enter, shall present to the Collector of Customs satisfactory evidence either that said vessel had not, at any time during a period of thirty days immediately preceding its arrival, touched at or communicated with any foreign port where cholera or yellow fever exists, or small-pox was known to exist in an epidemic form; that there had not been at any time during that period any case of contagious disease on board; and that said vessel does not convey any person or persons, merchandise, or animals affected with any infectious or contagious disease, or that the said vessel has been thoroughly cleaned and disinfected by the quarantine officer, and is free from infection at the time of entry. The certificate to that effect, of the medical officer of the Marine-Hospital Service, acting as quarantine officer for the United States at the port, shall be accepted by the Collector of Customs as satisfactory evidence, and the medical officer shall, before granting such certificate, satisfy himself that the matters and things therein stated are true.

329. Vessels coming from a foreign port or country where cholera

or yellow fever exists, or small-pox is known to have existed in an epidemic form within thirty days preceding their arrival, and vessels or vehicles conveying any person or persons, merchandise, or animals affected with any contagious disease, or having had on board at any time during the thirty days preceding their arrival any case of contagious disease, shall not enter any port of the United States until such disinfection or other precautionary measures shall have been performed as prescribed by these regulations, and the certificate of the medical officer of the Marine-Hospital Service, or other designated agent of the Treasury Department, shall, in such cases, as in the cases referred to in the preceding paragraph, be accepted by the Collector of Customs as satisfactory evidence of compliance with the regulations.

330. Quarantine stations will be governed by the general regulations of the Service, so far as applicable.

331. No pilot or other person will be allowed to leave a vessel until the vessel shall have been inspected by the quarantine officer, and any person violating this regulation shall be reported to the nearest United States attorney for prosecution under the act of August, 1888, and no person will be allowed to leave the quarantine reservation, or a vessel placed in quarantine, without permission of the quarantine officer.

332. Quarantine officers are hereby empowered and authorized to cause the temporary arrest of any person violating the quarantine regulations, and turn them over to the custody of the nearest United States marshal, and notify the United States attorney to that effect; or, if that be impracticable, to confine them on the quarantine reservation, subject to the orders of the said marshal or attorney.

333. When a vessel arrives at a United States quarantine boarding-station, the inspecting officer will examine the papers of the vessel to inform himself of her passengers and cargo; he will require all persons named on the passenger-list and crew-list to present themselves and answer to their names at muster. Should any person have died on the voyage, the circumstances of the death will be inquired into, and, in case of there being any person sick, such person will be carefully examined by the inspecting officer, the only exception being, in case of naval vessels, the statement of the senior surgeon or medical officer as to the sanitary condition of the vessel will be accepted.

334. When persons are found sick of cholera, small-pox, yellow fever, plague, or diphtheria, they shall be immediately removed to the quarantine hospital, and the vessel be thoroughly disinfected.

335. In order to stimulate ship-masters to aid in securing a clean ocean-going fleet, the following regulations concerning the treatment of foul ships will be observed at all national quarantine stations:—

When a vessel arrives at any national quarantine station from an infected port, and requires disinfection, she will be subjected to *ordinary disinfection*, as provided in former regulations.

When any vessel shall arrive at a national quarantine station in such foul condition as to render her dangerous from a sanitary point of view, and is found to require cleansing and disinfection, having at any former time within one year been subjected to ordinary disinfection, such vessel will be required to undergo *extraordinary disinfection*, which, in addition to the ordinary measures, will include holy-stoning, scraping, the taking out of rotten wood, a second disinfection, and interior repainting, all of which will be required before granting a certificate of free *pratique*.

336. The recognized method of disinfection of vessels will be, for all vessels: *a*, by bichloride of mercury; *b*, by sulphurous oxide; *c*, by flushing with sea-water.

337. For disinfection of clothing and other fomites, dry heat will be used whenever practicable, and when it is not practicable to use dry heat the sulphurous-oxide fumigation will be used.

338. The Supervising Surgeon-General will from time to time issue detailed instructions for the practice of disinfection, under these regulations, which instructions will include such improvements as may be suggested by the advance of science.

2. QUARANTINE REGULATIONS, STATE OF TEXAS.

General Rules.

No. 1. After the declaration of quarantine by the Governor, every vessel, before entering any port on the coast of Texas, shall be boarded by quarantine officers, and the crew and passengers be subjected to such questions by said officers as will be necessary to determine their probable connection with epidemic influence or infectious diseases.

No. 2. Vessels hailing from infected districts, or having communicated with others from such districts, by contact or otherwise, shall be placed in quarantine, casting anchor at such place or places as may be designated by quarantine officer of port, and a complete list of both crew and passengers taken. Notice in writing shall be given captains, holding them responsible for strict non-communication of both passengers and crew with other vessels or with any one from shore. Violation of this rule shall be punished by fine against vessel and captain, not less than \$500 or more than \$1000.

No. 3. From the masts of all vessels in quarantine shall be displayed a yellow flag, of such dimensions as to warn off others approaching.

No. 4. All vessels held in quarantine shall be under the direction of port quarantine officer, and put in thorough sanitary condition by fumigation of hold, washing decks with disinfecting fluids, and purifying bilges, etc.

No. 5. Costs of fumigation, disinfection, etc., shall be at expense of vessels.

No. 6. A complete muster of crew and passengers must again be taken before vessels are given free *pratique*, and a concise report made to State health officer. No vessel shall be finally released without permission of State health officer.

No. 7. Families of quarantine officers will not be allowed at stations without special permission from State health officer during the existence of quarantine.

Pilots.

Pilots will not be allowed to visit, or board, or communicate with any vessels without permission of port quarantine officer, under penalty of forfeit of their commissions as such.

Market Vessels.

Market vessels—meaning those which belong at the port, and which furnish daily supplies to vessels at anchor or in quarantine—shall, in every instance, apply to quarantine officer for permission before attempting to trade or communicate with such vessels; and in case of violation of this rule shall themselves be placed in quarantine and held at discretion of officer in charge.

Vessels with Cargo to be Disinfected.

Any vessels from infected districts which may desire to enter such cargo shall, upon arrival at outer bar, make known their intention to quarantine officer. Quarantine officers receiving this cargo at quarantine warehouse shall employ, as far as possible, only acclimatized men, and said employés shall be kept under quarantine themselves a sufficient number of days to determine their probable infection, their clothing and other articles capable of conveying infection be subjected to a high temperature, say 220° F. (105° C.), before being allowed to return to cities or shore. The crews of said vessels shall be subject to rules as above, and such other precautions as may be deemed requisite at the time by State health officer. Costs in this instance, as in others, are chargeable to owners of cargoes.

3. QUARANTINE REGULATIONS AT PENSACOLA, FLORIDA.

(Issued by the Escambia County Board of Health.)

1. The port inspector shall visit and inspect every vessel entering the bay of Pensacola, and ascertain and report her sanitary condition; and until such inspection and report, and the release of such vessel by said officer, no person shall visit her, and no person from her shall visit

any other vessel or the shore. The master or owner of each vessel so inspected shall pay to this Board for such services \$5.

2. No vessel coming into the port of Pensacola, having on board any contagious or infectious disease, or from a port where any such disease prevails, shall remain within the territory under the jurisdiction of this Board, except at a point designated and under restrictions imposed by this Board, according to the exigencies of each case.

3. It shall be the duty of any person coming into the county of Escambia or port of Pensacola, from any locality where any disease in an epidemic form prevails, to report at once to this Board or some officer thereof, and no person coming from any such locality shall remain in said county without the permit of this Board, and then only at such point as may be designated, and under such restrictions as may be imposed by this Board, according to the exigencies of each case.

4. No ballast brought into the bay of Pensacola by vessels shall be discharged in the county of Escambia, or the waters separating that county and the county of Santa Rosa, except at such point as may be designated in a permit obtained from this Board or granted on its authority; and in case this Board or its sanitary inspector or other officer, with approval of this Board, deem it expedient for the preservation of the public health to require fumigation, disinfection, or discharge of ballast at quarantine station, the same shall be done at the expense of the vessel, and in accordance with the system in use by this Board.

5. All pilots and tow-boats of the port of Pensacola shall be supplied with copies of these rules, and every pilot or tow-boat master speaking or boarding a vessel coming into said port shall hand a copy thereof to the master of said vessel.

6. In case any vessel shall be required, by authority of this Board in the exercise of its powers to preserve the public health, to discharge ballast at quarantine station or be fumigated, she shall pay 25 cents per ton for the ballast discharged, and for the fumigation shall pay as follows: Steam-ships, \$75; ships, \$50; barks and other vessels other than brigs and two-masted schooners, \$40; brigs, \$20; two-masted schooners, \$15.

7. No pilot, tow-boatman, or other person shall remove, transfer, or receive, or assist in removing, transferring, or receiving any person from any vessel entering the bay of Pensacola until such vessel shall have been inspected and released by the port inspector.

QUARANTINE PRACTICE.

The practical duties of administration, particularly the inspection and treatment of vessels, are well described by the

medical officers in command of the several stations named in the following letters:—

GULF QUARANTINE STATION, CHANDELEUR ISLAND, MISS.

(Letter from P. A. Surgeon H. R. CARTER, U. S. M.-H. S.)

I board the incoming vessel while under way and give her such a berth as in my judgment is suitable.

When she is at anchor I first examine her papers, bills of health, crew-list, and log; questioning the master at the same time on such points as may bear on the sanitary condition of his vessel; and, except in the case of Dr. Burgess's papers, given at Havana, far more valuable information will be given by, or may be extracted from, the master than is conveyed by the bills of health. The master is asked how long he lay at the port of clearance, especially *where* he discharged and *where* he lay; there being, for instance, as much difference in the liability to infection between different wharves in Havana, or between the Gamboa and the Coal Islands in Rio, as between different ports.

I especially ask for the cause of discharge of men left (generally in hospital) at the port of clearance, and mark the substitutes shipped there for special examination. These men having probably been ashore for some time and quite frequently just out of hospital, where they were left by other vessels, are occasionally the means of introducing yellow fever aboard a vessel healthy until they are shipped.

The statements of the master and even the log (except in British vessels) are naturally to be taken with some "personal correction" dependent on circumstances, and which has wide limits. In general, I think intentional false statements are extremely rare, but statements of damaging facts may not readily be volunteered.

The vessel is then inspected. I go all over it, into every place, noting especially the sleeping-places and bedding, water-closets, character of ballast, and condition of the hold and fore-castle, as regards cleanliness, ventilation, and dryness; whether the air streaks are open; if the ports have been open recently, or the wind-sails show signs of recent use. In the hold, aft and forward are most apt to be dirty. If the ballast has been recently trimmed and the crew is healthy it is a good sign; on the other hand, it may account for a sudden outbreak of fever after she puts to sea, in a ship previously healthy.

The bilge is examined by pumping, if in ballast; by lifting a timber-plank if not; and on the smell more stress is laid than on the color.

I inspect the ship before I do the crew, so that I may see the crew when they are not aware they are under observation. I then inspect the crew. All stand together, and as I call the roll each man answers,

comes to me, and passes to another place. Any I wish to examine more closely are told to step aside. These would in general be: Those who look sick, or as if they had been sick; those who by the log or master's statement had been sick; those who had shipped at port of clearance. They are examined as may be deemed necessary. In these cases little dependence can be placed on the accounts sailors give of their past ailments, and a kind of inverse malingering is universal. For instance, the cabin-boy of the "Maria," with yellow fever, was standing up, although holding by a chair, and reported himself as perfectly well and "could eat much," then staggered and had fallen had I not caught him in my arms, vomiting as he fell.

We have no cargoes, save occasionally a schooner with fustic, log-wood, or sisal.

The baggage is examined when unpacked for disinfection.

If the vessel is infected and has sick men aboard, I attend to the sick first, and remove them if possible. Right here I may say that in some stages of yellow fever removal is not possible with safety to the patient—it means death to him. In this event, he should be isolated on board ship, having already had the disease two or three days, and thereby having already exposed the vessel. As soon as possible, however, he should be removed.

A preliminary fumigation and disinfection is done immediately before doing anything else, in the hope of destroying the contagium at its source, and preventing the sickness of others of the crew. This is done as thoroughly as possible without removing ballast or much preliminary mechanical cleaning, but particular attention being given to the probable source of infection. The vessel is then treated in the routine manner, as follows:—

The bilge is first pumped out and washed until clean, after which the disinfectant is put in,—generally bichloride of mercury. At Chandelour we have practically no cargoes to deal with. The ballast therefore is next removed. All sand, earth, porous stone, or other foul ballast is removed—thrown overboard. The work is done by the ship's crew. Clean, sharp stone—as much as may be necessary to hold the vessel, *i.e.*, prevent her capsizing—may be allowed to remain, each stone having been immersed in a 1 to 800 solution of bichloride of mercury. This is done by the crew while trimming ballast,—a necessary procedure, irrespective of disinfection. The hold is washed down with sea-water by means of a force-pump, birch and whalebone brooms being also used, and, if necessary, scrapers. The same is done to the fore-castle and other parts, if necessary.

The vessel being mechanically clean in its accessible portions, the

disinfection is begun. All soiled or used clothing, and all bedding that can be so treated without destruction, is soaked for half an hour in bichloride solution. The remainder is hung up loosely for fumigation. Not unfrequently there are articles—cotton-stuff comforts, etc.—which cannot be disinfected, and are, therefore, destroyed. All articles not capable of conveying infection, as chronometers and articles made from the precious metals, are removed. The cabin, fore-castle, and hold are then fumigated. For close vessels the amount of sulphur used in the hold is 35 pounds per 100 tons. The cabin and fore-castle are kept closed twenty-four hours, the hold from forty-eight to seventy-two hours. In an ordinarily tight ship it is impossible to enter the hold, even after seventy-two hours, until the fumes have been displaced by air from wind-sail and open ports. When the doors are opened all surfaces are washed with a solution of bichloride, either with hose and brooms or with mops. Gilt-work, being utterly destroyed by this agent, is washed with water as near boiling as it can be used.

The quarantine detention of the vessel now begins. The proper time in quarantine is not less than the period of incubation. The number of days of passage from foreign ports counts for nothing, as does also the time on the quarantine grounds previous to completion of disinfection.

In estimating the probability of a vessel being infected, it makes quite a difference whether the yellow fever she has had in passage developed at such time that it could have been contracted elsewhere than on board ship, or so long after clearing as of necessity to have been communicated by the ship or fomites aboard her. In the latter case she was infected. This has a direct bearing on her treatment.

SOUTH ATLANTIC QUARANTINE STATION, BLACKBEARD ISLAND, GA.

(Description of Quarantine Methods, by Passed-Assistant-Surgeon J. H. WHITE, U.S.M.-H.S.)

On boarding a newly-arrived vessel, I *first* demand the crew-list and passenger-list (if any). I have the roll called, and, when all have answered, inspect each and every person, with a view to the discovery of any signs of present or recently-passed sickness, of any character.

The cabin, fore-castle, galley, and any other rooms are then inspected, and every chest and locker opened and contents seen.

The hold and between decks are next inspected. All sick are removed to hospital.

This constitutes the first step.

The *second* consists in putting into all these places a preliminary fumigation with sulphur of sufficient quantity, this process occupying about twenty-four hours.

Third.—All ballast is removed when possible, and when not so it is dipped stone by stone in bichloride solution of the strength of 1 to 300 or 1 to 500, and the whole vessel is washed as clean as water can make her,—hold, deck-houses, and all.

Fourth.—Another, and even stronger fumigation than the first, with sulphurous-acid gas.

Fifth.—With a force-pump and hose, a solution of bichloride (1 to 500, or stronger) is freely applied to every part of ship and contents. Clothing, both in use and not, is either burned, boiled, or soaked in a 1 to 500 solution of bichloride; sometimes both the latter measures. Soaking lasts ten to fifteen minutes. Clothing is boiled twenty minutes; bedding two to three hours. Bedding is most often burned, and always after small-pox.

DELAWARE BREAKWATER QUARANTINE STATION.

(Inspection and Treatment of Vessels, by WILLIAM P. ORR, A. A. Surgeon U. S. M.-H. S.)

The plan which I have followed in inspecting vessels at this station is as follows:—

I first go down into the cabin and examine the bill of health (and manifest, if the vessel has a general cargo). From these I learn the following important facts: The sanitary condition of the port of departure at the time of sailing; the date of departure; number of crew and passengers, and whether the vessel sails in quarantine or free *pratique*. I will say just here that the bills of health issued by Dr. Burgess, an Inspector of the Marine-Hospital Service, stationed at Havana, are the most complete and satisfactory bills of health that I examine, and we have vessels coming to the Breakwater from all over the world. He always gives the sanitary history and condition of the vessel, cargo, crew, and passengers, and the number of cases and number of deaths from contagious diseases during the week previous to the departure of the vessel.

If on arrival there is no sickness on the vessel, and there has been none during the passage, and there is no infectious or contagious disease at the port whence she sails, then the vessel is discharged from quarantine. If there is any contagious disease on board on arrival, the sick are brought ashore and cared for in hospital, and the vessel fumigated, disinfected, and detained for a variable period, usually ten days, in order to observe the crew and see whether any new cases are going to appear. If the crew are all well on arrival, but have had sickness (by sickness I mean yellow-fever, small-pox, or cholera) during the passage, the vessel receives the same treatment as above. In case the crew are all well, and there has been no sickness during the passage, but the vessel comes from

an infected port, then the treatment of the vessel depends upon the number of days' passage, the condition of the vessel, the statement of the captain (which is made under oath) as to whether the crew were allowed to visit the shore, and the length of time the vessel was in port discharging the cargo and reloading, and other considerations which enable us to decide whether any danger need be apprehended in allowing the vessel to enter. After careful inspection of a vessel from an infected port, if I find everything neat and clean, I usually allow her to proceed, provided she has had a passage of ten days or more; but if she has not been out for that length of time I detain the vessel, during the summer season, for observation until the ten days from date of departure have expired. At the end of this time, if no sickness appear, the vessel is discharged.

To clean an infected vessel, we begin the first day by fumigating,—that is, burn about 4 pounds of sulphur for every 1000 cubic feet of air-space, the hatchways, doors, and windows being closed and caulked, so as to make the hold, cabin, and fore-castle as nearly air-tight as possible. The sulphur-fumes are allowed to remain in the hold twenty-four hours, and in the cabin and fore-castle about ten hours; the second day all beds, pillows, and furniture which cannot be satisfactorily disinfected are burned, and all clothing, blankets, curtains, carpets, and cotton and woolen goods are soaked in a bichloride solution (1 to 2000). The third day the floors, walls, and ceilings of the cabin and fore-castle, and all furniture, drawers, and chests in them washed with the same solution. The vessel is now supposed to be clean, and is discharged at once, provided the average period of incubation for the disease from which the crew have suffered has elapsed since there was any one sick on board.

SPECIAL MEASURES AGAINST CHOLERA.

Other features of quarantine administration are well expressed in the following extract from the editorial pages of the *Philadelphia Medical News* of October 15, 1887, showing the measures necessary to extinguish an incipient epidemic of cholera and to prevent its spread. Such measures are as follow:—

(a) Speedy recognition and isolation of the sick; their proper treatment; absolute and rapid destruction of the infectious agent of the disease, not only in the dejecta and vomit, but also in clothing, bedding, and in or upon whatever else it finds a resting-place.

(b) The convalescents should remain isolated from the healthy so long as their stools possibly contain any of the infecting agent; before

mingling again with the well they should be immersed in a disinfecting bath, and afterward be clothed from the skin outward with perfectly clean vestments, which cannot possibly contain any of the infectious material.

(c) The dead should be well wrapped in cloth thoroughly saturated in a solution of corrosive sublimate (1 to 500), and, without delay, *cortège*, or lengthy ceremonial, buried near the place of death in a deep grave, remote as possible from water which may, under any circumstances, be used for drinking, washing, culinary or other domestic purposes. (Cremation, of course, is by far the safest way of disposing of cholera cadavers.)

(d) Those handling the sick or the dead should be careful to disinfect their hands and soiled clothing at once, and especially before touching articles of food, drinking, or culinary vessels.

(e) In the case of maritime quarantine, the well should be disembarked and placed under observation in quarters spacious enough to avoid crowding, and so well appointed and furnished that none will suffer real hardships.

(f) Once having reached the station, those under observation should be separated in groups of not more than twelve to twenty-four, and the various groups should, under no pretext, intermingle. The quarters for each group should afford stationary lavatories and water-closets in perfect working condition, adequate to the needs of the individuals constituting the group, and supplied with proper means of disinfection. There should be a bed raised above the floor, proper coverings, and a chair for each member of the group, each person being required to use only his own bed. There should be a common table of sufficient size to seat around it all the members of the group, who should be served their meals from a central kitchen, and with table furniture belonging to the station and cleaned by the common kitchen scullions.

(g) Drinking-water, free from possible contamination and of the best quality, should be distributed in the quarters of each group as it is needed, and in such a manner that it is received in drinking-cups only. There should be no water-buckets or other large vessels in which handkerchiefs, small vestments, children's diapers, etc., can be washed by the members of any group.

(h) Immediately after being separated into groups in their respective quarters, every person under observation should be obliged to strip and get into a bath (a disinfecting one is preferable), and afterward be clothed with fresh, clean vestments from the skin outward. Every article of clothing previously worn should be taken away and properly disinfected.

(i) Then all of the personal effects should be at once removed to a

separate building, washed (if possible), and thoroughly disinfected, or, if necessary, destroyed. After disinfection they should be temporarily returned to the members of groups, when occasion requires a further change of clothing.

(k) Under no circumstances whatever should washing of clothing by those under observation be permitted. All used clothing should be first thoroughly disinfected (by boiling, when possible), and then should be cleansed, the disinfection and washing being done by a sufficiently trained and absolutely reliable corps of employes supplied with adequate appliances.

(l) All those under observation should be mustered in their own quarters, and be subjected to a close medical inspection, *while on their feet*, at least twice every day, in order to discover and isolate, as soon as possible, new cases which may develop; and, of course, the clothing and bedding of these new cases should be treated without delay in the manner already mentioned. In the meantime, a watch should be set over the water-closets for the purpose of discovering cases of diarrhœa, and, when discovered, such cases should be temporarily separated from the rest. They should receive judicious medical attention at once, and precautions should be taken as if they were undoubted but mild cases of cholera.

(m) The quarters should be kept thoroughly clean, and every surface upon which infectious material could possibly be deposited, including the floors, should be washed with a strong disinfectant twice daily, and oftener when necessary. Evacuations from the bowels should be passed into a strong disinfectant; the hopper of the closet should be then flushed and finally drenched with a quantity of the same disinfectant.

(n) For the proper attention to the sick, there should be two or more competent and experienced physicians, assisted by a sufficient corps of intelligent and efficient nurses, with hours of duty so arranged that a physician, with a sufficient number of nurses, be in constant attendance in the wards of the hospital.

(o) For the prompt recognition and separation of new cases, their temporary medical attention, the proper treatment of discovered cases of diarrhœa or cholera and of other maladies, and the immediate correction of every insanitary practice or condition by constant, vigilant, and intelligent supervision, there should be at least two or more competent and experienced physicians, with hours of service so arranged that a physician is on duty night and day among those under observation; and he should have, subject to his orders at any and every moment, a sufficient and efficient corps of nurses and laborers to carry out properly and promptly his directions.

(*p*) In order to prevent the intermingling of the various groups, to enforce obedience and order, and to make it absolutely impossible for the quarantined and their personal effects to have any communication with the exterior, a well-organized and sufficiently large police corps should patrol the borders of the stations and the buildings day and night.

(*q*) Any group among whom there have developed no new cases of cholera or of choleraic diarrhoea, during the preceding eight or ten days, may be regarded as harmless, and allowed to leave quarantine after each one is finally immersed in a disinfecting bath and re-clothed with clean garments from the skin outward, the garments removed being destroyed or thoroughly disinfected and cleansed, as already indicated.

As yet no reference has been made to the crew, ship, and cargo. What has been said of the treatment of those under observation applies to every one of the ship's inhabitants. The observation, isolation, and cleansing of the crew and their effects could safely be performed aboard ship if necessary. The ship should be thoroughly cleansed and disinfected, particular attention being given to the quarters of the emigrants and crew.

AIDS TO QUARANTINE.

In aid of the national quarantines, sanitary inspectors are appointed by the Marine-Hospital Service at special points of danger, either in the United States or abroad. Through the State Department consular notification from foreign ports is received regularly by mail, or, in emergency, by cable, and the information thus received, and that received also from home ports, is communicated, by the Marine-Hospital Bureau, to all quarantine authorities and others, by means of a weekly publication known as the "Abstract of Sanitary Reports."

An important source of information concerning the movements of vessels in every portion of the world is the "Maritime Register," published in New York. The United States Collectors of Customs are efficient aids, having, by law, the power of search and detention of vessels, and having exceptional knowledge of the sanitary condition of the shipping at their respective ports. The Revenue-Cutter Service, a national coast patrol, renders efficient aid, and the light-house establishment and coast survey render valuable assistance in locating and buoying the anchorages.

Finally, the Marine-Hospital Service, having, besides the quarantines, the care of the sick of the merchant vessels of the United States, with 126 physicians stationed at all the larger and many of the smaller ports, is ready at a moment's notice to extend indefinitely its quarantine service. To the surgeon-general of this service, at Washington, are entrusted all national quarantine matters.

INLAND QUARANTINE.

Under Inland Quarantine will be mentioned The Sanitary Cordon, Camps of Probation, Railroad Quarantine, Disinfection Stations, and Inspection Service.

THE SANITARY CORDON.—This consists of a line of guards, military or civil, thrown around a district or locality, either to protect the same from the surrounding country when infected, or to protect the surrounding country from the infected district or locality. When a given locality is infected, and the adjacent territory is regarded as suspicious, it may be necessary to establish a double cordon, the first one embracing the whole suspected territory at its outer edge, the second investing more closely the well-defined infected locality. After the expiration of a sufficient time to prove that the area between the cordons is not infected, or has been cleared of infection, the first cordon may be removed. Hospitals and camps of probation may be necessary adjuncts to the cordon. The most noted example of the sanitary cordon is found in the history of the plague epidemic in Russia in 1878. A colony on the river Volga, called Wetljankaja, with a population of 1700 inhabitants, became infected with the Oriental plague, which extended to the neighboring villages. A military cordon was made to embrace all the infected district. The inhabitants of the focus of infection, Wetljankaja, were removed, property appraised for re-imbusement by the government, and the village burned. An additional cordon was thrown around Zarizin, a neighboring commercial city of importance and terminus of the Russian railway system. The cordons were maintained several months, and the plague was stamped out.

(See Abstract Sanitary Reports, vol. i [Bulletin's], page 78.) The sanitary cordon is the customary method of preventing the spread of epidemic disease in the eastern countries.

In the United States, when yellow fever prevailed in Pensacola in 1882, to the extent of 2200 cases, the navy-yard reservation, whose boundary-line is within two miles of the city limit, with a population of about 1500, was successfully guarded by means of a cordon and non-intercourse.

The following year, 1883, the navy-yard itself was infected, and a cordon was thrown around it to protect the city of Pensacola, and was maintained for a period of sixty days. This cordon was under the management of the Surgeon-General of the Marine-Hospital Service, aid having been requested of the national government. The Collector of Customs of Pensacola was made the agent to execute the orders of the Marine-Hospital Bureau, and to the president of the local Board of Health was entrusted the immediate command of the line and guards. The cordon entirely surrounded the land boundary of the naval reservation. Its line was four miles in length, one mile of it through a dense thicket, and was marked by blazed trees and flags. Forty men were employed as guards, an equal number being selected from each of the two political parties. Two captains were appointed, and were obliged to supervise the line night and day.

The sentinel posts were furnished with tents, and two guards were allotted to each post, taking alternate watches of four hours each. A detention or probation camp was established and placed in charge of a physician, where persons wishing to leave the reservation were obliged to pass a probationary period of twenty days. Not more than half a dozen persons were received in this camp. The government expended about \$20,000 in these restrictive measures, which were entirely successful. Not one person got through the cordon line. The success was due largely to the thorough discipline maintained by the Collector and the President of the Board of Health.

Yellow-Fever Cordon in Texas.—In 1882, yellow fever prevailing in Mexico along the Rio Grande, and in Brownsville, Texas, a sanitary cordon was established by the Surgeon-General of the Marine-Hospital Service, on request of the Governor of the State, extending along the line of the railroad from Corpus Christi, on the Gulf of Mexico, inland to Laredo, on the Rio Grande. This line was 180 miles northeast of Brownsville, the triangular territory thus hemmed in by the cordon on one side, the Rio Grande on another, and the Gulf on the third, being all suspected territory, although the fever prevailed in only one corner of it, viz., in Brownsville. All persons were detained at least ten days at the cordon before being allowed to pass northward,—a period of probation to insure that no one having the disease should carry it farther north. As soon as practicable another cordon was established much nearer to Brownsville, only 30 miles from it, the line extending from the mouth of the Sol Colorado, on the Gulf of Mexico, to Santa Maria, on the Rio Grande. After a time sufficient to prove that no more fever prevailed between the two cordons, the first one was removed. Within the second line, where the fever prevailed, chiefly in Brownsville, a hospital was established and dispensaries opened for the gratuitous treatment of all applicants.

Upon the Mexican side of the Rio Grande the fever continued to spread northwardly, and, in order to oppose it, still another cordon had to be established on the American side of the river, extending from Santa Maria on the south to Laredo on the north, a distance of 500 miles. Three hundred guards well mounted (Texan cow-boys) were employed in this cordon, and, while the disease was being stamped out in Brownsville, any further importation from Mexico was thus prevented. In Mexico the fever continued to spread until the authorities finally adopted measures similar to the above.

Much violent language has been used concerning the hardships imposed by the sanitary cordon, but in the presence of an epidemic the authorities who are responsible need to pay more

heed to the efficiency of the cordon than to individual complaints. It should be borne in mind that the sanitary cordon is not intended to bottle up all the people who are caught within an infected district. On the contrary, it is intended as a means of exit to those who will not carry with them contagious disease to the people beyond.

The cordon, then, imposes simply a period of detention corresponding to the incubative period of the prevailing disease. Ample preparation must be made for housing and feeding, in camps or other quarters, persons awaiting the expiration of the detention period; and hospitals must be provided for the treatment of those who develop sickness. Provision must also be made for the disinfection of suspected baggage.

CAMPS OF PROBATION.—Camps of probation or detention should be established with all the precision of arrangement and regard for site, water, and drainage that pertain to a military camp. Every effort should be made to make the camp as comfortable and cheerful as possible, and to this latter end amusements and entertainments such as might be suggested by the campers themselves should be encouraged. Every necessity in the matter of food, bedding, and the ordinary comforts of life should be anticipated to prevent any just cause of complaint. Such a natural division of the inhabitants should be made as seems desirable at the time, those of equal intelligence and refinement naturally seeking each other's company. The greatest concern is to prevent the camp itself from becoming infected. To this end no baggage should be allowed within the camp boundary without previous disinfection; and every refugee should be examined by a physician before being admitted to the camp. No one should be received who does not intend to proceed to an uninfected locality after his probation. In other words, a camp of probation should not be used as one of refuge.

The camp must be surrounded by guards to prevent egress or ingress, excepting through the established portal. At least

twice or three times in the twenty-four hours all refugees should be inspected in their quarters, and any case of sickness at once be isolated and watched until the diagnosis is certain. If the case is one of the prevailing disease, the patient must be removed immediately to the hospital, which should be at a safe distance, half a mile or more, from the camp. Before leaving the camp, each refugee's clothing should be fumigated, and he should be given a certificate that he has passed the required period of probation. A clear distinction must be made between camps of probation and camps of refuge. Camps of refuge are simply residence camps established to receive the population of an infected community when it has been determined to depopulate the infected district.

Depopulation of a house, a block, a district, or a whole city, if possible, the people moving into camps, is now recognized as a valuable means of controlling an epidemic; and there may be either camps of probation or simply camps of refuge, or both, according to the requirements of the situation. Camps of refuge, in connection with depopulation, were suggested by the late Surgeon-General Woodworth, in 1878, and the measure was practically carried out at Memphis, in 1879, by the establishment of Camp Mitchell. "But the establishment of a camp to which persons from infected points could go, be kept under observation a sufficient length of time to demonstrate they were not infected, have their baggage disinfected, and be given 'free pratique,' is apparently a new departure in inland quarantine."

Camp Perry, Fla.—Such was Camp Perry, Florida, described by the surgeon in charge, W. H. H. Hutton, in the Marine-Hospital Service Report for 1889. The site was admirably chosen by Passed-Assistant-Surgeon John Guitéras, upon a bluff on the south side of St. Mary's River, the dividing line between Florida and Georgia, about forty miles north of Jacksonville, Fla., which city was in the throes of a yellow-fever epidemic. The camp was opened August 20, 1888. It con-

sisted, in its completed stage, first, of 50 wooden cottages built elsewhere and transported on cars. Their dimensions were 12 feet by 10, and 10 feet in height, constructed of plain lumber, with cracks battened, and windows on each side with swinging shutters. Each held four cots, chairs, and toilet-stand, while unused clothing was neatly arranged on the rafters above. Besides the 50 cottages there were a quartermaster and guard-house, commissary building, dining-room, and kitchen, and laundry, built of rough lumber; 2 Ducker portable barracks, each 18 by 35 feet, provided with 12 beds each, and 350 tents, used principally by the single men, the employés and guards, and the colored refugees. The camp was laid out and its military discipline established under the temporary personal command of Surgeon-General Hamilton. So far as known this is the first camp of the kind ever established, at least in the United States. The cottages were arranged in a quadrangle around a parade-ground two acres in extent, and the tents were arranged in streets and alleys in the rear of the cottages. The accommodations were sufficient for 600 people, and extra tents were on hand so that if required 1000 persons could have been provided for, or 3000 per month, allowing for only ten days' detention of each person. Two hundred hospital-tents will accommodate 1200 people comfortably, according to Surgeon Hutton, who states that the small A-tents are unsuited for women and children, but will answer for men or boys. Wire-mattress cots should be provided. The marine-hospital officer at Savannah, Ga., was the purchasing agent for the camp, and promptly forwarded all subsistence supplies on requisition by mail or telegraph.

Discipline of the Camp.—On arrival of a train, each passenger was personally examined by a physician, his health-certificate scrutinized, and he was made to await the examination of others. Hand-bags, clothing, and loose wearing-apparel were left in the baggage-car for disinfection. The refugees were then marched to the quartermaster's room for registration and

assignment to quarters. On first arrival they were placed in the southern part of the camp, and in two days, there being no sickness, were moved forward several cabins, and this progression was repeated until the time for discharge.

Twelve guards were employed, under the command of a captain, and were divided into squads of four each. The schedule was so arranged that each guard was on duty two hours and off duty four.

A bugler announced the several calls as follows:—

| | | | | | |
|------------|---|---|---|---|--------------------------------|
| 5.30 A.M., | . | . | . | . | Reveille. |
| 6.00 A.M., | . | . | . | . | Breakfast, employés. |
| 7.00 A.M., | . | . | . | . | Breakfast, guests. |
| 9.00 A.M., | . | . | . | . | Surgeon's call and inspection. |
| 12.00 M., | . | . | . | . | Dinner, employés. |
| 1.20 P.M., | . | . | . | . | Dinner, guests. |
| 4.30 P.M., | . | . | . | . | Surgeon's call and inspection. |
| 5.30 P.M., | . | . | . | . | Supper, guests. |
| 6.00 P.M., | . | . | . | . | Supper, employés. |
| 6.30 P.M., | . | . | . | . | Retreat and change of guard. |
| 9.00 P.M., | . | . | . | . | Retiring taps. |

The yellow-fever hospital-camp, under the special charge of Dr. Faget, was located one-half mile from the probation camp. It consisted of 2 frame buildings, 2 hospital and 12 smaller tents, arranged in a double-crescent shape, the avenue in the middle presenting an attractive appearance.

Of the 12 small tents, 4 were for nurses, 3 for employés, 2 for convalescents, and 1 each for drug-store, storage- and dead-house. One of the hospital-tents was used as a dining-room for employés, convalescents, and parents of the sick.

The hospital was established September 3, 1888, and between that date and November 24th 35 cases of yellow fever were admitted and treated, 3 died, and 32 were discharged. Twelve hundred and eleven refugees were received into Camp Perry, nearly all of whom were from the infected district of Jacksonville.

Thirty-five cases of yellow fever were caught by the ten

days' detention, but no case of fever was contracted at the camp, and of the 1208 refugees who passed the required detention and proceeded to different parts of the country, so far as known, not one subsequently developed or carried the disease elsewhere. The general plan of the preventive measures adopted during this epidemic will be described under Railroad Quarantine.

RAILROAD QUARANTINE, INSPECTION SERVICE, AND DISINFECTION STATIONS.—Railroad quarantine, disinfection stations, and inspection service may be described by a brief account of the actual measures of this nature, made use of during the yellow-fever epidemic in Florida in 1888, of which Camp Perry, just described, was an important adjunct. (For details, see annual reports marine-hospital service, 1888 and 1889.)

The Governor of Florida made application to the national authorities, July 16th, for aid, and it was determined to prevent further spread of the disease by disinfecting all baggage from infected localities before permitting its transportation into other States, and by enforcing upon all persons from infected localities seeking to leave the State a probationary detention of ten days.

Accordingly, disinfection-stations were established at two points, through which all persons leaving Florida by rail were obliged to pass. One of these was at Live Oak, in Northwestern Florida; the other at Way Cross, Georgia, near the boundary-line of Northeastern Florida. The only other means of egress from the State was from the sea-ports; but healthy sea-ports maintained a vigorous quarantine against people from the infected districts, and infected sea-ports were not visited by the steam-ship lines, because their vessels would thereby be made liable to quarantine detention at other ports. The fumigation of baggage at Live Oak and Way Cross was accomplished by means of box-cars specially prepared, and subsequently in warehouses, the agent being sulphur dioxide.

Regarding persons, the inspectors, properly uniformed and wearing official shields, boarded the trains when the latter arrived at the inspection-stations, and demanded of each passenger a

certificate, showing where he had been during the previous ten days, which certificate was considered valid only when it bore the seal or signature of some officer of health, or recognized municipal authority. The inspectors themselves were kept informed regarding all infected or suspected localities, and a person coming from such locality was either made to return to it, or given the option of going to the camp of probation, there to spend the ten days' period of probation before being allowed to enter other States.

This was Camp Perry, previously described, located 38 miles south of the Way Cross Station, and 40 miles north of Jacksonville, where the epidemic prevailed chiefly. All egress from Jacksonville was, perforce, through Camp Perry and its ten days' probation.

This camp was a means of protecting not only other States, but the uninfected portions of Florida itself, more particularly Southern Florida, whose health authorities refused to admit within their limits the refugees from the infected districts unless they had passed the period of probation at Camp Perry. To assist in this protection to Southern Florida, no person was allowed to board a south-bound train between Way Cross, on the north, and Orange Park, a station 20 miles south of Jacksonville.

Moreover, through south-bound trains were boarded at Way Cross, and all passengers compelled to furnish evidence of coming from healthful localities. The evidence consisted of certificates from local authorities, baggage-checks, or railroad-tickets showing they were purchased in the North, and in some instances letters showing by the superscription and stamps where the person had been.

No train, excepting the special government train, was allowed to stop at Camp Perry. A government train also carried those who had passed the period of probation from Camp Perry to a point $3\frac{1}{2}$ miles distant, Folkstone, where they were transferred to a regular train running as far north as Way Cross,

Ga., where another transfer had to be made to a regular north-bound train. No Florida passenger-car was allowed to go north, and more than 1000 baggage and freight cars were disinfected by government officers before being allowed to leave the State.

The methods of railroad quarantine may also be studied in a review of the action taken to prevent the introduction of small-pox into the United States from Canada, where it prevailed extensively in the fall and winter of 1885, and January and February, 1886.

The following regulations were issued by the Surgeon-General of the Marine-Hospital Service, October, 10, 1885:—

The act approved April 29, 1878, entitled, "An act to prevent the introduction of contagious or infectious diseases into the United States," provides that no vessel or vehicle coming from any foreign port or country where any contagious or infectious disease exists, or any vessel or vehicle conveying persons, merchandise, or animals affected with any contagious disease, shall enter any port of the United States, or pass the boundary-line between the United States and any foreign country, except in such manner as may be prescribed under said act.

Attention is now directed to the prevalence of the contagious and infectious disease of small-pox in Montreal and other places in the Dominion of Canada, and the law referred to is held to apply alike to trains of cars and other vehicles crossing the border, and to vessels entering ports on the northern frontier.

Because, therefore, of the danger which attaches to the transportation of persons and baggage, and articles of merchandise, or animals, from the infected districts, the following regulations are framed, under the direction of the Secretary of the Treasury, and subject to the approval of the President, for the protection of the health of the people of the United States against the danger referred to:—

1. Until further orders all vessels arriving from ports in Canada, and trains of cars and other vehicles crossing the border-line, must be examined by a medical inspector of the Marine-Hospital Service before they will be allowed to enter the United States, unless provision shall have been made by State or municipal quarantine laws and regulations for such examination.

2. All persons arriving from Canada, by rail or otherwise, must be examined by such medical inspector before they will be allowed to enter the United States, unless provision has been made for such examination.

3. All persons coming from infected districts, not giving satisfactory evidence of protection against small-pox, will be prohibited from proceeding into the United States until after such period as the medical inspector, the local quarantine, or other sanitary officer duly authorized, may direct.

4. The inspectors will vaccinate all unprotected persons who desire, or are willing to submit to, vaccination free of charge. Any such person refusing to be vaccinated shall be prevented from entering the United States.

5. All baggage, clothing, and other effects, and articles of merchandise, coming from infected districts, and liable to carry infection, or suspected of being infected, will be subjected to thorough disinfection.

6. All persons showing evidence of having had small-pox or varioloid, or who exhibit a well-defined mark of recent vaccination, may be considered protected, but the wearing-apparel and baggage of such protected persons who may come from infected districts, or have been exposed to infection, will be subjected to thorough disinfection as above provided.

7. Customs officers and United States medical inspectors will consult and act in conjunction with authorized State and local health authorities so far as may be practicable, and unnecessary detention of trains or other vehicles, persons, animals, baggage, or merchandise, will be avoided so far as may be consistent with the prevention of the introduction of diseases dangerous to the public health into the United States.

8. Inspectors will make full, weekly reports of services performed under this regulation.

9. As provided in Section 5 of said act, all quarantine officers or agents acting under any State or municipal system, upon the application of the respective State or municipal authorities, are empowered to enforce the provisions of these regulations, and are hereby authorized to prevent the entrance into the United States of any vessel or vehicle, person, merchandise, or animals prohibited under the act aforesaid.

10. In the enforcement of these regulations there shall be no interference with any quarantine laws or regulations existing under or to be provided for by any State or municipal authority.

The following are the special instructions for the guidance of sanitary inspectors, issued by Surgeon H. W. Austin, in charge of the inspection service on the Canadian frontier from Buffalo, N. Y., to the Atlantic coast during the epidemic above referred to (See Marine-Hospital Report, 1886):—

REGULATIONS FOR SANITARY INSPECTORS.

The following instructions will be observed by the sanitary inspector on the following-mentioned railroads crossing the United States boundary-line, viz., the Grand Trunk Railway, at Rouse's Point, N. Y., and Island Pond, Vt.; the Passumpsic Railroad, at Newport, Vt.; the Central Vermont Railroad, at Highgate Springs or Saint Albans; the Canada Atlantic, at Rouse's Point, N. Y.; and the Southeastern Railway, at Richford, Vt. :—

All persons bound for the United States coming from Montreal, or other places in Canada where small-pox prevails, must produce satisfactory evidence to the inspector that they are protected by a recent vaccination, or submit to this operation before they are allowed to cross the boundary-line.

Inspectors will vaccinate all unprotected persons free of charge.

Persons coming from Montreal, or suburban villages, will be carefully questioned as to their residence, whether small-pox has occurred in their families, or whether they have been in contact with the disease.

Inquiries should also be made relative to their baggage, whether it consists of bedding, household goods, etc., likely to be infected; and if any person or article of baggage is considered by the inspector infected or likely to introduce the disease into the country, he or it should not be permitted to cross the line into the United States.

You may consider persons protected who may show evidence of having had the small-pox or varioloid, or who exhibit a well-defined mark of vaccination. Accept as evidence of protection a certificate from any physician in good standing that the person presenting the same has been successfully vaccinated. Should you doubt the validity or authenticity of the certificate, you may refuse any such person presenting the same the privilege of crossing the border unless he submits to vaccination. Baggage known to have come from any infected district, and believed to be infected, will be thoroughly fumigated with sulphur at Rouse's Point, Saint Albans, Richford, Newport, and Island Pond.

Weekly reports should be made to Surgeon H. W. Austin, United States Marine-Hospital Service, Burlington, Vt., of the number of trains inspected, number of persons examined, number of persons vaccinated, number of pieces of baggage fumigated, and any other information relative to services performed by the inspector.

It will be observed that all the railroads, five in number, over which passengers or freight might be brought direct from Canada into the New England States were guarded.

Besides the line commanded by Surgeon Austin (Atlantic coast to Buffalo), another line was under the direction of Passed-Assistant-Surgeon Wheeler, at points east of Buffalo, and still another on the Michigan frontier, under command of Surgeon W. H. Long. These lines were established at the request and with the co-operation of the authorities of the respective States. Thirty-six inspectors were employed at 37 stations, who examined 49,631 persons on railroad-trains, vaccinated 16,547, and detained or sent back 603. The contents of more than 7000 pieces of baggage were disinfected. The measures taken were successful.

The following are the rules for railroad quarantine adopted by the Quarantine Conference held in Montgomery, Ala., March 5th to 7th, 1889:—

1. Quarantine should not be made against any place until it is officially known that yellow fever or other infectious or contagious disease exists at such place.

2. Only competent physicians should be put in charge of quarantine stations, and only thoroughly-qualified persons should be employed as inspectors on railway-trains.

3. Quarantine stations located on railroads should be established at convenient points, on one or both sides of a town or station, as may be deemed necessary.

4. If an epidemic of yellow fever or other infectious or contagious disease exist at a town or station, trains carrying passengers or freights should be required to pass through the limits of such towns or stations at a speed of not less than ten miles per hour, without stopping at such towns or stations, but should stop at the quarantine station.

5. Passengers to or from such infected point should only be received or delivered at the quarantine station, under the supervision of the quarantine officer in charge of the station.

6. Railway-tickets may be sold to persons leaving an infected place to any point willing to receive them.

7. All baggage from any infected point should be properly disinfected.

8. As far as practicable, the same rules proposed for railroads should be applied to vessels of every kind, stage-coaches, or other means of travel.

9 The passage of railroad-trains through any point on the line of road, whether infected or not, should not be prohibited by any quarantine regulations. The conductors of passenger-trains should close the windows and ventilators and lock the doors of cars passing through any place where a train is not permitted to stop.

10. All freight to any infected place should be delivered either at the quarantine station or the nearest railway-station to such infected point where it can be properly cared for.

11. All mail-matter from any infected place should be properly disinfected by the United States Government; and mail-matter intended for infected points should be put off the trains at the quarantine stations. The United States Government should instruct postmasters to receive and deliver mails at such quarantine stations.

12. Railroads and express companies may receive for transportation from any infected place, during the time such infection exists, any merchandise or traffic consigned to places willing to receive it.

13. State authorities should employ competent persons on passenger-trains as inspectors of passengers, baggage, and express matter, as additional precaution; but the fact of inspectors being on such trains should not relieve trains carrying passengers or express matter or baggage from stopping at quarantine stations for such inspection as the officer in charge may determine to be necessary.

14. It is recommended that all quarantines, as far as practicable, should be uniform in their requirements and operations, which will greatly contribute to the prevention of panics, and tend to allay unnecessary excitement and fear on the part of the people.

15. The form of health certificate adopted by the Quarantine Convention, held at Montgomery, March 5, 1889, should be prepared for health officers to issue to such persons as may be found entitled to receive the same. A copy of this certificate should be printed with these rules, and conspicuously posted at railway-stations.

16. It is the desire and intention of health authorities, as far as practicable, to throw every safeguard around the public health of all localities. Municipal, county, and State authorities are expected to co-operate in every possible way with health officers located in towns, villages, and cities, and in charge of quarantine stations, to enable them to prevent the introduction or spread of yellow fever or other infectious or contagious diseases.

It was also resolved by this conference that the best form of disinfectant for personal baggage is moist heat.

CORRELATION OF MUNICIPAL, STATE, AND NATIONAL QUARANTINE LAWS.

As shown in the foregoing pages, quarantines are administered under three forms of government,—local, State, and national. A vessel arriving at a given port may be refused permission to discharge cargo by authority of either a national statute, a State law, or a city ordinance. At Brooklyn, for example, if the United States officers should consent to a vessel's entry and discharge, restraint could still be imposed by the State officers; and if the latter also should consent, the city authorities could still prevent. In some instances, as at Philadelphia and New Orleans, municipal officers are included in the State quarantine boards, and harmony of action between city and State is thus assured. But, unfortunately, there are still a few States which exercise either little or no supervision of quarantines, so that a county or village quarantine may be purely a local affair conducted without regard to neighboring counties or villages or to the rest of the State. It is this form of quarantine which, in times of epidemic and panic, has for so many years wrought untold misery, which has given rise to the shot-gun quarantines, checked all the currents of trade and social intercourse, arrayed county against county, village against village, and turned the hand of neighbor against neighbor in a ferocious struggle to ward off the pestilence.

Instances of this form of quarantine were numerous in the Southern States during the yellow-fever epidemic of 1878, when the policy of non-intercourse between communities was so rigidly enforced that many were cut off from subsistence supplies, and there was danger of starvation.

Much has been written upon the folly of the shot-gun quarantines, yet communities employing this method have, under their peculiar circumstances, acted wisely, and the results, as compared with those of similar communities neglecting this method, have demonstrated its merit. The blame for all the hardships and suffering entailed is to be laid upon those whose

business it is to make the laws of the State. In the States indicated there were no State boards of health, or they were clothed with but little authority, or, being formed in conjunction with the board of some principal sea-board city, gave little attention to inland districts.

The most recent illustration of the difficulties made by local quarantines, without State supervision, was in Florida during the yellow-fever epidemic of 1888, when the whole State, there being no central sanitary authority, was in confusion through the enactments of village, county, and city boards of health, all acting independently, with no common plan or guidance. When finally, by request of the Governor, the United States authorities assumed control, the petty enactments of these small local boards, and their adherence to their rights, gave great trouble to the government officers, some of whom experienced great delay and personal hardships in getting through the local lines to the points of danger and activity to which they had been ordered. This epidemic demonstrated clearly the need of a State board of health, which the Legislature has since established. State boards of health do not do away with local boards, but make them work in harmony on broad plans laid down in the interest of all.

But there are States which yet have no boards of health, where, in case of epidemic, the old confusion might arise were it not for a new exercise of power on the part of the national government, made possible by the Act of Congress, approved March 28, 1890, known as the Interstate Quarantine Act, to which further reference will be made.

Having shown the necessity of State supervision over village and county quarantines, it is now pertinent to consider the relation of the States to one another. Theoretically, in maritime quarantine, there is opportunity for clashing. One State might be very rigid in its exactions, while a neighboring State, owing to financial stringency, indifference, or a desire to divert the commerce of the first to its own ports, might be very

lax. On this account, and to secure uniformity of procedure, it has been urged that all maritime quarantines should be given over to the national government. It is not intended to enter into this subject exhaustively, but it may be remarked that practically there is little clashing between the State maritime quarantines; and that, while the national government could readily and effectively conduct all the more important quarantines upon the coast, to establish or maintain the very numerous smaller ones would be an excess of responsibility and labor. Moreover, it would seem that the people of each section are best qualified to judge of measures of protection required by their own peculiar surroundings; and if they were not it might still be a questionable public policy to relieve the State governments of this sanitary responsibility, and encourage thus a weak leaning upon the national government. But another view of the matter is had from the stand-point of the interior States. The interior States are as much interested in the efficiency of quarantine at New York or New Orleans as are the cities named, for fomites failing of proper disinfection at these points are rapidly carried to innumerable localities in the interior. Thus, in a measure, the people of the whole interior are dependent upon these quarantines, that is to say, upon the legislative liberality of the States in question, and the efficiency of their executive officers.

Should, however, there be a persistently lax maritime quarantine on the part of a State, the interior States could maintain inland quarantine against the offending one, and by thus restricting its commerce compel a greater efficiency. Should an epidemic disease obtain lodgment in a State the others may, and frequently do, quarantine against it. In the Southern States particularly the interruption to interstate commerce has been frequent by reason of quarantines. The effect of this has been beneficial in that it has stimulated the health authorities in their efforts to exclude epidemic disease. But if there is danger of the spread of cholera, yellow fever, small-

pox, or plague from one State to another, the national authorities, by virtue of the interstate quarantine act, may adopt the necessary preventive measures.

The relation which the national government has always borne toward the States in the matter of quarantine is that of a powerful ally, in the absence of local quarantine assuming jurisdiction, giving aid, when requested, to weak quarantines, and establishing quarantines at points, as the Delaware Breakwater and Cape Charles, where one establishment serves for the protection of several States. All national quarantines have been located by the request or ready assent of the States in proximity.

While it has been urged that quarantine is a function of the general government by reason of the constitutional right of Congress to regulate commerce, the other theory has prevailed, viz., that it is a police power appertaining to the State. The first quarantine laws were enacted by the States or colonies, by Massachusetts, for example, as early as 1648.

A resolution looking to the national control of quarantine was offered in the Fourth Congress, April 28, 1796, as follows: "*Resolved*, That the President of the United States be authorized to direct such quarantines to be performed on all vessels from foreign countries arriving at the ports of the United States as he shall judge necessary." This resolution failed to pass, but one was adopted authorizing the President "to direct the revenue officers and the officers commanding ports and revenue-cutters to *aid* in the execution of quarantine laws, and also in the execution of the health laws of the States respectively, in such manner as may to him appear necessary." From that time until the passage of the interstate quarantine act of 1890, there was no national quarantine legislation that was not distinctively and only in aid of State laws.

With regard to quarantine fees, however, without which many State and local quarantines could not be maintained, it is noticeable that Congress, while not forbidding their exaction, declares, in Section 4792 of the Revised Statutes, that "nothing in

this Title shall enable any State to collect a duty of tonnage or impost without the consent of Congress." The inference is that Congress, in its constitutional power to regulate commerce, is unwilling to formally surrender this right.

The right of the State to impose fees has been affirmed, however, by the Supreme Court of the United States.

Before extending quarantine aid to a State it is the custom of the government to obtain a formal request from the Governor or State sanitary authorities. The agent of the government is the Surgeon-General of the Marine-Hospital Service, who assumes then the direction of expenditures and measures. When necessary the employés, sanitary guards, etc., of the Marine-Hospital Service are given a proper legal footing by being sworn in as State or local officers, deputy sheriffs, etc., and likewise under the law State officers may be endowed with the authority of United States sanitary officers. In this manner the national and State authorities work together harmoniously. Following are the United States quarantine laws in full:—

UNITED STATES QUARANTINE LAWS AND REGULATIONS.

SECTION 4792, REVISED STATUTES OF THE UNITED STATES.

The quarantines and other restraints established by the health laws of any State, respecting any vessels arriving in, or bound to, any port or district thereof, shall be duly observed by the officers of the customs revenue of the United States, by the masters and crews of the several revenue-cutters, and by the military officers commanding in any fort or station upon the sea-coast; and all such officers of the United States shall faithfully aid in the execution of such quarantines and health laws, according to their respective powers and within their respective precincts, and as they shall be directed, from time to time, by the Secretary of the Treasury. But nothing in this Title shall enable any State to collect a duty of tonnage or impost without the consent of Congress.

NATIONAL QUARANTINE ACT.

AN ACT to prevent the introduction of contagious or infectious diseases into the United States.

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That no vessel or vehicle coming from any foreign port or country where any contagious

or infectious disease may exist, and no vessel or vehicle conveying any person or persons, merchandise, or animals infected with any infectious or contagious disease, shall enter any port of the United States, or pass the boundary-line between the United States and any foreign country, contrary to the quarantine laws of any one of said United States, into or through the jurisdiction of which said vessel or vehicle may pass, or to which it is destined, or except in the manner and subject to the regulations to be prescribed, as hereinafter provided.

SEC. 2. That whenever any infectious or contagious disease shall appear in any foreign port or country, and whenever any vessel shall leave any infected foreign port, or, having on board goods or passengers coming from any place or district infected with cholera or yellow fever, shall leave any foreign port, bound for any port in the United States, the consular officer, or other representative of the United States at or nearest such foreign port shall immediately give information thereof to the Supervising Surgeon-General of the Marine-Hospital Service, and shall report to him the name, the date of departure, and the port of destination of such vessel; and shall also make the same report to the health officer of the port of destination in the United States, and the consular officers of the United States shall make weekly reports to him of the sanitary condition of the ports at which they are respectively stationed; and the said Surgeon-General of the Marine-Hospital Service shall, under the direction of the Secretary of the Treasury, be charged with the execution of the provisions of this act, and shall frame all needful rules and regulations for that purpose, which rules and regulations shall be subject to the approval of the President, but such rules and regulations shall not conflict with or impair any sanitary or quarantine laws or regulations of any State or municipal authorities now existing, or which may hereafter be enacted.

SEC. 3. That it shall be the duty of the medical officers of the Marine-Hospital Service and of customs officers to aid in the enforcement of the national quarantine rules and regulations established under the preceding section; but no additional compensation shall be allowed said officers by reason of such services as they may be required to perform under this act, except actual and necessary traveling expenses.

SEC. 4. That the Surgeon-General of the Marine-Hospital Service shall, upon receipt of information of the departure of any vessel, goods, or passengers from infected places to any port in the United States, immediately notify the proper State or municipal and United States officer or officers at the threatened port of destination of the vessel, and shall prepare and transmit to the medical officers of the Marine-Hospital Service, to collectors of customs, and to the State and municipal health

authorities of the United States weekly abstracts of the consular sanitary reports and other pertinent information received by him.

SEC. 5. That whenever, at any port of the United States, any State or municipal quarantine system may now or may hereafter exist, the officers or agents of such system shall, upon the application of the respective State or municipal authorities, be authorized and empowered to act as officers or agents of the national quarantine system, and shall be clothed with all the powers of United States officers for quarantine purposes, but shall receive no pay or emolument from the United States. At all other ports where, in the opinion of the Secretary of the Treasury, it shall be deemed necessary to establish quarantine, the medical officers or other agents of the Marine-Hospital Service shall perform such duties in the enforcement of the quarantine rules and regulations as may be assigned them by the Surgeon-General of that Service under this act: *Provided*, That there shall be no interference in any manner with any quarantine laws or regulations as they now exist, or may hereafter be adopted under State laws.

SEC. 6. That all acts or parts of acts inconsistent with this act be, and the same are hereby, repealed.

Approved April 29, 1878.

[Extract from Quarantine Act of August 1, 1888.]

AN ACT to perfect the quarantine service of the United States.

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That whenever any person shall trespass upon the grounds belonging to any quarantine reservation, or whenever any person, master, pilot, or owner of a vessel entering any port of the United States, shall so enter in violation of Section 1 of the act entitled, "An act to prevent the introduction of contagious or infectious diseases into the United States," approved April twenty-ninth, eighteen hundred and seventy-eight, or in violation of the quarantine regulations framed under said act, such person, trespassing, or such master, pilot, or other person in command of a vessel shall, upon conviction thereof, pay a fine of not more than three hundred dollars, or be sentenced to imprisonment for a period of not more than thirty days, or shall be punished by both fine and imprisonment, at the discretion of the court. And it shall be the duty of the United States attorney in the district where the misdemeanor shall have been committed to take immediate cognizance of the offense, upon report made to him by any medical officer of the Marine-Hospital Service, or by any officer of the Customs Service, or by any State officer acting under authority of Section 5 of said act.

SEC. 2. That as soon after the passage of this act as practicable, the Secretary of the Treasury shall cause to be established, in addition to the quarantine established by the act approved March fifth, eighteen hundred and eighty-eight, quarantine stations, as follows: One at the mouth of the Delaware Bay; one near Cape Charles, at the entrance of the Chesapeake Bay; one on the Georgia coast; one at or near Key West; one in San Diego Harbor; one in San Francisco Harbor; and one at or near Port Townsend, at the entrance to Puget Sound; and the said quarantine stations when so established shall be conducted by the Marine-Hospital Service under regulations framed in accordance with the act of April twenty-ninth, eighteen hundred and seventy-eight.

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Approved August 1, 1888.

AN ACT to prevent the introduction of contagious diseases from one State to another and for the punishment of certain offenses.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever it shall be made to appear to the satisfaction of the President that cholera, yellow fever, small-pox, or plague exists in any State or Territory, or in the District of Columbia, and that there is danger of the spread of such disease into other States, Territories, or the District of Columbia, he is hereby authorized to cause the Secretary of the Treasury to promulgate such rules and regulations as in his judgment may be necessary to prevent the spread of such disease from one State or Territory into another, or from any State or Territory into the District of Columbia, or from the District of Columbia into any State or Territory, and to employ such inspectors and other persons as may be necessary to execute such regulations to prevent the spread of such disease. The said rules and regulations shall be prepared by the Supervising Surgeon-General of the Marine-Hospital Service, under the direction of the Secretary of the Treasury. And any person who shall willfully violate any rule or regulation so made and promulgated shall be deemed guilty of a misdemeanor, and upon conviction shall be punished by a fine of not more than five hundred dollars, or imprisonment for not more than two years, or both, in the discretion of the court.

SEC. 2. That any officer, or person acting as an officer, or agent of the United States at any quarantine station, or other person employed to aid in preventing the spread of such disease, who shall willfully violate any of the quarantine laws of the United States, or any of the rules and regulations made and promulgated by the Secretary of the Treasury as provided for in Section 1 of this act, or any lawful order of his superior

officer or officers, shall be deemed guilty of a misdemeanor, and upon conviction shall be punished by a fine of not more than three hundred dollars, or imprisonment for not more than one year, or both, in the discretion of the court.

SEC. 3. That when any common carrier or officer, agent, or employé of any common carrier shall willfully violate any of the quarantine laws of the United States, or the rules and regulations made and promulgated as provided for in Section 1 of this act, such common carrier, officer, agent, or employé shall be deemed guilty of a misdemeanor, and shall, upon conviction, be punished by a fine of not more than five hundred dollars, or imprisonment for not more than two years, or both, in the discretion of the court.

Approved March 28, 1890.

