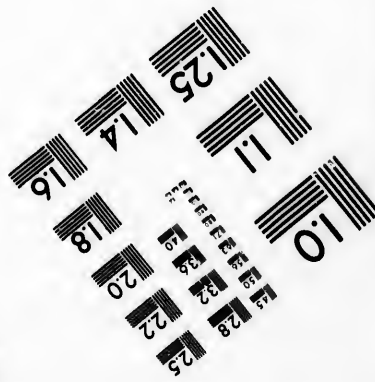
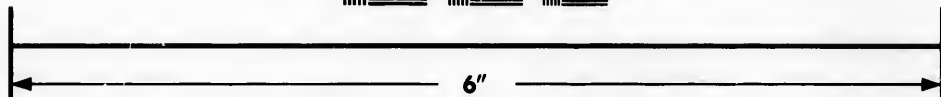
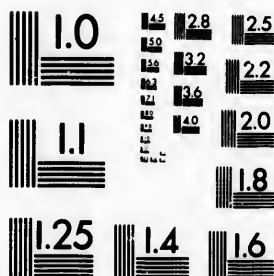


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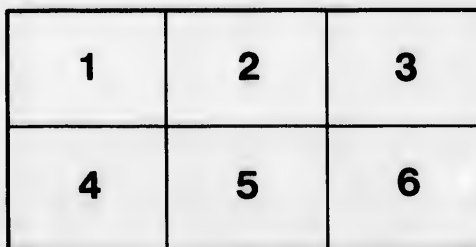
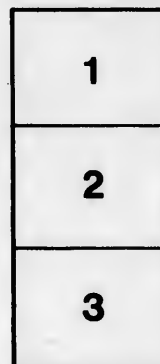
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COAST DEFENSES AGAINST ASIATIC CHOLERA.

REPORT OF AN INSPECTION

OF THE

ATLANTIC AND GULF QUARANTINES

BETWEEN THE

ST. LAWRENCE AND RIO GRANDE.

JOHN H. RAUCH, M. D.,
SECRETARY ILLINOIS STATE BOARD OF HEALTH.

SPRINGFIELD, ILL.:
H. W. ROKKER, STATE PRINTER AND BINDER.
1886.

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COAST DEFENSES AGAINST ASIATIC CHOLERA.

REPORT OF AN INSPECTION OF THE QUARANTINES MAINTAINED UPON THE ATLANTIC AND GULF COASTS FROM THE ST. LAWRENCE TO THE RIO GRANDE.

BY JOHN H. RAUCH, M. D., Secretary Illinois State Board Health.

At the July, 1885, meeting of the Illinois STATE BOARD OF HEALTH the Secretary was instructed by a resolution of the BOARD "to inspect "the methods of quarantine of the Louisiana State Board of Health "and their actual operation at the stations below New Orleans; and "also to extend his inspection of quarantine methods and regulations to "such other ports and places as he may deem necessary in the interests "of the public health of the State, with especial reference to the exclu- "sion of Asiatic cholera and small-pox."

Such inspection was designed to supplement the action of the BOARD—instituted on receipt of the first information that Asiatic cholera had again invaded Europe, threatening another pandemic extension—and which action aimed to secure the best attainable sanitary condition of the territory under its immediate jurisdiction as one of the most important preparations against the spread of the disease within the State, should the contagion be introduced.

The geographical position of Illinois—within 24 to 48 hours of all the important ports on the Gulf and Atlantic Coasts—its commercial relations, the extent and character of its means of communication, and the fact that fully one-half of the immigrants to this country come into or pass through the State, most of them remaining at least long enough to communicate contagion and under conditions favorable to such communication, obviously make the administration of these quarantines—with especial reference at this time to the exclusion of Asiatic cholera—a matter of sufficient importance to warrant the BOARD in securing all accessible information concerning them, the better to enable it to discharge its duty in connection with the protection of the lives and health of the citizens of the State.

In the present epoch of quarantine Illinois has a direct interest—chiefly commercial—in the exclusion of yellow fever from the Mississippi Valley; in the exclusion of vaccinally-unprotected immigrants at the North Atlantic ports for the protection of her own territory from small-pox; and in the exclusion of Asiatic cholera generally, whether it threatens by direct importation from Europe or mediately through the West Indies, Mexico and South America. In brief, the State is concerned in the condition of the sanitary coast defenses from the mouth of the St. Lawrence to the mouth of the Rio Grande.

PRESENT STATUS AND PROSPECTS.

It is hardly necessary to say that this country is not yet free from danger of an invasion of cholera simply because there is now a cessation of alarming reports from Europe. Periods of remission, more or less complete, have characterized every epidemic spread of cholera since it first invaded the latter country. Until it entirely disappears from the European continent it will not do for us to relax our vigilance or to remit a single precaution. On the contrary, this delay in its march should be utilized to strengthen our defenses, and to perfect our precautionary system. It must be remembered that the duration of a cholera invasion of Europe is not limited to two or three years. From the date of its first appearance in 1829-30 in Russia, to its final extinguishment in Italy, Austria and Germany, a period of seven years elapsed, during which, at one time or another, every one of the Continental countries was invaded—some of them more than once. Similarly in 1847, it again entered Russia at two points, and before its final disappearance in the Levant in the winter of 1855-56, it had traversed every part of the Continent and invaded Great Britain. In its last pandemic spread it appeared first at Malta in 1865, continued to ravage various parts of Europe until 1869, when there was a complete remission, only to break out again in 1871, and finally disappear in 1873.

With immigrants from every portion of Europe continuously landing upon our shores and rapidly distributed throughout the interior, we will not be freed from this menace until every trace of the contagion in that country has vanished. At the close of the year the disease still remained in southern Spain, in France at Brest, in Italy near Venice, whence it had spread to the Austrian port of Trieste, and it has also effected a landing on the Western hemisphere, in the French penal colony Cayenne. Thus far the disease has not extended in Europe to the regions whence our heaviest foreign immigration is derived, and to this fact is probably largely due our present immunity. When the German and Scandinavian countries and the British Islands become infected, if they should, our serious danger will then begin.*

I am often asked: "Do you expect to keep cholera out?" To which my reply is, that it is the duty of every sanitary authority to try to do so; to strengthen the weak places and perfect the strong; to utilize every possible resource; to secure the best attainable condition of his own immediate territory, and to put himself in a position to receive help from, or to extend help to others in fighting and excluding a common foe. We may not be able to entirely shut it out, but it will be a great achievement if its invasion be postponed and its spread limited, and greater still, if it is prevented a lodgment in this country. If an outbreak at a port or locality can be deferred until toward cold weather, that ally would itself help us to extinguish it, and it might require a fresh importation the next season to start another. It is our duty to try to shut it out, and not fold our hands supinely and join in the condemnation of quarantine and preventive methods, which, in a great measure, are a new outgrowth since the Fever-Summer of 1878; which have received a great stimulus to development by the present dread of cholera, during the past two years; and which, so far as they

* Reports continue to appear in the public press of new outbreaks in Spain and elsewhere.

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have been tested in small-pox and yellow fever, give promise of success with the Asiatic pestilence. With a sufficient number of National refuge stations, (there should be at least one on the Texas coast and one for New England, in addition to those on the Delaware Bay, Hampton Roads and Sapelo Sound, and all of them should be as fully equipped as that at Ship Island,) with properly-appointed quarantine establishments at the larger ports, and inspection stations at the smaller ones, the entire system to be mutually coöperative, governed by the same general rules and regulations, kept fully informed of public health conditions abroad by consular agents and intelligent medical inspectors when necessary, there would be no reason to apprehend the introduction of cholera or any other foreign pestilence.

QUARANTINE IN THE PAST.

A brief summary of the origin and varying phases of quarantine in North America will be useful in this connection, mainly as serving to emphasize the distinction between the ancient and modern systems, and also for information.

From the date of the earliest establishment of quarantine in this country down to the present time, its efficiency and the public interest in it have been fitful and spasmodic, dependent upon some real or fancied pressing emergency. The ravages of imported small-pox led to the passage of the first quarantine laws in 1698, and these were added to from time to time, and either vigorously enforced or more or less neglected as that disease increased or declined with the conditions of immigration, and the slave-trade. The plague through Mediterranean commerce and outbreaks of yellow-fever at long intervals, also affected quarantine laws and practice until near the close of the last century. For nearly 30 years, ending in 1791, the country was exempt from yellow fever, and during this period little attention was paid to the subject. That exemption, it may be noted, was due to the suspension of direct commerce with the West Indies through the enforcement of the colonial acts by Great Britain; but after the Declaration of Independence, commerce with the West Indies and the Spanish Main was gradually re-established, and in 1791 began the yellow-fever epoch of quarantine following the increasing ravages of the pestilence in the principal seaports of the country, while small-pox gradually lost much of its importance after the introduction of vaccination by Jenner in 1799. To yellow-fever, after the war of 1812, and taking the place of small-pox as a quarantinable disease, there was added typhus or ship fever and this disease—aggravated and often developed during the long voyages in sailing vessels with crowded steerages and a gross neglect of hygienic observances—continued to increase in frequency and severity with the increase of immigration.

In 1832, Asiatic cholera was added to ship fever and yellow fever, and although this new plague has only affected quarantine by its four epidemic visitations separated by long intervals throughout more than half a century, it marks another epoch in quarantine. Meanwhile, the yellow-fever zone in North America had become practically contracted to south of Philadelphia—once the most terribly scourged of American cities—and ship fever had lost much of its significance through the substitution of steamships for sailing vessels, and the enactment and enforcement, both by this country and by foreign countries,

of laws for the prevention of overcrowding and for the protection of the health of immigrants. With the decline of ship fever, small-pox again began to increase in consequence of a neglect of vaccination or its imperfect performance, and this disease again affected the public health more or less severely as the tide of immigration swelled or ebbed.

Within the past quarter of a century small-pox has more than once assumed epidemic proportions, as in the period from 1868 to 1873 and from 1879 to 1883; yellow fever has prevailed locally from time to time, and as an epidemic in the Mississippi Valley in 1873, 1878 and 1879; cholera spread throughout the country in 1866-67, and invaded nineteen states west of the Alleghenies in 1873; and these three diseases with their varying manifestations—occasional long intermissions, followed by violent and disastrous epidemic outbreaks—have dominated the quarantine question during this epoch.

In the few years immediately preceding this period some progress was made in an organized attempt to reform the abuses of quarantine, and to frame a system in accord with the increasing knowledge of epidemic diseases—one which should be freed from the unnecessary hardships and rigors of quarantines, revived or improvised in the face of existing danger, and too often inspired and enforced by an unreasoning dread and terror—similar to those witnessed in southern Europe during the past two years. This attempt was inaugurated by Dr. Wilson Jewell, of Philadelphia, one of the foremost sanitarians of his day, and who, in 1856, proposed the establishment of "a uniform code of regulations, operating alike in all respects, and offering the least resistance to an active commerce, and with a humane regard for the health of the passengers and crews, and the comfort of the sick on board of all vessels detained at quarantine stations." A "Quarantine Sanitary Convention" was held in 1857 for the purpose indicated, and some progress was made during its subsequent sessions when the outbreak of the Civil War put an end to the movement.

It may be here remarked, in passing, that these few quoted lines indicate the essential features of the quarantine of those days. They were primarily quarantines of detention or exclusion, inconsistent with an "active commerce;" the "health of the passengers and crews, and the comfort of the sick," were matters of secondary importance and the enforcement of sanitary measures confined to proceedings of a most primitive character where such measures were attempted at all. Little attention was paid to disinfection, purification, isolation of the sick, and the other measures which now receive most attention. The regulations entailed great personal sufferings and hardships, and vexatious delays and losses to travel and traffic, while they generally failed to protect the country from the introduction of these exotic diseases. It is not to be wondered at that "quarantine" has received so much condemnation.

COAST DEFENSES SHOULD BE UNDER NATIONAL CONTROL.

During all this time, from the earliest date to the present, the control of quarantine has remained entirely under the jurisdiction of State and local authorities, except during the brief period in which the National Board of Health exercised its limited quarantine powers under the act of 1878 and which expired in 1882. It is this absence of

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adequate National health authority and legislation, and the fact that, in such absence the maritime quarantines are controlled and administered by State and local authorities—resulting in diverse, and frequently conflicting, regulations and requirements and of necessity, in a tendency to limit precautions to their own individual interests, commercial as well as sanitary—which throw upon interior States the responsibility of fully informing themselves of the strength or weakness of these outposts, in order to know where to anticipate danger and how to make their own preparations to meet it.

At its last session, Congress appointed a commission to examine and report upon the measures necessary for the defense of our seacoast against a foreign armed enemy, and a distinguished publicist and statesman, Mr. Tilden, has recently urged this as a paramount duty of the Government. Millions of dollars have already been expended for such defense, and millions more will probably be forthcoming to meet this possible contingency. But the assaults of foreign contagion are not a contingency. They are actual events, and during the past twenty years they have cost the country, an aggregate loss of life only less than that of the great war immediately preceding. Every sanitarian and many of our leading statesmen know that this actual and ever-recurring loss is wholly and entirely preventable by the expenditure of a sum which sinks into utter insignificance before the millions which will be appropriated for the protection of our coasts against a possible future danger.

But thus far neither sanitarian nor statesman has been able to overcome the petty jealousies of individuals, communities, and of States themselves, so as to secure the legislation necessary to remedy even the present confusion. Such sanitary measures as are now enforced by the National Government are based upon authority derived from the act of April 29, 1878, to prevent the introduction of contagious or infectious diseases into the United States. But the late Secretary of State, Mr. Frelinghuysen, and the late Secretary of the Treasury, Mr. Folger, both decided that the act in question, having been repealed by the act of June 2, 1879, could not be revived by the expiration of this latter act. The point would have less practical importance if the authority which assumes to act under it can and will furnish the country the necessary protection in the present emergency. Practical sanitary executives are less concerned, just now, as to who exercises the authority and by what right, than in the questions: Is the authority wisely exercised? Is it sufficient? May we rely upon it implicitly? If not, to what extent, and how can we remedy its deficiencies?

It is by no means meant by this that it would not be better that there should be a properly organized National health department, acting under clear and undisputed legal authority, and supplied with funds adequate to its legitimate necessities. The present status of National sanitary legislation and of the National sanitary executive is admittedly defective and unsatisfactory. The history of the recent attempts to control the disinfection of rags; the complications at the port of New York concerning consular bills of health; the strictures upon the inspection service maintained along the coast, and in the matter of inspections on the Canadian frontier during the recent small-pox epidemic; the complaints of various boards of health that they are directed to look to the associated press for information and warning concerning threatened danger from abroad, to their ports and

territory*—and many other similar matters point to the necessity for a well-considered and radical revision of existing National sanitary legislation.

Consular bills of health, which are now as a rule almost worthless, might be made of the greatest value; and these, together with the prompt publication of direct and official information concerning the sanitary status of foreign ports—such information to be secured by competent persons—are essential to the prevention of the introduction of foreign contagion. Obviously such measures can be regulated, controlled and provided only by the National government.

POSSIBILITIES OF PRESENT COAST DEFENSES.

Nevertheless, I am more than ever convinced, since completing this inspection, that Asiatic cholera, as well as small-pox and yellow fever, may be effectually excluded from the United States by an intelligent use of the agencies still at our command. This is not a matter of speculation or theory. A great advance has been made since 1878. A quarantine of exclusion of these three diseases is now a matter of certainty, depending upon prompt notification of threatened danger; vigilant supervision over commercial intercourse with infected localities; inspection of all immigrants and the enforcement of their vaccinal protection; sanitation and purification of infected vessels and cargoes; isolation of those sick with these diseases; the surveillance of suspects during the periods of incubation; and the employment of other well-defined preventive and precautionary measures which now constitute the best modern sanitary practice as applied to maritime quarantine.

Cholera has never yet been kept out of this country after becoming epidemic in Europe, and I admit that quarantines, as conducted in that country, have proved ineffectual to control the spread of the disease. But the conditions which obtain here are radically different from those in Europe. In that country, as I have said elsewhere,† a narrow strait or sea, a river, a mountain chain, or merely a territorial boundary line, with its custom-houses and passport system, defines the limits to be guarded, and forms the only physical barrier between the quarantiner and the quarantined. Here, the whole width of the Atlantic intervenes between us and the infected country. There, cordons and quarantines mean privation, misery and suffering, and, ultimately, starvation. Here, the Nation could exist unaffected in all her material interests by a quarantine whose period of detention is limited to the time necessary to destroy contagion through the rapid processes of modern disinfection and sanitation. There, it may be true, as alleged, that a quarantine of exclusion is impossible of execution, and

*Both for the ILLINOIS STATE BOARD OF HEALTH as its Secretary, and for the Sanitary Council of the Mississippi Valley as its executive officer, I have attempted to secure such information—asking for copies of consular reports, or the essential facts contained therein, as to the existence of epidemic contagious diseases at ports in commercial relation with this country and with especial reference to Asiatic cholera; also for the addresses of medical inspectors stationed at foreign ports, etc. The Secretary of State, in acknowledging the receipt of my requests, stated that they had been referred to the Treasury Department, informing me in effect, that charge of all matters pertaining to the public health was assumed by that branch of the National government. No reply has yet been received from the Treasury Department nor from any of its bureaus.

†Practical Recommendations for the Exclusion and Prevention of Asiatic Cholera in North America. An Address delivered at the opening of the National Conference of State Boards of Health, St. Louis, Mo., October 13-15, 1884.

that the attempt to maintain it does more harm than good, in leading to numberless contraband practices by which the disease may be introduced in unsuspected ways. None of this is true when applied to the exclusion of Asiatic cholera from this country; while to accept the statements unquestioned would cause vigilance to be relaxed, would invite contagion to our shores unimpeded, and would finally throw upon individual communities the burden and the responsibility of fighting the disease at an immense disadvantage—that is, of fighting it at home and from many quarters, instead of on the outer lines and from only one direction.

Those outer lines, even with some defects and weak places, I believe to be even now sufficiently strong to keep out the disease if proper vigilance and thoroughness be exercised, if all the facilities be utilized, and if timely notification of threatened danger be given by the National government.

The next year or two, however, will furnish a tolerably conclusive test of the efficiency of quarantine to exclude the pestilence from this country.

IMMEDIATE RESULTS OF THE INSPECTION.

During the progress of the inspection it was observed that the comparisons instituted and the information furnished prompted quarantine officers and health authorities to avail themselves of facilities previously overlooked or neglected, and to put themselves in communication with each other for purposes of mutual coöperation and support. At many of the stations those in charge invited criticism and suggestions, while others would not rest satisfied until their facilities and appliances were made more complete. Suggested improvements have already been made in many instances and others will doubtless be secured.

Not the least among the good results which are already perceptible is the recognition of the fact that the administration of quarantine at a given port is not a purely local measure; but that the country back of it, and communities distant in space but in close proximity in point of time, are also interested. Since States and communities continue to control maritime quarantine, and in many instances are jealous even of a suggestion of Federal interference, it is right that they should recognize the full import of their obligations. Nor should they overlook the fact that these distant communities have the power to both help and punish. Illinois, for example, by recently refusing entrance to immigrants coming through ports which were lax in enforcing vaccinal protection, furnished a powerful argument to the quarantine officers at such ports whereby they secured compliance with their requirements by the steamship companies. This reflex action may be carried still further. If a port or locality should notoriously disregard the precautions necessary to prevent the access of cholera it would be an obvious duty of self-protection not only to exclude immigrants but to cut off all intercourse with such port or locality. With the danger of such a contingency clearly recognized the authorities would not only be apt to exercise proper vigilance, but all transportation and commercial agencies—railroads and steamships—would become quarantine aids. Captains and officers would have an additional incentive

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for keeping their vessels in good sanitary condition and for promptly reporting cases of suspicious sickness during the voyage, if it came to be understood that failure in these respects would be followed by loss of trade and employment.

One obvious advantage which may be expected to follow the publication of this report, will be the notification to all interested of the weak places in our line of coast defenses, and this will naturally ensure greater care and vigilance at such places and greater watchfulness of them by others.

To some places which I was unable, from want of time and pressure of other duties, to personally visit and inspect, the following series of questions was addressed, and subsequent correspondence elicited the necessary information in such cases:

1. What are the quarantine facilities at your port? Please furnish copy of laws or ordinances, and of rules and regulations.
2. How far from the city is the quarantine station?
3. Is the station out of the track of commerce or travel?
4. How far from the city are vessels inspected?
5. How are vessels, cargoes and persons disinfected and purified?
6. What are the periods of detention and seasons?
7. How would a cholera-infected vessel be treated?
8. Under what circumstances would vessels be sent to the nearest refuge station?

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ATLANTIC AND GULF COAST QUARANTINES.

LOCATION OF STATIONS, EQUIPMENT, POWERS AND AUTHORITY, RULES AND REGULATIONS,
METHODS, ETC., ETC., FROM CANADA TO TEXAS, INCLUSIVE.
ARRANGED GEOGRAPHICALLY.

Canada :

On the 9th and 10th of October, I made an inspection of the Grosse Isle quarantine establishment, on the St. Lawrence river, about 29 miles below Quebec. Dr. F. Montzambert, Chief Quarantine Officer of the Dominion, telegraphed me on the 9th that he would send his yacht to meet me at St. Thomas, a station on the Inter-Colonial railway, about 30 miles from Quebec. We left the wharf at this place about 4:30 p. m., but owing to head winds were unable to use the sails, and the men had a weary pull of two hours and a half to make the five miles to the station against the strong current and ebb tide. As this boat is the sole means which the station possesses for boarding a vessel for inspection purposes, I became quite convinced that a steam yacht or launch is a necessity in such a swift current and with such high tides as obtain in this stream, the channel being fully two and one-half miles from the station. The Grosse Isle quarantine station is an island about one and one-half miles long, divided into Sick, Central and Healthy Divisions. In the Sick Division are the hospitals with the necessary adjuncts. There is a two-story brick hospital, with 100 beds, including some in private wards for cabin passengers, ship's officers, etc.; and a one-story wooden shed with about seventy beds. There are also ample facilities for disinfection, and for the purification of clothing, etc. In the Central Division are the quarantine officer's and chaplain's residences, and quarters for the employés, eight in number, embracing a hospital steward, a sergeant of police (who speaks four languages), a baker and the boat's crew. From this point ships that stop opposite the station for inspection are gone out to. In the Healthy Division, (a mile and a quarter from the hospital), are the houses of detention with accommodations for about 2,000 persons; a large wash-house; a bakery; a furnace for hot-air disinfection; rooms specially arranged for fumigation; chapels, police barracks, etc. There is telephonic communication between the different divisions of the station, and telegraphic to Quebec. The disinfectants employed are chloride of lime, corrosive sublimate and sulphurous-acid gas. Labarraque's solution is also used for the sponging and washing of patients and attendants, and permanganate of potass for coloring dangerous solutions; chloride of lime in solution, four ounces to the gallon, is used in the vessels which receive the discharges of the sick. Infected clothing and bedding are steeped at once, in the wards, in a weaker solution of chloride of lime or of corrosive sublimate, and then boiled before being sent to the wash. The dry-heat oven is rarely used; what can not be steeped for at least two hours, and then boiled for at least half an hour is generally burned, in the absence of a steam disinfector. For fumigation, sulphurous-acid gas is used in closed apartments either from burning the crude sulphur, or from the copper reservoirs in which it has been stored under pressure, and which are obtained from New York.

Should a vessel arrive here with cholera, Dr. Montzambert purposes to treat her as follows: Land the sick and their attendants directly at the Sick Division, with every thing suspected connected with them. Land all the steerage passengers and their effects, and place them in the detention houses at the Healthy Division. Open all windsails, hatches, portholes, etc., on the vessel; have the bilge-water repeatedly pumped out or changed; supply unquestionable drinking water to all. All the luggage of the cabin passengers and the effects of the crew to be opened out on board; all body and bed linen to be steeped in

solution of corrosive sublimate; and other effects, with the opened trunks, etc., to be repeatedly fumigated with sulphurous-acid gas in closed apartments. The vessel in all attainable parts, and notably the cabins, steerage and forecabin, to be scrubbed with solution of corrosive sublimate and fumigated. The cargo to be opened up in as many places as possible, and then, the hatches, etc., being closed, the compressed sulphur dioxide to be poured in amongst it from the reservoirs. Should it seem necessary, the cargo would be landed to allow of its more detailed disinfection, and the more satisfactory treatment by washing, rinsing with corrosive-sublimate solution and fumigation of the empty vessel.

Whilst the vessel and those on board are thus being attended to the steerage passengers and their effects are washed and disinfected on shore at the Healthy Division. The attendants being always amongst them, would report by telephone at once any slightest appearance of illness, and in addition a regular medical inspection is made twice daily of all those under detention, viz: At 9 a. m. and 4 p. m. each day. Any one showing even doubtful symptoms is at once removed from amongst the others, placed in a ward of observation and thence returned to the Healthy Division or taken to hospital as may be required. Subsequent to completed process of disinfection, the vessel, passengers and crew would be detained for eight clear days after the occurrence of the last cholera case before being admitted to pratique.

The process thus described is carried out with any vessel that arrives with an infectious disease diffused amongst its passengers, except that the vessel is allowed to proceed after disinfection without further detention. With a cholera ship, however, application would be made by telegraph for authority to detain the vessel and all on board, and it would probably be accorded.

Grosse Isle was for a long while one of the most important quarantine stations on this continent. Over 15,000 victims of cholera and ship fever are buried on the island. It was established during the sailing-vessel period when,—as the result of the long voyage, crowded steerage and ignorance or disregard of all sanitary and hygienic observances—almost every arrival was more or less infected. For the requirements of the period, it was probably as well adapted and as completely equipped as any establishment in the world. The vessels then in use could easily approach its wharf and receive such treatment as was at that time considered necessary.

But with the advent of the huge ocean steamships—with their great draught, short passages, improved accommodations, and imperative demand for "quick dispatch"—the station has lost much of its importance. One set of conditions has largely obliterated its necessity as a barrier against the introduction of epidemic contagion, while another set has created a necessity for improvements and modifications which have not been made. As a consequence, there is less attention paid to the maintenance of the station and to the enforcement of the regulations. During the season up to the 9th of October, the date of my inspection, only 32 vessels out of a total of 420 arrivals had stopped at the station for examination.

My observations and study of the enactments suggest the following as among the more important matters requiring attention, if this station is to be relied upon, to prevent an invasion of cholera or other grave epidemic contagious disease via the St. Lawrence river*—having regard on the one hand to the efficiency of service, and on the other to the interests of commerce:

1. The boarding at Rimouski and inspection of the mail steamers is an absolute necessity, and all foreign vessels bound up should be inspected at or below Grosse Isle, so that if the vessel needs to be detained at quarantine the fact can be promptly ascertained, and if healthy and free from danger of conveying infection or contagion, she may proceed without unnecessary delay.

2. The revision of the regulations so as to secure the compulsory sending back to quarantine of any vessel that passes up to Quebec without having been inspected, no vessel to be allowed to enter the custom house at Quebec or Montreal without first exhibiting the certificate of the inspecting medical officer.

3. Better facilities for boarding vessels at the quarantine station are required as already suggested.

* Cholera was introduced into this country by this route in 1832.

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4. The adoption of some of the more modern appliances for disinfection, as for example, a steam disinfector for rags, textile fabrics, etc., or the methods employed at the Mississippi quarantine of the Louisiana State Board of Health.

5. The vaccinal protection of the immigrants should be enforced.

6. The addition of another medical officer to the staff of the station.

7. Should it be impracticable to thoroughly disinfect a vessel or cargo, wharfage facilities, in addition to those existing at present, should be provided for vessels of the heaviest draft that navigate the St. Lawrence.

The modifications herein briefly indicated, with the facilities already possessed and the natural advantages fully utilized, would, to a great extent, remove the apprehension of cholera finding its way into the country through the St. Lawrence, and would materially obviate the necessity of restrictions over traffic and travel between the Dominion and the United States. Sweeping and onerous requirements, entailing unnecessary expense and delay—especially if such expense and delay be due to inadequate equipment and appliances—defeat the very object of quarantine and provoke avoidable hostility and opposition, or lead to neglect and indifference. In order to make a quarantine effective as a safeguard of the public health, nothing should be required which is not clearly necessary; the facilities and regulations should be such as to insure a minimum of interference and inconvenience consistent with the end; and every necessary requirement should be rigidly continuously and impartially enforced.

The only diseases requiring attention at the present time are cholera and small-pox. Up to the time of my visit the vaccinal protection of immigrants was not enforced, and small-pox had repeatedly been introduced into Illinois and the Northwest by unvaccinated immigrants coming through the Dominion. Since my inspection, no unprotected immigrant is allowed to land, and under the present regulations the risk of imported small-pox contagion, via the St. Lawrence, is very materially reduced. A steam yacht has also been ordered to take the place of the yacht for boarding vessels at Grosse Isle. Upon this will be placed the modern appliances for disinfection above indicated.

During my inspection I was urged to make my criticisms and suggestions direct to the quarantine officer, and subsequently the Dominion government invited me to communicate the same to them.

In addition to the quarantine on the St. Lawrence there are two other quarantine stations maintained by the Dominion government—one on Partridge island, for the port of St. Johns, N. B., and one on Lawlor's island, for the port of Halifax. These are subject to the same enactments as apply to the Dominion generally.

Dr. W. W. Wickwire, Inspecting Physician for the port of Halifax, writes me, under date November 20th, "the quarantine station is on an island in the harbor of Halifax, about three and a half miles from the city. This island is owned by the Dominion government, and is used entirely as a quarantine station—the only persons living there permanently are the steward and his family. The island (Lawlor's) has an area of about 150 acres. There are now hospital buildings affording accommodations for about 100 persons, but additional buildings could easily and rapidly be constructed.

The quarantine anchorage, where inspection takes place, is about three-quarters of a mile from the city. Pilots are required to bring all vessels into this anchorage ground if there be any disease whatever on board, and there remain until inspected."

Maine:

The Navy Department has been in the habit of sending yellow-fever infected vessels to the Navy Yard at Portsmouth, New Hampshire, but owing to protests by the citizens, of that city, against such action, Dr. F. M. Gunnell, Surgeon-General, under authority of the Secretary of the Navy, in 1884, established a refuge station on Widow's Island, in Penobscott Bay.

A temporary hospital and quarters for officers have been built, and an artesian well bored, from which an abundant supply of good water has been obtained at the depth of sixty feet. "The island is convenient of access from the sea, has excellent anchorage protected from storm winds, and affords a safe and desirable refuge for infected vessels coming north from the West Indies or Gulf of Mexico." The Surgeon-General recommends

in his report bearing date October 1, 1885, that permanent buildings be erected at this place; and a strongly constructed wharf, to facilitate the landing of heavy stores from vessels in order to accomplish thorough fumigation and disinfection. With the exception of this station there are no quarantine facilities along the coast of Maine, and this is under the control of the Navy Department. Why should it not be utilized as a refuge station, in case cholera is found on vessels in this neighborhood?

I visited Portland in August last, on account of the importance it possesses in this connection, owing to its being the winter port of the Grand Trunk railway, and thus receiving a considerable immigrant travel during the winter months. I found that inspections were made only upon the arrival of vessels at the wharf, when they are boarded by the city physician. If contagious disease, such as small-pox, be found on a vessel, it would be ordered to the quarantine grounds about two miles from the city; those on board would be vaccinated, and such disinfection enforced as might be practicable under the circumstances.

The attention of the mayor, and subsequently of the State Board of Health, was called to the possibility of cholera being introduced by immigrants during the winter months.

New Hampshire :

Dr. Irving A. Watson, Secretary of the New Hampshire State Board of Health, writes, under date of October 3, 1885: "Except under unusual liability to infection, no quarantine is maintained at Portsmouth. The only vessels that come into the harbor of Portsmouth are coasters from American ports, and a few vessels now and then from the British Provinces (New Brunswick and Nova Scotia.) During the present month but one vessel has entered the port outside of coasters from American ports, and that was a vessel from New Brunswick loaded with railroad ties. The very small amount of shipping that comes into Portsmouth outside of our own coast trade which is very small, consists of now and then a vessel loaded with railroad ties from the Provinces, and salt from Turk's island. There is no passenger traffic whatever. The quarantine laws of the State, as well as the city ordinances of Portsmouth, are quite strict, and in the very few instances of contagious diseases that have been found on board of vessels coming into the harbor of Portsmouth, the masters of such vessels have notified the pilots and a medical officer has been sent to them and suitable quarantine established.

"Formerly there was a quarantine station about a mile down the harbor, which was established and used exclusively by the government; it now exists unoccupied. There has been no occasion for the disinfection of cargoes, for many years, I think. The government has sent one or two vessels, among which was the Plymouth, up to this port to freeze out the yellow fever.

"I do not know of a single instance in which disinfection of vessels, crews and cargoes has been required. I have recently investigated the condition of affairs at this port, and do not find it necessary at the present time to establish a quarantine station. There is not the least probability of small-pox being brought to Portsmouth from Montreal and vicinity, or from the Provinces by water. On the other hand we have no infected cities to fear along our own coast, and as no vessels arrive from foreign ports, other than those mentioned above, there seems to be no demand whatever for a quarantine service. Should any circumstance arise that would make it necessary to establish such a service at Portsmouth, we would do so."

Massachusetts :

In company with Dr. S. H. Durgin, Chairman, and Mr. George F. Babbitt, a member of the Boston Board of Health, I made a visit of inspection to the Boston quarantine establishment on the 13th of August last. This is situated on Gallop's island, about seven miles from the city, and comprises abundant hospital accommodations for contagious diseases in two buildings; a large storehouse for infected cargoes, connected with deep water by a suitable wharf and tramways; and upon another wharf is a building for disinfecting clothing, baggage, etc. The island is about twelve acres in extent, and vessels may lie at its wharves entirely out of the track of commerce. The arrangement of the buildings, etc., is compact and workmanlike, and everything was found in good order.

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boarding station is at Deer Island, about a mile and a half from quarantine, and the port physician resides at this station during the entire year. The quarantine steamer, Samuel Little, is also kept at the Deer Island station ready for boarding vessels, conveying the sick from vessels to the hospitals, etc. Since my inspection this vessel, built for the quarantine service thirteen years ago, has been ordered to be replaced by a new one with important improvements and better facilities for disinfection. The regulations require the port physician in quarantine to visit and inspect all vessels arriving in the harbor between June and November from any foreign port, except Canada and the Provinces, and from any domestic port south of Virginia. No vessel which has had on board, during her last voyage, any sickness of a contagious or doubtful character, shall pass quarantine without inspection and consent of the port physician. It is also provided by regulation that no vessel shall be allowed to bring any sickness of a doubtful or contagious character past quarantine during any season of the year. Every facility is provided for the speedy and comfortable transfer and the subsequent care of such persons as may arrive by vessels suffering from contagious or infectious diseases. The personnel of the quarantine establishment consists of two physicians and the necessary employes. The physicians are employed during the whole year. When quarantine duties do not demand their attention they are occupied in the city institutions on Deer Island.

In the large storehouse there is an apartment for disinfecting rugs and other articles by the sulphurous-acid process, and there is also a large amount of storage capacity. The disinfection of clothing, personal baggage, etc., is effected by the steam process. The superheated steam is supplied by the quarantine steamer. For my observation the steam was discharged into the apartment provided for this purpose, and in a few minutes the temperature was raised to 220° F., at which point it was evident it could be maintained as long as desired.

All immigrants are examined on arrival, and are vaccinated or revaccinated if not protected by decidedly recent vaccination or revaccination. Careful scrutiny is bestowed on all persons and goods arriving by vessel, and such cargoes, vessels and personal baggage as seem to require it are thoroughly disinfected as above indicated.

The administration of quarantine at Boston has received for the last nineteen years the direct supervision of the present Chairman of the City Board of Health, and the access of cholera through this port is hardly likely to occur. During this period I have been able to trace small-pox cases to Boston very rarely, and none for several years recently. The methods pursued at this port demonstrate that the disease may be excluded.

Rhode Island:

The quarantine regulations of the port of Providence are under control of the board of aldermen, who appoint annually a health officer of quarantine, to execute such orders as said board may, from time to time, prescribe relating to quarantine. Dr. Charles V. Chapin, Superintendent of the Health Department of Providence, writes "that all vessels subject to quarantine are stopped about one mile below the city. Vessels are inspected by the health officer before they are allowed to come to the wharf, or have any communication with the shore.

"Our foreign commerce is very small, mostly with St. John, N. B. and with the West Indies. The only European arrivals we have are a few Italian vessels with sulphur.

"If any vessel was found to be infected, I would have her thoroughly cleansed and disinfected with sulphur or chlorine or both. Baggage and clothing of crew could be treated on shore at the small-pox hospital grounds, which are situated near quarantine. Our channel is so narrow that it is impossible for vessels to anchor very far from the line of travel."

Connecticut:

The quarantine facilities of New Haven, the most important Connecticut port, are described by Dr. Lindsay, Secretary of the State Board of Health, as "not entirely satisfactory. No special preparation exists for the proper management of vessels subject to quarantine, excepting that the Board of Health of New Haven is clothed with full authority, to subject any such vessel to such regulations for the protection of New Haven, as said Board may deem necessary.

"The vessel (and cargo, if necessary,) would be disinfected by the fumes of burning sulphur and subsequent ventilation, and washing with solution of corrosive sublimate or some of the preparations of chlorine. The clothing of the crew and their personal effects would be also disinfected, and they would be kept under supervision until danger of communication of the disease had passed.

"Vessels on which there has been no malignant or contagious disease during the voyage, and on which there is at present no sickness may come to any public wharf in New Haven harbor, and signal for the health officer; but no person is allowed to leave the vessel before the arrival of the health officer. In case of any sickness on board, the vessel shall come to anchor within quarantine limits and signal for the health officer from there. The quarantine station, as you will see by the enclosed map, is only one and one-half miles from the centre of the city, and in New Haven harbor directly in the line of travel.

"In case of the arrival of a cholera vessel, it would be detained in quarantine. There is no hospital provided for the reception of cholera. The patient would be kept on board under such care as was practicable, respecting isolation and disinfection, until a temporary provision could be made, (by tents, probably,) on the shore for his or their reception, after which the vessel would be disinfected. If the cargo was such as to require special apparatus for disinfecting it, we have none, and should have to send the vessel to New York or elsewhere for that purpose."

New York:

About two-thirds of the total immigration and more than two-thirds of the total foreign imports into the United States pass through quarantine at the port of New York. Without assuming that these proportions may be taken as a measure of the relative importance of the New York quarantine compared with the quarantines of the rest of the country, its absolute importance cannot be overestimated. The individuals and their effects and the cargoes with which it deals, are distributed to every part of the continent, and while from climatic and other conditions, the port itself might be protected by given quarantine methods, it would by no means follow that measures adequate for such protection would ensure the safety of remote sections of the country from the disastrous effects of the importation of foreign contagion or infection through and beyond the port. Many improvements in the New York quarantine system have been made during the past twelve or fifteen years, and to a great extent in direct recognition of these considerations. During this period the interest of the interior in the administration of the system has come to be acknowledged and is allowed to exert some influence.

The statutes relating to quarantine at the port of New York are very voluminous, but the most important are to be found in Chapter 358 of the Laws of 1863, entitled, "An act establishing a quarantine and defining the qualifications, duties and powers of the health officer for the harbor and port of New York," and in Chapter 592 of the Laws of 1865, amendatory thereof. Although there is a board of quarantine commissioners consisting of three members, the powers and duties prescribed by the law are practically exerted and discharged by the health officer aforesaid. In 1880, upon the establishment of a State Board of Health, this officer, together with the attorney-general and the superintendent of the State survey, were made *ex-officio* members of the State Board, but no control or authority over maritime quarantine is conferred upon or exercised by the Board, except indirectly through the *ex-officio* connection of the health officer, who is chairman of a standing committee of that body upon the subject of quarantine.

On the 10th, 11th and 12th of August, in company with Dr. William M. Smith, Health Officer of the Port, I made a personal inspection of the quarantine establishment and of the methods enforced thereat. The quarantine anchorage is in the Lower Bay, a triangular area of about two and one-half miles along its sides, its northern apex being about eleven miles from the city and five miles from the health officer's station, near Clifton, on the left shore of "the Narrows." At the upper apex of the anchorage, and about four miles inside of Sandy Hook, is moored the quarantine ship, "Illinois," in charge of a deputy inspector.

After the first day of May and until the first of the ensuing November, all vessels from the West Indies, the Windward Isles, the east coast of South America, and the west

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coast of Africa, as also those from infected ports of the United States, are brought to an anchor near this vessel and boarded by an inspector from an ordinary row boat. The officer ascertains—1st. The present condition of the passengers and crew. 2d. The history of the vessel during the passage in reference to sickness, etc., and the sanitary history of the vessel while in the port of departure. The bill of health is then examined, and the sworn statement of the captain and medical officer of the vessel is next required, each being duly sworn, that the port or ports from which they sailed were, to the best of their knowledge and belief, perfectly healthy, being free from all malignant contagious and infectious disease; that no such disease existed among the shipping in said port or ports at the time of their departure, and that no case of sickness or death from small-pox, cholera, yellow fever, ship fever, or any contagious or infectious disease has occurred on board their vessel while in any port or on the passage.

A careful examination is made in every instance of the steerage, and if objectionable from filth, it is ordered to be immediately cleansed and then fumigated. If the vessel has been absent from the port of departure for a time, equal to or exceeding the usual period of incubation of the disease prevailing at such port, the passengers are inspected by the quarantine officer and the vessel is discharged under a permit.

If there is any sickness of a suspicious character resembling yellow fever, cholera or typhus, the sick are removed to the quarantine hospital on Dix Island. If the ship is less than five days from a port infected with yellow-fever, passengers and vessel are held until that period has fully elapsed. In the meantime the hatches are opened, the cargo and steerage are fumigated twice, at various intervals of several hours, with chlorine or sulphurous-acid gas.

All baggage, masts, and whatever articles liable to have become infected are put in a close apartment and submitted to disinfection by the agents mentioned. This done, the master of the vessel is given a "permit" and directed to the discharging anchorage in the upper bay, distant three miles from the city. Here (in the language of Dr. Smith's report,) under the constant supervision of the quarantine police, and the frequent visitation of the health officer, the most perfect system of cleanliness is enforced. In the meantime the cargo is discharged upon open lighters. The exposure of the cargo to air in its transit to the dock, serves still further to remove the danger of infection. There is no instance of the propagation of disease from that source in the history of quarantine at the port of New York. The cargo being removed, the hold is thoroughly washed, and in the case of sailing vessels the limber-strecks along the keelson are taken up, accumulations of filth removed, and the air-spaces washed down, until the water returns clear of any evidence of impurity. A solution of sulphate of iron, or of bichloride of mercury is then used, with which to scrub and rinse the entire hold, inclusive of the air-spaces and limber streaks. Finally, from fifty to one hundred pounds of sulphur, according to the size of the vessel, are burned under the hatches, which are closely covered. The ship's crew is then mustered, and examined as they pass before the health officer. If all are well the vessel is allowed to proceed to her dock, without further delay. In vessels suspected of yellow-fever infection, the crew are not allowed to discharge cargo, or if they do, are submitted to a quarantine of observation for five or six days.

All foreign vessels not subject to visitation in the lower bay are boarded by the health officer or his deputy at the boarding station on Staten Island, a short distance above the Narrows, and opposite the health officer's residence. From May until November following, all vessels from ports "south of Cape Henlopen," are visited at this point, unless some of the ports south of this, become infected with yellow-fever, in which case vessels from such ports are examined at the quarantine station in the lower bay.

The quarantine hospital for yellow fever and other contagious diseases, except small-pox, is upon Dix Island, an artificial construction about two miles above the quarantine anchorage towards the Staten Island shore, out of the track of commerce. The hospital is built on the pavilion plan, has five wards connected by covered passage-ways, and has comfortable accommodations for 300 patients. There are also on the island suitable quarters for officers and attendants, a disinfecting room and all the modern sanitary appliances. Small-pox cases are not treated here, but are taken to one of the city institutions on Blackwell's Island in the East River.

One mile above Dix Island is Hoffman Island, also artificial, and upon this are the buildings and appliances necessary for a quarantine of observation. "Suspects" from yellow-fever, cholera, typhus or yellow-fever exposure, are here detained during the respective periods of incubation. Two immense structures furnish accommodations for about 2,000 persons, and in another building are the quarters for officers and employés, and for administration purposes. Abundant bathing and laundry facilities and disinfecting appliances are provided, and here as well as on Dix Island, are immense reservoirs and a number of cisterns for the storage of fresh water.

The health officer's station, or main quarantine station is near Clifton, and at this place is the residence of the health officer, quarters for two deputies, and a good wharf. Vessels are here boarded from a commodious steam yacht, by which, also, communication with the other divisions of the quarantine establishment is maintained. The islands and stations are connected by telegraph, and the health officer's quarters are also connected by wire with the city.

The personnel of the establishment varies with the exigencies of the season. In addition to the health officer, I found only two deputies employed, one upon the quarantine ship and one at the quarantine station. Dr. Smith himself attends to the sick in hospital, and was treating a yellow-fever case (convalescent) during my visit.

Summing up, with reference to the exclusion of cholera and small-pox,* the quarantine plant and facilities of the port of New York are unrivalled, the printed regulations judicious, and with proper vigilance, the service should suffice to prevent either of these diseases from obtaining access to the country through this avenue. But the entire system is hampered by a vicious financial policy which is, in effect, a farming-out of the service. At the other important ports the fees go directly to the municipality or State, and the chief executive officers are paid fixed salaries, and are provided with such employés as may be necessary to the proper and efficient conduct of the quarantine.

New York may exclude cholera under her present system, but more confidence would be reposed in the result if less were demanded of professional ability, personal integrity and executive firmness in the health officer, and if the system were freed from influences which are most deprecated by those who, without prejudice, best understand them.

Pennsylvania:

The maritime quarantine of the port of Philadelphia, and practically of the State of Pennsylvania, is enforced at the "Lazaretto", situated on the left bank of the Delaware river, about eleven miles below Philadelphia. In company with Dr. R. A. Cleemann, of the City Board of Health, and Dr. Benjamin Lee, Secretary of the State Board of Health, I made a visit of inspection to this station on the 6th of August last. The quarantine grounds are about ten acres in extent, surrounded by cultivated farms and separated from the main channel by Little Tinicum island, between which island and the station there was formerly a navigable channel which was used as the quarantine anchorage, but is now too shallow for that purpose for large vessels. Quarantine was established at this point in the early part of the century, and sections of a law enacted in 1802 are still in force. There has been practically little change in the equipments or methods since 1818, except that a steamboat has replaced the many-oared barge used formerly in visiting, and that by this means vessels are inspected *en route*, not being obliged to come to anchor unless detention for sickness is necessary. The structures, comprising a large hospital (sixty beds), administration building, government warehouses, etc., are well built and spacious, but antiquated. For more than half a century the establishment was the best equipped on the continent. All vessels from foreign ports and such American ports as may be designated by the Board of Health of Philadelphia, bound for the port of Philadelphia, and arriving between the first of June and the first of October, are required to come to anchor as near the Lazaretto as the draft of water will permit, and there await the visit of the quarantine officers,—the Lazaretto physician and the quarantine master. The former administers the oath or affirmation to the captain, and examines personally

* Cholera found its way through this port to the eastern portion of this country in 1849, and to the country generally in 1865. No attention is paid to the vaccinal status of immigrants unless the disease is actually on vessels. As a natural consequence small-pox has repeatedly been introduced into the interior through this port.

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into the state of health of all on board, and, in conjunction with the quarantine master, ascertains the sanitary history of the voyage, condition of port of departure, character of cargo, etc. The latter officer examines into the condition, with regard to cleanliness, of the hold, cabin and fore-cabin, causes the bilge to be pumped out and purified by fresh water, and ascertains whether any part of the cargo is in a damaged or infectious condition. If the vessel is satisfactory in all these respects, a certificate to that effect, signed by both officers, is furnished and she is allowed to proceed to the port. This certificate is addressed to the health officer of the port, to whom it must be delivered within 24 hours after the vessel lands at her wharf.

If any contagious or infectious disease (measles excepted) be found on board, or if the vessel be from an infected port, or if her cargo be considered dangerous as to contagion or infection, or the vessel's sanitary condition be unsatisfactory, the certificate is withheld and the necessary measures are instituted to render her safe from conveying contagion or infection. These measures are entirely within the discretion of the Lazaretto physician* (of course under the control of the Board of Health of the City) and are enforced under his supervision by the quarantine-master. So far as they are prescribed they consist of purification "by ventilation, scrubbing and whitewashing." Fumigation is effected by sulphur combustion in iron pots. There are none of the modern appliances for disinfection of vessels or cargo. No attention is paid to the vaccinal status of immigrants unless small-pox is discovered on a vessel; and as a natural consequence the disease has frequently been introduced into the interior through this port. Telegraphic communication has recently been established with Philadelphia.

Owing to the filling up of the channel in front of the Lazaretto, large vessels detained in quarantine could not be kept out of the track of commerce as completely as is desirable. In examining the surroundings of the station we proceeded on the quarantine steamer as far south as Chester, at which place we found the revenue cutter from which inspections of vessels arriving in the Delaware Bay are made. In connection with these inspections I took occasion to repeat the suggestion made at Baltimore, to-wit: That the Government inspection service should be utilized as fully as possible, and to this end should receive the cooperation and recognition not only of Pennsylvania, but of the Delaware and New Jersey health authorities, State and local. This suggestion was subsequently acted upon by the adoption of a resolution by the Philadelphia board of health requiring all vessels from infected ports to report for the removal of sick sailors at the U. S. Quarantine Station at the Delaware breakwater before proceeding up the river.

Dr. Benjamin Lee, of the State Board of Health, wrote me on the 28th of September that "in company with Drs. Cleemann and Ford and several non-professional members of the city board, Dr. Wilson the Lazaretto physician, and Dr. Ballhache of the Marine Hospital service and National Board of Health, I visited the U. S. Quarantine Station at the Delaware breakwater on September 4. Dr. Marshall of the Delaware State Board joined us on the way. Dr. Hunt of the New Jersey Board fully expected to come but was prevented by an outbreak of typhoid somewhere in his bailiwick." After describing the accommodations, surroundings, etc., and means of boarding vessels, Dr. Lee adds: "The vessels lie about four miles off in very rough water and decline to come inside the breakwater on account of the time which it takes. The only boat is a little yawl entirely unfit for heavy weather. There is space enough to put up temporary barracks here in case of emergency, and there is a government pier close by to which vessels could be brought. There are no arrangements for disinfecting cargoes or clothing.

"It is doubtful whether this would be the best place for a permanent quarantine station on account of the exposed situation and roughness of the water. Also because in case of storm so many vessels take refuge here, often close together. The distance from the city is also a possible objection. [?] I think there must be an island higher up the bay somewhere, which could be utilized for the purpose."

* Appointed by the Governor.

Delaware :

Quarantine along the Delaware coast is limited to the local reg- 'ons of the coasting trade. There is a government quarantine station at the Delaware 'water, described in connection with the Pennsylvania quarantine system.

Maryland :

On the 4th of August, accompanied by Dr. James A. Steuart, Health Commissioner, I made an inspection of the quarantine establishment at the port of Baltimore. This is situated at Little Hawkins or Leading Point, about seven miles from the city, on the Patapsco river. The grounds belonging to the station embrace about twenty-five acres, surrounded by improved farms. There is a new and well arranged hospital building with accommodations for forty patients. Also a residence for the physician in charge, boatmen's house, stables, etc., all in good condition and neatly kept. The station is connected by telephone with the city. There is no provision for the care of those detained for observation after exposure upon an infected vessel. The hospital facilities may be increased by the use of tents in suitable weather, and in case of emergency the old quarantine establishment now used as a small-pox hospital might be utilized.

The quarantine season extends from May 1 to October 31, and during this period an assistant resident physician is on duty at the station. All foreign vessels bringing passengers are required to stop for examination throughout the year. No attention is paid to the vaccinal protection of immigrants, unless small-pox is discovered on a vessel, and owing to this neglect repeated introductions of the disease into the interior have occurred through this port. Vessels are boarded in the harbor from a steam tug kept in constant readiness for that purpose. The depth of water at the quarantine anchorage is about twenty-two feet at low tide, and there is plenty of room to anchor vessels out of the track of commerce. There are no facilities as yet provided for the discharge and disinfection of cargo from an infected vessel, but additional facilities and proper appliances for disinfection are contemplated.

As a further precaution in the present emergency, I suggested the advisability of requiring vessels to submit to inspection by the government service at Capo Charles.

Virginia :

Dr. James D. Galt, the Quarantine Medical Officer of the Elizabeth river district, has furnished the following from Norfolk, under date October 20, 1885:

"In reply to your inquiries as made in letter No. 20,519, I would briefly state that the quarantine facilities of this port are ample. Situated on the Elizabeth river, itself an estuary of Hampton Roads, there is all the sea room necessary for an efficient quarantine. The quarantine station is abreast of Carey Island, five miles below the city, where the river rapidly widens into Hampton Roads. Vessels are invariably examined at the station, and are absolutely prohibited from coming up until inspected by the quarantine officers.

"There is nothing special about our method of disinfecting vessels, cargoes and the crew. The fumes of burning sulphur are usually employed. Sometimes, in the case of large sized vessels, chlorine, generated by the action of sulphuric acid upon common salt, is also employed below the water line. Vessels in quarantine are anchored at a safe distance outside the main ship channel.

"So far I have had no cholera-infected vessels to inspect. Should any such arrive, I would treat them on the same general principles of disinfection as other vessels, giving special attention to the thorough disinfection, or destruction, if necessary, of all clothing, bedding, rags, or any other materials which might act as fomites for the infection."

In response to a subsequent inquiry, asking what assistance or protection has been afforded by the quarantine or inspection maintained by the National Government through the Marine Hospital and Revenue Marine services, Dr. Galt writes that "while it does not relieve me from responsibility as the local quarantine officer, it is undoubtedly an additional protection to this city, and I would compare it in military phrase to a second line of entrenchments around us. This service is, as you know, maintained only during the warmer months, and was raised on the 10th inst. [Nov.] for the winter, so that I am now without its assistance."

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Subsequently, Dec. 31, the following information was furnished through Dr. Galt by Dr. F. M. Urquhart, of the Marine Hospital service: "The service has two quarantine steamers, the Woodworth and Manhattan, which are used for inspecting vessels. If any vessel is found infected it is carried to Fisherman's Island and quarantined, and the sick placed in hospital on the island. The hospital was built during the summer of 1884, and contains about twenty beds.

"Fisherman's Island is just off Cape Charles. A keeper and assistant remain at the hospital at all times, and extra help is employed in case of sickness. Two surgeons of the Marine Hospital service are detailed for the summer season (May to December), the one in charge, the other as assistant. The vessels inspected are all foreign vessels and vessels from the southern ports of the United States. Every vessel is thoroughly inspected (each man inspected and cargo examined). If vessel is found infected, cargo is transferred to lighters and thoroughly disinfected (or thrown overboard), and vessel thoroughly cleansed, disinfected and detained in quarantine for a certain length of time."

North Carolina:

There are four ports of entry on the North Carolina coast, all having good and spacious harbors, namely, Edenton, Beaufort, Newberne and Wilmington. Of these the port of Wilmington is the only one of importance for quarantine purposes. Dr. Thomas F. Wood, Secretary of the North Carolina State Board of Health, writes as follows concerning quarantine at this port:

"In reply to your letter of inquiry No. 20,513, I would say: Our quarantine facilities are inadequate. The quarantine station is at the mouth of Cape Fear River, 20 miles from Wilmington. At this station certain vessels are required to proceed at once to the station for inspection. The quarantine officer is appointed by the Governor. He lives at the station and has immediate charge of all the details of disinfection, cleansing, unloading and police direction of the detainees.

"In all cases of doubt he submits his case to the advisory quarantine board, two gentlemen, selected by the President of the State Board of Health, who reside in Wilmington. Each vessel is treated upon its individual merits, and the rules are made elastic enough to apply to each case.

"Our means of disinfection are primitive. The vessel is unloaded, bilge is pumped out and fresh water pumped in until it is discharged clear and odorless, and the disinfection is completed by burning sulphur under closed hatches. The vessels are unusually small, and come in ballast, and as they are not numerous there is little difficulty in performing satisfactory cleansing. When there is doubt, the vessel is required to load at the station, the cargo being carried to it in lighters.

"Should a vessel put in with cholera on board, we would relieve the necessities and have her towed to Sapelo Station. If her crew was small we would keep her under observation, and treat the men on board. The quarantine hospital was burned two years ago, and the State has not rebuilt it."

Dr. Wood encloses a printed copy of the quarantine regulations, but as these are sufficiently summarized in his letter they are omitted from this report.

South Carolina:

The quarantine system of South Carolina is governed by the provisions of a state law, approved December 20, 1881, entitled "An act to render more efficient the quarantine service of the several ports of the State." Under this enactment the administration of quarantine at the port of Charleston is placed in charge of the Board of Health of the city, subject to the advice and supervision of the executive committee of the State board of health. At the other ports of the State quarantine remains under the supervision and control of this latter body, and the stations at Georgetown on South Island, at St. Helena entrance on Buzzard's Island, and at Port Royal on Paris Island, have received special attention since the danger of cholera importation became imminent. Many of the buildings have been repaired, and new ones have been erected on the site purchased last year on Buzzard's Island.

The following regulations—which are uniform with those in force at the Georgia quarantine stations, so far as relates to foreign vessels—govern the quarantines of South Carolina:

I. On and after the opening each year of the National Quarantine station (Sapelo Sound), all vessels from infected or suspected latitudes arriving with sickness on board, or having had same during voyage, must be directed by the pilot to proceed to said National Quarantine station.

II. Any vessel arriving at this port bearing the certificate of the National Quarantine Officer, must be brought to anchor at the quarantine station, and there remain until released by the order of the board of health.

III. During the closure of said National Quarantine station, all vessels such as above described, must anchor at the port quarantine station, under personal direction of the quarantine officer.

IV. Vessels from any foreign port direct, or via American ports, with or without sickness on board will, during the entire year, be compelled to anchor and remain at the quarantine station until released by written permit of the quarantine officer.

V. All vessels arriving at this port with sickness on board, or having had same during voyage, will, at all seasons of the year, no matter from what port, either American or foreign, anchor at the quarantine station, and there remain until released by order of the Board of Health.

VI. Vessels from infected or suspected latitudes, will, during the entire year, be required to discharge any and all ballast at the quarantine station, or such other place as may be designated by the health authorities, in the harbor under water; to have bilges and timbers cleaned and sweetened, and from May 1 to November 1st of each year, be subjected to at least two fumigations and such other disinfection as may be necessary, and be detained at least fifteen days.

VII. On and after May 1st, and until November 1st of each year, and longer if the board of health so determine, all coastwise vessels or steamers from latitudes south of Cape Hatteras, other than those by inland route, must anchor at the quarantine station. Steamers and vessels from non-infected or non-suspected ports, will not be detained longer than necessary for the quarantine officer to satisfy himself of their perfect sanitary condition. Vessels from infected or suspected latitudes will have to comply with section VI, be fumigated at least twice and detained at least fifteen days.

VIII. Coastwise steamers and vessels arriving at this port by inland route, from latitudes south of Cape Hatteras, between May 1st and November 1st, and later, if the Board of health so determine, must be inspected and given permit by the quarantine officer, before the landing of either passengers or freight.

IX. From May 1st to November 1st of each year, no vessel from an infected or suspected latitude will be allowed to either lighter or bring cargo of fruit up to the city.

X. Pilots must, in each case, before boarding, make inquiry as to the sanitary condition of vessels; in no case must they board if the vessel has sickness on board, or has had same during voyage; in such cases they must either direct to Sapelo Quarantine station, lead the vessel in, or have their small boat hoisted alongside, clear of the water, and in this way pilot the vessel in.

Dr. H. B. Horibeck, City Registrar and Secretary of the Charleston Board of Health, furnishes the following information concerning the station at the port of Charleston:

The station at Fort Johnson, on James Island, is about two miles east from Charleston in the harbor. The buildings comprise a fever-hospital and pest-house, offices, etc. There is a fine and commodious wharf, also boats for boarding purposes, under care of a quarantine officer, and a guard boat. Service is maintained from May 1st to November 1st every year, to prevent unauthorized communication with the Station. This service is also continued from November to May when necessary. Vessels are inspected at the station in the stream. They are fumigated with sulphurous-acid gas, and disinfected with the bi-chloride-of-mercury solution. Cargoes of fruit from infected ports are not permitted to go to the city from May 1st to November 1st, and certainly no other cargo until it has been taken out of the ship at the station and fumigated (see quarantine regulations.) Vessels arriving pass within a few hundred yards of vessels detained at quarantine. No vessel from a cholera port is allowed to come in, but is ordered to Sapelo. Should a vessel have either cholera or yellow fever break out at quarantine it would be sent to Sapelo instantler, or on the next tide—that is, certainly within twelve hours."

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Georgia :

Dr. J. T. McFarland, Health Officer of Savannah, furnishes the following in response to my letter:

"The quarantine station is located seaward of the city, distant between fourteen and fifteen miles, upon an oyster-bed shoal; this shoal is entirely surrounded by water and is covered about four feet in every flood tide. One short angle of the river channel runs within about three hundred yards of the station. All vessels from infected or suspected parts and latitudes are required to discharge ballast all the year round at this quarantine station. No ballast from the West Indies, or suspected localities north of Rio de Janeiro, has been allowed to be brought to the city of Savannah since 1876. This regulation was instituted as a guard against yellow-fever introduction.

"The facilities of the station are not as great as are required; an increase of wharfage and the erection of a storehouse are needed.

"All vessels are inspected at the quarantine station by the resident physician. Vessels in cargo, from foreign ports, seldom come to this port between May 1 and November 1. I believe this is the case at the other South Atlantic ports. During this season but one vessel in cargo (gunno) has arrived here. Coffee vessels have been in the habit of coming to this port, and have been required to undergo sulphur fumigation with cargo in place; the fumes of the gas do not injure the quality of the bean in the slightest degree. The cargo is then allowed to be taken by lighters to the city, while the vessel is detained at the station; her bilges and timbers are cleansed and disinfected with solution of sulphate of iron or bichloride of mercury, and, along with all clothing and bedding, she is then subjected to a second fumigation. The requirements having been carried out, and no sickness having occurred on board during detention time, permit is granted by the health officer for vessel to come to the city. The clothing on board any such vessel is subjected daily, during detention, to the action of fresh air, all bedding and clothing being exposed on deck of vessel and in some cases these are subjected to boiling. Fumigation with chlorine gas is frequently resorted to—always when there is any suspicion of small-pox infection.

"So soon as cholera became epidemic in Spain this past summer, orders were issued to the pilots of this port, not to board, but to direct to the Sapelo Quarantine station, any and all vessels arriving from ports infected with cholera. This National Quarantine station is distant only about sixty miles from the mouth of the Savannah river. Recently orders have been issued allowing pilots to lead to the port quarantine station any vessel from the Mediterranean coast, when such vessel has not had death or acknowledged infectious disease aboard during her voyage. This change of order was made in consequence of the decrease of cholera in Europe. These vessels were ordered to the National Quarantine station because they were all deemed entitled to thorough cleansing, and the health authorities of Savannah decided that if cholera did make its appearance on board any of them while having the clothing, bedding, etc., attended to, it would be decidedly preferable to have them away from this port. Vessels arriving at this port from yellow-fever latitudes are not boarded by the pilots. Such vessels are led into quarantine grounds; if they have not had sickness on board during voyage. If they have had sickness on board during voyage, which the captain acknowledges to have been suspicious, he is directed to the Sapelo station. If any vessel arrives at the port quarantine station and it is determined after investigation that she has had infectious or contagious disease on board, she is immediately ordered to leave the port, and is directed to the National Quarantine station. This refuge is unquestionably a very great safeguard and help to this portion of the Atlantic coast, and in helping and protecting us it protects the country at large.

"Should a vessel arrive at this port with cholera on board, and the National Quarantine station be closed, the ship would be placed at the greatest distance from line of travel (say three-fourths of a mile) and guard boats, with most reliable crews, would prevent any communication with or from her, excepting the quarantine physician, who would have to remain and look after the sick. Telegraphic communication would be opened at once with the authorities at Washington, asking the immediate opening of the National Quarantine station. If such station was opened the vessel would be sent there. If it was not opened the health authorities of Savannah would have to assume the responsibility and do the best in their power to prevent the spread of the disease.

"In closing I cannot refrain from an expression of condemnation and protest against the unreliability of the ordinary bills of health issued by some consuls of the United States. They are worse than useless,—they are dangerous. It is a frequent occurrence that clean bills of health are issued by them at ports where deadly epidemic diseases are prevailing. There should be some remedy for such pernicious and questionable conduct. Again, I know positively that steamships, from districts of Spain affected terribly with cholera, have been admitted into one of the largest ports of the United States, during this season, without the slightest attempt at fumigation of the clothing of seamen, or cleansing of vessels, the statement being made to me in official correspondence, that as no sickness had occurred during the voyage it was deemed unnecessary to use any precautions, and that this would be the line of action pursued in the future at that port."

Dr. Jas. S. Blain, Health Officer of Brunswick, answers:

1. The quarantine facilities of Brunswick are not so perfect as I would like to have them; but they have proven sufficient to protect this city from all epidemic infectious and contagious diseases since the yellow-fever epidemic of 1876.

2. I inspect all vessels at a distance of from four to ten miles from the city. All vessels are inspected before permission is granted to proceed to the city.

3. Vessels are purified and disinfected, first by the discharge of all ballast or cargo; secondly, the planking along the keelson is taken up, all filth collected in the limbers of the vessel taken out, and the vessel thoroughly washed and pumped out, salt water being used until the vessel is perfectly clean; thirdly, a strong solution of carbolic acid and sulphate of iron is applied to the whole interior, and the vessel is then fumigated by burning from 100 to 300 lbs. of sulphur in the cabin, fore-castle and hold of the vessel. All bedding and clothing of the crew is subjected to cleansing and disinfection. All infected or suspected vessels are detained ten days after cleansing, then if no case of disease appears the vessel receives a permit to proceed to the city.

4. The quarantine station is four miles from the city; it is not out of the line of travel, but no intercourse with vessels in quarantine is permitted.

5. All vessels with sickness on board, and all vessels from cholera infected or suspected ports whether or not having sickness on board, are sent to Sapelo Sound. All pilots and steam tugs on this bar have permanent instructions to order all vessels with sickness on board or from cholera-infected ports to Sapelo Sound. Pilots are not permitted to board such a vessel, but are instructed to direct or conduct them to Sapelo Sound. After discharge from the National Quarantine station, all vessels are again inspected at this Quarantine station before receiving a permit to proceed to the city.

Florida:

Notwithstanding its extended coast of nearly 1,200 miles, Florida has few harbors inviting foreign commerce, and except Fernandina and Pensacola, the relations of its seven ports of entry to the interior are limited. A State enactment approved February 16, 1855, provides for the appointment of county boards of health which are clothed with full power to act in regard to all matters pertaining to quarantine, to appoint a port inspector and other officers, to declare and establish quarantine and provide rules and regulations for its enforcement, and "after the establishment of any quarantine against any port or place any person violating the same shall be deemed guilty of a felony, and upon conviction thereof, shall be punished by a fine of not more than five hundred dollars, or by imprisonment in the state penitentiary not more than one year."

Under this law the quarantine of the port of Pensacola is now administered by the Escambia county board of health. The station is on Santa Rosa Island about nine miles from the port, and is described by the quarantine physician, Dr. White, in reply to my inquiries addressed to Dr. R. B. S. Hargis, as being supplied with "all the buildings necessary for quarantine purposes. Vessels are inspected at the station. Vessels detained are required to discharge all ballast, and after discharge of ballast, the vessel is thoroughly cleansed and washed in all its parts, then fumigated, using 12 pounds of sulphur to every 100 tons registered, the fumigation lasting 12 hours. After fumigation, a saturated solution of copperas is poured through the air-streaks, between each timber, running down to

bilge; lime water (whitewash) used in same manner. The entire hold is then whitewashed, lime put in bilge to the forecabin, with bedding, clothing, etc., under the same process of cleansing, fumigation, etc., the cabin receiving same attention.

"It is not probable that a vessel with cholera on board will arrive at this station, as all vessels arriving outside the entrance of the port upon which any contagious, infectious or pestilential disease occurred during the voyage are sent to Ship Island, the pilot co-operating with the local authorities in directing them to that station. Should, however, a vessel get to this station with cholera on board, and in such a condition that she could not be sent to Ship Island, the sick would, if possible, be cared for in hospital, and the vessel put in best sanitary condition, and such bedding, clothing, etc., as could not be disinfected would be destroyed."

Dr. Alexander, Port Physician at St. Augustine, writes that the quarantine flag for that port "stands about one and three-fourths miles from the city, where all vessels from a distance are inspected. Coasting vessels, or those plying between this and near ports, are allowed to come to the wharf for inspection, provided there is no sickness on board; if there is, then they share the quarantine ground as all others. Even upon coming to the wharf, no communication is allowed until inspected. Our pilots are required to learn from the captain, before boarding a vessel, whether she is from a suspected port, or has on board a suspected case. In the first case, she is brought with as little contact as possible inside the harbor, there anchored and report made to port physician and board of health. If sickness is on board, she is directed to proceed directly to Sapelo Sound refuge station without boarding or entering harbor here.

"Should necessity demand the treatment of a vessel, we would use the disinfectants recommended by the National Board of Health and adopted generally, viz: sulphur, sulphate of iron, carbolic acid, etc., subjecting cargo, clothing, bed-clothes, etc., to the same, and burn what might endanger after-disinfection.

"A vessel entering with contagious disease would not be allowed to remain one hour, as the condition of our harbor would subject the whole city to immediate infection; even should a vessel coming from foreign ports be in perfect health and condition, she must stop at quarantine ground, and all circumstances connected with her trip be well considered by the board of health before allowing her to come up.

"The coast map will show our unfortunate position as far as receiving or entertaining a vessel with disease on board. Our proximity to the high seas, the short and extremely narrow inlet, could but endanger us under the most favorable circumstances, as the small craft or pleasure boat would pass less than one hundred yards from the anchorage."

No responses have been received to repeated requests for information from Key West and elsewhere.

Alabama:

The coast quarantine of Alabama is limited to one port of entry—Mobile, and concerning this, Dr. Jerome Cochran, the State Health Officer, has kindly furnished, in response to my questions, the following succinct replies, which fully cover all the important points:

1. The Mobile quarantine station is chiefly an inspection station, but has the ordinary appliances of disinfection.
2. The entrance from the Gulf of Mexico into the Bay of Mobile is thirty (30) miles from the city, and vessels are boarded for inspection at this entrance.
3. Vessels from infected ports with no sickness on board are disinfected anyhow before they are allowed to approach the wharfs.
4. Vessels with any infectious sickness on board, or having had any cases during the voyage, are sent at once to Ship Island. Such vessels are not allowed to enter the Bay at all until released from quarantine by the Ship Island officials.
5. Mobile is thoroughly in earnest about her quarantines, and no infectious disease has been introduced through the quarantine into the city since the war. Such outbreaks as we have had have been the result of infection brought overland from New Orleans.

6. Any vessel having on board at the time of its arrival, or having had on board at any time during the voyage, yellow fever or cholera, would be sent to Ship Island at once, and not allowed to enter the bay at all until discharged from the station, and even then, if there was any suspicion that she still remained dangerous, she would be disinfected anew at our own station."

Mississippi:

The county boards of health of Hancock, Harrison and Jackson counties control the maritime quarantines of Mississippi. There is no direct foreign commerce, but Bay St. Louis has a large coasting trade with Mobile and New Orleans, and acquires some quarantine importance in consequence.

Louisiana:

The quarantine system of Louisiana is under the control of the State Board of Health, which is authorized by various acts of the State Legislature to fix the duration of quarantine and to make and enforce all necessary regulations, to contract for building, employ persons, etc. At its discretion the Board may at any time cause the detention at the quarantine stations for disinfection, fumigation and purification, of any or all vessels from ports in which yellow fever usually prevails or from ports where other contagious or infectious disease is reported to exist. Quarantine stations are established by law on the Mississippi river not less than 70 miles below New Orleans, at the Rigolottes—the entrance to Lake Pontchartrain—and below Morgan City on the Atchafalaya. But the State Board is also empowered to establish additional stations upon any of the approaches to the city of New Orleans in its discretion.

Under this latter authority the present Board has recently established a refuge station in Pas a L'Outre, some 28 miles below the original station, which latter is on the right bank of the Mississippi 75 miles below New Orleans. A boarding station is also maintained at Eadsport at the head of the jetties.

Accompanied by Dr. Joseph Holt, President of the State Board, and to whose indefatigable energy the recent practical improvements are mainly due, I made a personal inspection of the Mississippi river stations on the 15th, 16th and 17th of July last, and witnessed the inspection of vessels, the disinfection and treatment of an arrival from an infected port—a 2900-ton iron steamer; inspected another which had been treated two days before my arrival and was not yet released; examined the appliances for disinfection, etc., and the buildings, hospitals, warehouse and other items of the quarantine plant. I am, therefore, enabled to endorse from personal observation the claim made that this is the most thorough and vigorous system of sanitary quarantine which has ever been enforced for the protection of a port from the introduction of foreign contagion into this country—if not in the world.

Beginning with the arrival of a vessel in soundings she is met by the pilot, who cooperates with the quarantine authorities and is frequently accompanied by the medical officer from the boarding and inspection station at Eadsport. This officer examines the ship's log and receives a sworn statement from the captain as to the sanitary history of his vessel and her voyage, beginning at the port of departure. All on board are mustered and carefully examined for cases of suspicious sickness. If the vessel be found in good sanitary condition and free from infection she is allowed to proceed up the river, but reports at the upper quarantine station for a second inspection. If from a non-infected port, she is now given free pratique and proceeds to the city. If from an infected or scheduled port, or if any suspicious development has occurred in the interim after first inspection, she is either subjected to treatment at the upper station or sent below to the refuge station, as the circumstances demand. For example: A short time before my visit a Mexican steamer had arrived; she was inspected at the boarding station and all hands mustered and examined as usual, without detecting any suspicious illness. After she had been allowed to depart the pilot reported that a sick man had been roused from his berth to be mustered with the crew. The fact was at once telegraphed to the upper station, and on the arrival of the vessel the man was found to be suffering with what proved to be yellow fever. The vessel with the sick man on board was at once sent down to the refuge station for necessary treatment, entirely out of the track of commerce.

If a vessel on first inspection be found infected she is not allowed to proceed up the river, but is at once sent to the refuge station, the sick are removed to the hospital and the vessel is treated as hereafter described. After being thoroughly cleansed and disinfected, she is then sent to the upper station, where the compromised passengers and crew are subjected to a quarantine of observation during the usual period of incubation—depending upon the character of the disease. For the accommodation of these the large government warehouse is utilized. Meanwhile, the vessel may be allowed to proceed to the city in charge of an acclimated crew, or her cargo may be sent up on lighters—at the discretion of the quarantine authorities.

There is one medical officer on duty at the boarding station, one at the refuge station, and two at the upper quarantine—together with the necessary guards, boatmen, stevedores, nurses and other employes. All the stations are in telegraphic communication with each other and with the office of the State Board in New Orleans.

The following extracts from recent letters of Dr. Holt, written me since my visit, sufficiently explain the other details of the present quarantine administration for the protection of the Gulf gateway to the Mississippi valley. Improvements in minor points have since been made, and others will undoubtedly follow as experience demands their necessity. Under date of September 8th Dr. Holt writes:

The system comprehends two stations. The Lower Station, for the reception of infected vessels only, is situated at Pas a L'Outre, an unused outlet of the Mississippi. The isolation of this place is complete, while affording anchorage to vessels of any tonnage. As soon as a vessel arrives in this station the sick are removed to the hospital, where every provision is now made for their proper entertainment and treatment. Preparatory to the disinfection of a vessel, persons are removed ashore and detained there until this process is thoroughly accomplished.

Pending the construction of a receiving wharf and warehouse, the freight, when the requirements of disinfection make it necessary, is discharged into barges, and every part of the vessel is then subjected to thorough treatment. This consists in cleansing of the bilge, and flooding it with bichloride of mercury in solution, one part to one thousand of water. All surfaces within the hold or belowdecks are freely wetted with the same solution applied as a spray from a large watering rose, similar to those used in garden watering-pots, supplied through a two-inch hose, from an elevated tank on the wharf, or from a tank by means of a powerful hand-pump aboard the quarantine tug-boat. The freight in the barge or after its return aboard ship, is subjected to the protracted action of concentrated sulphurous-acid gas.

This is applied in the following manner: Aboard the tug there is a compact battery of twelve furnaces for the rapid combustion of sulphur in large quantity. The furnaces measure each 3 feet 6 inches in length by 12 inches broad and 7 inches in height, and contain, each, a cast-iron pan 3 feet long, 1 foot wide and 2 inches deep. These furnaces open into a large reservoir, to which is connected a driving or exhaust fan capable of displacing about six thousand cubic feet of air per minute. It is driven by an engine which derives its steam from the tug boilers. The sulphurous fumes are conveyed to the close barge or into the hold of a ship through a tube of galvanized iron, jointed in the manner of a stove pipe, twelve inches in diameter, and of a length necessary to reach any part of the ship required. We have now substituted for this a hose of asbestos cloth. The vessel is detained at this station until there is every assurance of her being no longer infected.

The Upper Quarantine Station, situated on the left bank of the Mississippi, thirty miles above its outlets, is the regular station at which all vessels en route to the city are required to stop and undergo inspection. Those hailing from inter-tropical, American and West Indian ports, and from all the ports of France, and from the Mediterranean, are subjected to the process of disinfection with the mercuric solution and the sulphurous fumes described. Every article of ship's bedding, etc., sailor's luggage, clothing and baggage of officers and passengers is taken ashore, where, on the wharf, it is wetted with the disinfectant solution.

Not having as yet satisfactorily completed our drying chambers this part of the process is still inconvenient. It is desirable that all of these articles should be dried out and

returned aboard ship as early as possible. In the meantime the vessel has been treated by the disinfectant wetting in every part and every particle of the atmosphere heretofore contained in her has been displaced by the sulphurous acid gas.

Vessels, together with their cargoes, officers, passengers and crew, coming from ports infected with yellow fever, are compelled to remain in quarantine a period of five days from moment of arrival, for observation, in order to give a reasonable assurance against the presence of the disease in its incubatory stages.

"The entire treatment of a vessel to prevent the introduction of cholera, yellow fever or small-pox is so exacting and so rigorous as to occasion no little grumbling on the part of those who must undergo it. This is particularly the case with officers and others aboard Mexican, Spanish and Italian vessels. These persons resent any effort at sanitary treatment as a personal affront while, in fact, they most require it. They are utterly without feeling and indifferent as to whether they convey to our port cholera, yellow fever or the plague. The Americans, English, French and Germans are reasonable in this matter. I mention this as a simple matter of experience in regard to nationalities, as we have to deal with them in quarantine.

"Our quarantine methods represent the introduction of a system of maritime sanitation which has already suggested many particulars of improvement and has opened to our view a broad field of sanitary enterprise far wider in its possibilities of good—first in giving the highest attainable quarantine against the introduction of pestilential diseases, and, secondly, in removing foolish and untrustworthy restriction, destructive of international commerce and travel. We have demonstrated by practical experience that the entire plan of treating ships in quarantine, or maritime sanitation, can be operated at a very moderate cost in ports doing a small business in shipping."

The following passages from the letter referred to are of special interest:

In using the bi-chloride of mercury, we know that we have one of the most powerful of all the germicidal agents. Practical test in municipal disinfection and in quarantine has demonstrated its absolute freedom from injury to those having to do with it. In the operation of maritime sanitation, our employes have been wet with the solution from head to heels and for hours at a time, without having as yet shown the slightest evidence of mercurialization. The clothing and other baggage of passengers and crew have been soaked in it without the slightest injury to persons or fabrics. Injury to the latter has always been due to the water and not to the chemical. The decks, cabins, bunks and every available part of the vessels have been freely drenched with the solution without injury.

The sulphurous-acid gas, used as the displacing agent of the atmosphere below deck, has long since proved itself the most reliable gaseous disinfectant and the least injurious to cargo of any yet tried. As applied in our quarantine, it is like turning loose a volcano into the hold of a ship. The amount of sulphur used on any one vessel varies from one hundred and fifty to nearly three hundred pounds, so applied as to displace with immense force every particle of air contained in the bilge, between the planking, or skin, and ceiling, in all parts of the cargo and dunnage. So searching are these fumes under the operation of the law of the diffusion of gases, favored by high pressure and rapid motion of currents, that a bowl of rain water, buried in the heart of a cargo of coffee, seventy-five feet distant from the conveying hose, was found distinctly impregnated with sulphurous acid. The effect upon the coffee itself, when dry and in good condition, was not observable. By getting the hose well into the dunnage, we can now treat a cargo of coffee with a thoroughness never before contemplated, and without the extra expenso to shippers or consignees of a dollar, as against from five hundred to eighteen hundred dollars in times past, when quarantine treatment involved discharging and reloading cargo, and the employment of a great gang of stevedores, barges, tugs, etc., and even then the disinfection was utterly worthless, as proven by the subsequent appearance of yellow fever on the ship in port. If recent observations on the destructive influence of mineral acids, even greatly diluted, on the cholera virus are true, then we have in this agent the most efficient adjunct to the mercuric solution.

As an instance of unexpected difficulties met with in practice, the amalgamating powers of the mercury salt on pumps, fittings of hose, nozzles, spray roses, etc., presented

for awhile a most formidable difficulty, finally overcome in a simple and economical way. The rapidly destructive effect of the heated sulphurous-acid gas upon all flexible hose of organic composition, compelled us to adopt the galvanized iron tubing, heavy and excessively awkward in use. This I have completely overcome by having had manufactured a close-woven, twilled or corduroyed asbestos cloth. While a perfect non-conductor of heat, this material is abundantly light, and is proof against acids or heat.

Under date of November 11, 1885, Dr. Holt writes: "In reply to your letter No. 20,854 I have the honor to state that we are maintaining a careful guard in the inspection of all vessels from Mediterranean ports. The process of bichloride disinfection is enforced, however perfect the health record and clean the bill of health, including a careful attention to bilge. The only modification in the full force of treatment is the omission of the atmospheric displacement by the sulphurous blast. This feature of our system was discontinued November 1, the end of our regular quarantine season.

"We are rapidly constructing an immense heating chamber, supplied with a double steam coil from a twenty horse-power boiler. The builders (Chicago) insure the easy and speedy attainment of 250° F. This will be used in addition to the bi-chloride mercury wetting. Any vessel not giving proof of continued good health or, in other words, showing any ground for suspicion, will be remanded to the lower station, where she will be subjected to prolonged and vigorous treatment.

"The new system has paid out of itself every dollar of running expenses. We will open it in perfect working order as to every detail early in May next. We are fully impressed with the necessity of maintaining vigilance in regard to cholera."

Texas:

The quarantine system of Texas covers a coast line of some 500 miles, extending from the mouth of the Sabine at the Louisiana boundary to the mouth of the Rio Grande. Upon the recommendation of Dr. R. M. Swearingen, the State Health Officer, the law has recently been changed so as to relieve local boards of health of the responsibilities of this coast quarantine, and the Governor is authorized to appoint State quarantine officers, and has sole control of them in the enforcement of the quarantine laws. This change was inaugurated in the spring of 1883, and stations have since been established and equipped at the six ports of entry, as follows:

At Brazos de Santiago, near the mouth of the Rio Grande, and covering the port of Brownsville, the commercial gateway to the lower valley.

At Aransas Pass, covering the gulf entrance to Corpus Christi bay.

At Pass Cavallo, the entrance to Indianola.

At Velasco, at the mouth of the Brazos river.

On the east end of Galveston island, for the port of Galveston.

At Sabine Pass, the terminus of the Texas Trunk railway.

Of these stations, that at Galveston is by far the most important, and its quarantine equipment is described by Dr. Swearingen as consisting of a steam tug fitted up with hot-air chambers and modern appliances for the disinfection of a vessel and cargo; a disinfecting warehouse with a capacity for treating 4,000 sacks of coffee at one time; and a station house—the whole plant representing an outlay of about \$55,000.

The station is on the east end of the island, about two miles from the city. Vessels from suspected ports are inspected beyond the bar, ten or twelve miles southeast of the station, and are detained there, if considered dangerous, until the exact facts are determined. If actually infected, they are not permitted to cross the bar, but are ordered to the Ship Island refuge station. If from an infected or interdicted port, a quarantine of detention of twenty days is rigorously enforced, during which period the cargo may be removed by lighters to the disinfecting warehouse, and the vessel be suitably treated. From May 1 to the close of the quarantine season in November, 1884, 939 vessels were inspected at this station, and 17 of these were subjected to the 20 days' detention. All vessels are inspected coming from south of 25° north latitude, and the enforcement of the regulations results in a practical exclusion of vessels from Mexican, Cuban and Brazilian ports during the summer and fall.

* Cholera was introduced into this country through this port in December, 1848, and in February, 1873.

Yellow fever is the disease most dreaded, and the quarantine system has been framed and heretofore administered with reference to its exclusion. The Mexican authorities have cooperated by establishing a quarantine at Bagdad in aid of the station at Brazos Santiago covering the lower mouth of the Rio Grande, and have adopted the same rules and regulations as those enforced at the Texas ports.

An inspection of transatlantic steamers with reference to cholera is now maintained at the six Texas stations and will be continued throughout the winter. As late as November 10th of this year there were several steamers from cholera-infected ports on the Mediterranean detained in quarantine off Galveston. The vessels are not allowed to come to the wharf, but are unloaded and loaded again by lighters.

A communication from State Health Officer Swearingen to the Governor of the State, commenting upon the efforts to establish an international quarantine, incidentally but fully sets forth the principles upon which the Texas quarantine system is based.

"Another very material variance between the authorities of the State and those of Mexico, is the length of time thought to be necessary for vessels from infected places, or places liable to infection, to remain in quarantine before granting them free pratique. The Mexican Congress of Hygiene limits the period to ten days, for what they are pleased to designate 'the rigorous quarantine,' while in Texas twenty days is the universal rule.

"If we had disinfecting warehouses at every port of entry, and steam tugs supplied with powerful exhaust fans that could drive out the impure air from the holds of ships, and immediately after forge into every nook and crevice germicidal gases, the ten days' period of detention would probably be sufficient; but without these appliances of purification, a longer time unquestionably gives greater security.

"In making the above declaration, I do not lose sight of the fact that an infected vessel, without treatment of any kind, at the end of twenty, thirty or even sixty days quarantine, is possibly more dangerous than on the first day of arrival. The history of yellow fever gives abundant evidence that the poison does not retain its infectious quality for a long period when exposed to pure air, and that its proliferous properties are lost. The reverse is equally true. In warm, moist, impure air, its infectious quality seems to have no limitation, and of course such condition must favor its multiplication. With these facts conceded, the corollary is unavoidable, that the number of germs will increase when left undisturbed in the hold of a vessel, where all these favorable conditions are found. Without a warehouse for transferring goods, we cannot, in ten days, by opening every aperture for ventilation, by shifting cargo, pumping out bilge water, and the free use of germicidal gases, so disturb the condition of things as to pronounce the ship, crew and cargo innocuous.

"Again, all persons are not equally susceptible to the poison of yellow fever, and the period of incubation does not usually commence the first day of exposure. If such was not the case every unacclimated person in an infected city would be down about the same time, and epidemics would be confined to a few days, instead of a few weeks. Assuming, then, that the cargo of a ship is infected, and that it will take ten days for the crew to discharge it, the probabilities are that with the majority of them the period of incubation would commence on the eighth, ninth or tenth day, instead of the first, second or third day, after the work of discharging had exposed them to infection. It follows, then, that a ten days' quarantine, when each day brings additional exposure to those who must handle the infected goods, offers every opportunity for the germs of yellow fever to be inoculated before the period of detention expires, and for the denouement to be made afterwards. * * *

"Twenty days quarantine for ships from interdicted places, ten for handling cargoes and ten more to give time for incubation, has been the rule so long governing the ports of Texas that it might be properly classed among the unwritten laws of the State. It is a conservative period, a kind of half way chronological station between the opponents of quarantine on the one side, and the advocates of total non-intercourse on the other. Under that rule we have had no epidemic, nor have our commercial relations been seriously impaired by it. The guarantee given of freedom from infectious diseases more than compensates for the losses sustained by a policy that must necessarily divert certain currents of trade into other channels.

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"The people of Texas, satisfied with the system under which they have prospered for so many years, will be unwilling to take new departures, until the etiology of, yellow fever is more thoroughly comprehended, and science discovers more powerful agents for its destruction than we now possess. With due deference to the distinguished sanitarians who compose the Congress of Hygiene in our sister republic, we could not accept the ten days' period of detention 'as a base for any agreement that might be entered into.'" * * *

Since the date of the letter from which the foregoing extracts are made (September, 1884) the "appliances for purification" have been furnished at the Galveston station. But Dr. Swearingen remarks in a recent letter to me, "although we have (at Galveston) every facility for inaugurating a quarantine more in harmony with the views of sanitarians, our people are not yet prepared for experiments."

As to land quarantines, Dr. Swearingen says: "Railways in Mexico make it possible for persons, freight, etc., to be transported from Vera Cruz to any city in Texas within five days, via El Paso or Laredo. Quarantine stations for the first time were this year established at those points. I have not attempted even an inspection service against small-pox in Mexico. It would be purely ornamental if I did so. The Rio Grande is a shallow stream, and from El Paso to Brownsville, by the river bed, is probably two thousand miles. Smuggling is carried on extensively, and the United States Government cannot prevent it. A quarantine officer at any point, would only be a notice to these organized bands and to the travelers of both republics, that they would have to cross the river higher up or lower down, 'only this and nothing more.'

"I can enforce with some reason an embargo against persons from Vera Cruz when yellow fever prevails there, for that city is the only nidus of infection, but when small-pox is all over the country, the extreme folly of such a thing as an inspection at railway crossings, is too apparent to be discussed."

Should cholera be introduced into Mexico and become epidemic there, the same conditions would then obtain with reference to the exclusion of that contagion. Dr. Swearingen adds, however, that Texas "will cooperate with the authorities of other States, in any defensive action against cholera importation that may be indicated by the American Public Health Association."

National Refuge Stations:

There still remains to notice the Refuge Stations in Sapelo Sound—off the coast of Georgia—and on Ship Island in Mississippi sound. These were originally projected by the National Board of Health as part of a system intended for the protection of the minor ports, by providing fully-equipped establishments for the care and treatment of infected vessels. Only the Ship Island station was completed on an adequate scale, and its chief importance as a safeguard to the Mississippi river and the port of New Orleans has been largely superseded by the establishment of a refuge station in Pas a L'Outre by the Louisiana State Board of Health.

These stations, Sapelo Sound and Ship Island, are now in charge of the Marine Hospital service, together with those in Hampton Roads and at the Delaware Breakwater, already described.

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