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YELLOW FEVER.

SINCE the beginning of the eighteenth century seamen have had occasion to notice that sometimes, after a visit to certain ports in the West Indies or in Central or South America, a mysterious something has entered their ships,— a something which may in a few days turn the vessel into a floating pest-house, or which may show no signs of its presence for days or weeks, and yet at the end of the voyage may promptly destroy a stranger entering the hold ; which might attack all the sailors sleeping on one side of the ship and leave the rest unharmed,— in short an invisible, impalpable entity presenting so many peculiarities in its results that it was the most natural thing in the world to imagine it as being endowed with the attributes of purpose and will, and to speak of it as "Bronze John" or "Yellow Jack."

This tendency to personify yellow fever is strong among all who are familiar with it, and physicians and nurses who have had much experience of its vagaries often speak of them, and of Yellow Jack, in much the same terms as they would speak of a highly disreputable but very interesting acquaintance,— a sort of Bohemian among diseases. Its course in a city has been compared to that of a tax collector passing from house to house along a street, often only one side of a street. It is usually stopped by prison or convent walls, sometimes affecting but a few squares, and again developing in a week into one of the most terrible of epidemics. Those who have seen most of it are as a rule least dogmatic in their assertions with regard to it ; and those who are well satisfied as to the nature of its cause, and are ready to demonstrate precisely how its occurrence or spread may be prevented, will usually be found to have had little personal experience of its eccentricities.

We have no reliable information as to the origin of yellow fever in time or space. / The majority of specific, contagious, or infectious diseases — such as plague, small-pox, measles, scarlatina, cholera, etc.— can be traced with more or less precision to Asia as a starting-point ; but Yellow Jack has no such history. His presence is first distinctly

recognized in the West Indies about 1690, prior to which date there is no satisfactory evidence of the existence in these islands of a pestilence presenting its peculiar symptoms, and harmless to the natives while fatal to the unacclimated. The old name of *Mal de Siam* is due to the rumor that the disease was brought from Siam to Martinique by the ship "Oriflamme;" but this rumor has no foundation, the disease on this ship having arisen after its touching at Brazil, where the fever was then prevailing. (It is the intertropical Atlantic pestilence, just as cholera is that of India, or the plague that of Egypt and Mesopotamia. It is a specific disease due to a specific cause,—a cause which can be packed away in a closet or bureau, and be preserved for months; or which may be carried in a ship, or in a trunk of clothing for hundreds of miles, retaining its specific powers. Many of its phenomena can at present only be explained on the assumption that this cause is either itself capable of growth and reproduction outside the bodies of the sick, or that it is the product of something which has these qualities. In other words, the cause may be a minute organism, somewhat like the yeast-plant; or it may be the product of such an organism, like alcohol.) Either of these may be comprehended under what is known as the germ-theory.) If the cause is an organism which itself enters the human body and multiplies there, it must exist in more than one form; and in the form in which it usually exists in the human body it is not capable of passing directly to another person. It is presumed that it usually enters the body through the respiratory process, and a period of from one to ten days elapses before the characteristic phenomena of the disease appear. This is known as the period of incubation. The cause of the disease has a self-limited period of existence, and this period is comparatively short if it is freely exposed to the external air. In the West India Islands the disease disappears at various ports for many years, and only reappears on a fresh reimportation of the cause.

If this cause is a minute organism, it must be one which requires peculiar nutriment for its continued reproduction. No such organisms have yet been found in the blood or tissues of those affected with the disease under ordinary circumstances. The photomicrographs of the Havana Yellow-Fever Commission sufficiently prove this. In the air of places known to be infected are found various sorts of organisms, the great majority of which are those occurring in all places where decay of organic matter is going on. There are also found certain crystals, the nature of which is not yet well ascertained.

Many of the phenomena of the disease resemble those produced by the venom of the cobra or rattlesnake ; and if such snakes could not live more than four months unless they could bite a human being, the analogy would be still more close. It cannot be cut short by any known method of treatment, but it is a preventable disease, standing in this respect between typhoid fever on the one hand and scarlet fever on the other. The power of fear in predisposing to the disease or in leading to its fatal termination is very great ; and there is much truth in the saying that "yellow fever kills those who are afraid of it, and small-pox those who are not." It rarely attacks the same person more than once, being in this respect like small-pox and other diseases which are not propagated by germs properly so called, but by minute particles of living matter known as bioplasts, and more specifically as contagia. Persons who have had the disease are usually said to be "acclimated ;" but this term is a bad one, since the word is often used in another sense. When Dr. Mitchell, the medical director of the Howards at Memphis in the epidemic of 1878, hastily dictated a telegram calling for "acclimated" physicians and nurses, a number of persons responded to the call who had been living for years in the South, and in that sense were acclimated, but who had never had the fever, and whose presence therefore was a burden rather than an aid. For the purposes of this article we will call persons who have had the fever *protected* persons. The phenomena of an outbreak of yellow fever, and the sanitary measures to be taken to restrict its spread, depend very much upon the relative proportion of protected persons present ; in fact, this element of the problem is so important, that, if it be unknown, all speculations as to the influence of temperature, moisture, filth, etc. upon the spread of the disease have little scientific value. The belief that the disease ever spontaneously originates from combinations of filth, heat, moisture, and the presence of unprotected persons is an exercise of pure faith with which science has nothing to do at present, as there is no evidence in its favor ; and certainly, if this combination could produce it, we should long ago have heard of its appearance in the tropical ports of Asia, or in ships visiting the inter-tropical Pacific, whereas it has never occurred at these points.

Sanitary shriekings about filth have had and still have their utility in calling public attention to the evils of uncleanliness of air, food, drink, or persons, but they soon lose their power when used by amateur hygienists as their sole stock in trade ; and this is becoming too much the case in this as in other countries. Wherever human beings

are collected for any length of time, and especially in cities and villages, filth is always and without exception present. Its presence in ordinary amount produces a very small probability of a very great danger ; and it is only when this amount is increased to an extent which rarely occurs, that this probability becomes any thing like a certainty. Many sanitarians suppose that the presence of filth is necessary for the reproduction and growth of the yellow-fever poison, and it is true wisdom on the part of a community to act as if this were correct ; yet it is very doubtful whether any city or village in the United States is so free from filth that the poison might not flourish under certain circumstances of temperature, moisture, and the presence of a large proportion of unprotected persons,— and the sanitarian is not justified in promising absolute immunity from epidemics of the disease as the result of civic cleanliness. {There are, however, two forms of decaying organic matter whose presence has been so often connected with outbreaks of yellow fever that they require special notice. The first is in decaying wood, as in old ships, piers, wharves, wooden pavements, etc. The second is the presence of large quantities of rotting and very offensive seaweed mixed with dead fish, animals, etc., which has immediately preceded several epidemics on the Gulf coast.}

As a rule we have no means of knowing whether the cause of yellow fever is present in a given room or locality, or in a trunk or box, other than the production of the disease in the human subject ; and it is therefore usually impossible to ascertain with certainty where or how any one affected has contracted his illness. In a few rare cases its presence may be detected by a very characteristic odor, which becomes extremely well marked in rooms suddenly abandoned and closed in the panic of an epidemic, and which contain the soiled clothing, bedding, etc. of persons who have died of the disease. On entering for the first time a house which has been thus abandoned and closed, the sense of the presence of a specific material poison is very vivid. If we could find some certain and easily-applied test for the presence of yellow-fever poison,— as for instance, a liquid which would change color upon being brought in contact with it,— we could then go on to investigate the nature of the poison and the best means of destroying it with good hope of success. At present we have no such test ; and hence we have to do a great deal of what is probably unnecessary work, in order to be sure of eradicating and stamping out the disease in any given locality. Attempts have been made by the Havana Yellow-Fever Commission to discover such a test by the

production in animals of some characteristic phenomena as a result of exposing them to the action of the yellow-fever poison ; but the results have been negative. Many allusions are made in accounts of different epidemics to accompanying sickness and mortality among domestic animals, and such mortality no doubt exists ; but it seems to be rather a consequence of the neglect to care properly for such animals, induced by sickness, panic, etc., than to any direct effect of the epidemic cause.

The means which are at our command for destroying this poison are known as disinfectants. The most important of these are fresh air, long-continued cold, heat moist and dry, aqueous solutions of certain salts of iron and zinc, scrubbing and cleansing, and certain gases or vapors. The fact that the occurrence of frost puts an end to the epidemic prevalence of yellow fever, and that in localities subject to annual frosts the disease does not as a rule appear the next year unless from fresh importation of the cause, long ago led to the suggestion of the employment of artificially-produced cold as a disinfectant. There is no evidence in existence as to the effects of cold applied for a comparatively short period of time ; but with modern improvements in refrigerating machinery it would seem worth while to try the experiment, if it could be performed at a reasonable cost. In the absence, however, of any test of the presence and vitality of the poison other than the production of the disease in man, there are very great difficulties in the way of trying such an experiment without incurring an unjustifiable risk. Supposing an infected vessel to arrive at New Orleans in July, and to be cooled down in every part to zero for eight hours, would it be prudent to allow such vessel to proceed at once to the city without further precautions ? Certainly not, since this would be to experiment on the health of the whole Mississippi Valley ; and the health authorities of the port, in view of the experience of the "Susquehannah" and the "Plymouth," would probably require the thorough cleansing and disinfection of the vessel,—and it would then be impossible to say how much refrigeration might have had to do with rendering the ship harmless. The experience of the "Plymouth" just referred to is far from demonstrating the inutility of cold as a disinfectant for yellow fever, since from the published accounts it does not appear that the bedding and clothing of the seamen were disinfected while on shore, and the whole matter of the application of artificial refrigeration as a means of disinfecting ships or cargoes is still *sub judice*.

The application of heat, either by means of a hot blast or by superheated steam, for the purpose of disinfecting a ship would present

greater certainty as regards the destruction of the poison, but has special inconveniences of its own which will prevent its use except in ships known to be infected. If the researches inaugurated by the National Board of Health during the past summer be continued, there is good prospect that we shall soon have at comparatively small cost some data that will enable us to speak positively and understandingly upon the merits of various disinfecting agents as regards the yellow-fever poison; and this is most desirable so far as regards shipping, for nearly every port has a different method of procedure at present, some of which are either inefficient or unnecessarily expensive.

| As regards clothing, bedding, etc., it is often urged that their destruction by fire is the best method of dealing with them. As a matter of fact the attempt to carry out such destruction has often resulted in a spread of the disease,—as in Memphis in 1878, where the clouds of smoke from the burning of infected bedding in the streets seemed to be almost literally the wings of the pestilence, so certainly did fresh outbreaks of the disease appear in the direction in which the cloud drifted. | This is due, not to the smoke itself, but to the currents of air caused by the heat, and to the disturbance of the infected material. The "golden rule" in dealing with such material during warm weather is not to disturb it while it is dry, but to saturate it with scalding water before moving it. In cold weather thorough ventilation and exposure of stuffs to the cold of three or four nights will render them harmless, and the more they are disturbed and shaken while thus exposed the better. The demand that at the end of the epidemic of this year the National Board of Health should expend forty or fifty thousand dollars in buying up and destroying infected clothing and bedding is made in forgetfulness of these facts; for such expenditure would be in the main a useless waste of money, even if it were expedient that the United States should undertake to provide clean clothes for people who need them. Heretofore there has sometimes been gross carelessness in leaving infected houses closed throughout the winter, and the epidemic this year at Morgan City may have been due to this cause. It is reported that a Jewish rabbi and his wife died in a house in that place in 1878. This house was then hurriedly deserted, leaving the bedding soiled with excreta as it was thrown off the dead, the remains of the last meal on the table, and the whole house reeking with infection. It remained thus until May, 1879, when it was opened and the contents sold at auction. Such negligence may almost be termed criminal, and the result was certain.

It is no part of the purpose of this article to comment on the pathology or the therapeutics of the disease, and we will pass at once to those practical questions with regard to yellow fever which are, or should be, just now of special interest to the people of the United States and to their legislators. These questions may be stated as follows :—

1. Can the occurrence of yellow fever in any locality in the United States be prevented, or its spread limited after it has occurred? — and if so, how?
2. What is the cost of such prevention, and how does it compare with the cost of an epidemic or with the value of the locality?
3. If the cost of such prevention is a wise expenditure, what proportion should be borne by the municipality, the State, and the United States respectively?
4. In case of neglect or refusal of any municipality to take the precautions generally considered necessary to prevent the occurrence of this or any similar disease, or in case such municipality takes unnecessary precautions which cause injury to individuals or the public without benefit, how far and in what manner is it expedient that the State should interfere to protect the surrounding country either before or after the occurrence of the disease in epidemic form?
5. In case of the neglect or refusal of both the municipality and the State to take action, how far, under what circumstances, and in what manner is it expedient that the United States Government shall interfere in order to secure protection to neighboring States?

These are very grave and difficult questions,—questions which will require the best scientific, medical, legal, and political information and resources which can be obtained, if they are to be properly answered. Dogmatic assertion is entirely out of place in such a discussion, since if we are to deal with the matter at all it must be tentatively, knowing that we must experiment and be ready to admit and repair the mistakes which will almost surely be made in attempting to secure the best results.

In reply to the first question, it may be said that physicians and sanitarians are almost unanimous in the opinion that the occurrence of yellow fever in the United States can be prevented, but that they differ widely as to the methods. Some believe that it can be effected by quarantine only; some that local cleanliness alone is sufficient; some, and these the majority, that both quarantine and cleanliness are essential. Before discussing these opinions it is necessary to define the sense in which this word “quarantine” is used.

The great majority of our readers probably have a vague idea that quarantine means a place where travellers are kept for a certain time, varying from one to forty days, for the purpose of seeing whether they will become sick. But we mean by quarantine that system of investigation used to determine the presence or absence of causes of disease in vehicles, persons, baggage, and goods passing from one place to another ; and the removing or destroying such causes if suspected to be present. In this sense quarantine does not necessarily include detention, or obstruction to traffic or travel ; it may sometimes be enforced on a train or steamer at full speed and without causing an hour's delay. Usually, however, a certain amount of delay is necessary, especially when yellow fever is in question ; but it is the object of sanitarians to make this delay as brief as possible. The necessity for such delay depends in part upon the period of incubation of the disease, in part upon the want of a test for the presence of the poison. When a person has been exposed to the influence of the cause of yellow fever, a certain time must elapse before it is possible to decide whether he will have the disease or not. Under certain circumstances, which as yet are not at all understood, a person having yellow fever may himself become a source of infection. This is not usually the case, and perhaps it never occurs in the temperate zone,—the usual source of infection being bedding, clothing, and other similar articles known as fomites ; but it is possible that it does sometimes happen, and that some such instances occurred in the epidemic of 1878, although the difficulty in distinguishing between the influence of the person and that of the clothing is usually insuperable. It follows that while at Northern ports there is little or no need of any detention of persons to guard against yellow fever, such detention may be advisable at our Gulf and South Atlantic ports. This period of detention, if it is to be enforced at all, should be such as to make up not less than the full time of five days from the date of the last possible exposure ; and from ten to twenty days are needed to obtain complete security. An exception should be made to this rule in favor of persons presenting satisfactory evidence that they have had the fever.

The principal danger however is in the ship, car, or other conveyance, and in bedding and personal luggage ; and, as we have no means of deciding that these are free from infection, we must treat them as if they were infected in all cases in which the possibility of such infection exists. This requires detention for sufficient time to unload the ship and thoroughly cleanse and disinfect it, and for disinfecting such

baggage and freight as may be considered dangerous. It should be distinctly understood, however, that detention of a ship is by itself not merely a useless obstruction to commerce, but that it may increase the danger of infection. The yellow-fever poison, or that which produces this poison, grows and multiplies outside the human body, thus differing from the poisons of small-pox or scarlet fever; and a ship but very slightly infected may, after lying for two or three weeks in the warm water and air of one of our tropical ports in summer, without having her cargo or ballast removed, and without being properly cleansed, become so saturated with the poison as to be extremely unsafe to approach. Yet this is the usual mode in which quarantine has been administered, and it is to this mode that the greater part of the objections to quarantine alone apply. These objections have been best summed up by Mr. Simon, whose remarks in advising the Privy Council of England upon this subject may be paraphrased and condensed as follows :—

Quarantine conducted with extreme rigor, and with the precision of a chemical experiment, will probably keep yellow fever out of any port of the United States not already infected, and in which the extremely difficult conditions can be fulfilled. A quarantine which is ineffective is a mere irrational derangement of commerce, and a quarantine of the kind which insures success is more easily imagined than realized. Only in proportion as a community lives apart from the great highways and emporia of commerce, or is ready and able to treat its commerce as a subordinate political interest, only in such proportion can quarantine be made effectual for protecting it. Against the efficiency of quarantine when enacted there operate some of the strongest of all law-breaking influences : on the one hand, instincts of contempt for the narrow self-protectiveness which it represents, and, on the other, those eager commercial interests which now mainly govern the world. Contraband of quarantine, like ordinary smuggling, is developed as soon as the inducements for it are considerable. Where great commercial countries are concerned, it can scarcely be dreamed that quarantine restrictions will be any thing better than elaborate illustrations of leakiness.

There is no system of quarantine compatible with the preservation of commercial intercourse with the West Indies, Mexico, Central America, and South America which will absolutely and certainly prevent the introduction of yellow fever into the United States ; or, at all events, which will do this at any reasonable cost. But it is perfectly possible, by a uniform system of quarantine which shall interfere with traffic and travel very slightly, much less in fact than the Mediterranean quarantines, to prevent such introduction in at least ninety per cent of the cases in which it would occur in the absence of such a system. This means that a certain number of epidemics can be thus

prevented, and a number delayed in their appearance for from one to six weeks, which is certainly a result well worth the comparatively small cost and trouble needed to secure it. But if ports within the fever zone are to rely solely on such a quarantine, or on any form of quarantine, even if one of entire non-intercourse, and in consequence neglect civic cleanliness, then such quarantine will prove a curse rather than a blessing. From the point of view of the sanitarian and the legislator, discussions about the germ-theory of yellow fever, and whether or not it can arise spontaneously, are of secondary interest. Everybody admits that municipal uncleanliness is a bad thing, and a very expensive thing,—so expensive that it is absolutely necessary to the business stability of a place that it shall be kept within certain limits, and this irrespective of any considerations of yellow fever. Every one also admits that the cause of yellow fever is portable. Now it should be distinctly understood that so far as quarantine is concerned the question is not as between quarantine and no quarantine, but between a rational system of quarantine and one that is not. Quarantine of some sort must be enforced against yellow fever by our southern ports: they are forced to this by their interest in keeping up their connections by boat and rail with the interior, no matter whether they wish to do it or not. It follows, therefore, that the object should be to secure both municipal cleanliness and a reasonable quarantine to prevent the occurrence of yellow fever at points liable to that disease. Into the details of the methods to be pursued to insure municipal cleanliness, as the sanitarian understands that phrase,—that is, the absence of filth from air, water, soil, and buildings, and not merely clean streets and alleys,—and also to secure such a quarantine as we have indicated as desirable, this paper cannot enter. They will be found in recent treatises on hygiene, and in the publications of the National Board of Health.

But what is to be done when the fever has passed the cordon and is found in a community? It is probably possible under such circumstances to limit its spread and to stamp out the disease, as the experience of the past year in the Southwest would seem to show; but the obstacles to so doing are great, and ought to be distinctly understood, and as yet the best methods of dealing with them have not been agreed upon.

The first is the difficulty of obtaining information as to the existence of the earlier cases in time to prevent communication with or from them. It is to the interest of many wealthy business men to

prevent the announcement of the existence of such cases, as matters now stand ; for the announcement of the existence of a case of fever in New Orleans or Mobile results in the establishment of local quarantines at once against those cities. Were such quarantines established only when really necessary, and on a uniform and reasonable plan, such concealment would be far less necessary and the motives to it would be much less powerful. On the other hand, if the inland towns in more immediate commercial intercourse with New Orleans could feel that they had reliable information as to the disease in the latter city, they would be much less fearful and much more judicious in their efforts to protect themselves than they now are. The concealment of the first cases of the fever which occurred in Morgan City last August, and the resulting epidemic, which could have been easily prevented had timely warning been given, illustrate one side of the question ; while on the other may be placed the local quarantine against New Orleans during the greater part of the summer, although there was no necessity for such quarantine for more than three weeks of the time, had it been possible to obtain reliable information as to the actual condition of the city. This is by no means generally understood, and New Orleans in particular has, prior to last summer, pursued what we consider to be a mistaken policy in this respect. Just as our ports establish quarantine during the summer against all vessels coming from West Indian ports regardless of the bills of health they may have, on the ground that no reliable information can be obtained as to the freedom of these ports from yellow fever, so a tendency to a similar action against New Orleans is being developed on the part of interior towns, and for the same reason. The mere fact of the existence of three or four cases of yellow fever in the city of New Orleans does not necessarily prove it an infected city, nor that commercial intercourse with it is dangerous ; although such existence would prove both as regards Memphis.

In New Orleans the great majority of persons are protected by previous attacks. It is therefore not uncommon to find that the disease does not spread in that city beyond the limits of one or two blocks. If these blocks are not in or near the commercial centres, and if a reasonable amount of isolation of the cases can be secured, they do not cause any danger, nor any good reason for the interruption of travel and traffic. But no amount of assurances to this effect given by citizens, physicians, or sanitarians of New Orleans will at present, nor for some time to come, give complete confidence to

the interior towns. The policy of concealment has been pursued so long and so uniformly, and its results have several times in the past proved so disastrous, that we can scarcely blame Pensacola or Galveston, Vicksburg or Memphis, for quarantining against New Orleans during the summer months. There is but one remedy for this, and that is to secure the fullest publicity; and to do this through persons whose competence and disinterestedness will not be doubted. All doubtful cases must be published at once, not concealed till doubt is no longer possible. It is far better to announce every case about which any one expresses any suspicion, with the results of the investigation, than to announce only those cases which are finally decided to be yellow fever. When this has been done for a sufficient length of time to teach people that the daily bulletin truly represents the situation, it will be very seldom that any inland quarantine will be enforced against New Orleans.

We have spoken of doubtful cases. Of these there are always many. The first cases in the season, especially, are very apt to be mistaken for simple remittent fever; and it is not till the physician finds that quinine does not have the anticipated effect, or his attention is called to the fact that though the temperature is high the pulse is relatively slow, or fatal symptoms appear, that he suspects that "Yellow Jack" is mocking him. A second obstacle which experience has shown to be a very grave one in the larger cities of the South and Southwest is the difficulty of securing isolation of the infected room, house, block, or district. The people are not educated as to its value and necessity. The persons to be isolated resist the measures as much as possible, and politicians and the press generally oppose it as involving unwarrantable interference with the liberty of the people. There is a certain class to whom the advent of a yellow-fever epidemic brings holiday and harvest, free rations and blankets; and they are vigorous in their assertion of the rights of all citizens to come and go wherever they please.

While it is probably possible, by skill and energy, to stamp out yellow fever within two or three weeks in any locality in which the people can be induced to do what is necessary for the purpose, it will nevertheless usually be found to be practically impossible to induce the ignorant, the idle, and the vicious, ranged as they are under the leadership of a few men whose immediate pecuniary interests are pre-eminent, to take the steps necessary to put an end to the epidemic, or to allow others to take such steps. It is necessary that this shall

be distinctly recognized by those connected with the management of an epidemic; for it is their business to give such advice and directions as can be practically carried out, not merely such as may be theoretically the best. It is worse than useless to prescribe a remedy that will not be taken, or to become angry or disgusted at opposition to sanitary police measures. It is in part because this opposition is to be expected, and because of the impossibility of controlling to any great extent the movements of the people in our cities, that we must advise the inhabitants of an inland town, in which the majority of persons are unprotected, to leave the place until the occurrence of frost. This depopulation of a place is a very costly process, but the only safe one for the majority under such circumstances. With reasonable care it can be effected without danger to the surrounding country, as was shown by the experience of Memphis in 1879. During the first week after the establishment of the fever over thirty thousand persons removed or were removed from the city, and no spread of the disease resulted. Of those who went into camps in the immediate vicinity, and remained there during the summer, not more than a dozen took the disease; and in every one of these cases it was traced to a visit to the city in defiance of the advice and orders of the sanitary authorities.

There are two cities in the United States in which it would not be worth while to attempt any such process of depopulation, because of the large proportion of protected persons in each; namely, New Orleans and Key West. Key West is really a sort of suburb of Havana; a large proportion of its inhabitants are native Cubans, and the disease has no terrors for them. The occurrence of epidemics of yellow fever in New Orleans depends so much upon the number of unprotected persons present in the vicinity where the disease first appears in any given season, that other factors are of very secondary importance as regards the city. The habits and ideas of the people are such that it is almost impossible to secure complete isolation of a patient, house, or block; nor are efforts to prevent the occurrence of the disease likely to meet with much sympathy among a large portion of the population. They have had the fever themselves and have no fear of it, and decidedly object to having their freedom to go and come, or to import or export goods, restricted for the sake of protecting comparatively few people who they think ought to make up their minds to have the fever and be done with it. If it were the interests of New Orleans and of her people only that were in question there would be

much force in this view ; but this is not the case. The inhabitants of the Mississippi Valley, at least as far north as Cairo, think that they have an interest in the health of New Orleans, and will not permit unrestricted intercourse with that city while yellow fever is known to exist there. It is not the question as to whether intercourse shall be restricted under such circumstances, but as to how it shall be restricted. Until very recently New Orleans has not learned this lesson, and has not been convinced that her best policy from a business point of view is to prevent the occurrence of the disease, and to seek to inspire confidence in the interior of the valley as to her sanitary condition.

If it be true, as is claimed by some persons, that yellow fever either spontaneously originates in New Orleans or is endemic there, and that its occurrence cannot be prevented by any system of quarantine, not even if pushed to absolute non-intercourse, it will then become a question for the interior towns of the Mississippi Valley as to whether their wisest course is not to insist upon supervision of their railroad and steamboat connections with New Orleans, commencing about June 1 and ending about Nov. 1, regardless as to the actual existence of the fever during the interval. If this be done regularly and methodically, little interference need be caused with commerce, and the principal objection is the expense. As there is no evidence worthy of consideration as to the spontaneous origin of the disease, and there is certainly very good evidence as to its transportability, and that its cause can remain for months shut up in a closet or trunk, it seems on the whole wisest to act as though the disease might be driven out and kept out of New Orleans ; and this is to be done by local sanitation, drainage, cleansing, and disinfection, and by a proper system of quarantine. The question as to the cost of quarantine and of local sanitation as compared with the cost of epidemics which might be prevented by them is one of great practical interest, but which admits of only an approximate answer. As we are considering yellow fever only, we will select the cities of New Orleans and Memphis to illustrate the problem.

The city of New Orleans contains in round numbers two hundred and ten thousand inhabitants. To put its maritime quarantine in proper condition as to buildings, boats, and other material would require about fifty thousand dollars, and to operate it thereafter an annual expenditure of about forty thousand dollars. A proper maritime quarantine establishment cannot be extemporized in an emer-

gency; it requires time and no small amount of money to organize and maintain it. This quarantine establishment of New Orleans should also protect the Gulf counties of Mississippi. There should be at once expended in the city of New Orleans, for sanitary engineering works, about one million dollars; while for local sanitation at least two hundred thousand dollars should be expended annually. Add to these sums about twenty-five thousand dollars annually for emergencies,—that is for stamping out the disease if it should make its appearance in the city,—and we may say in round numbers that the interest on six millions of dollars will keep the city substantially free from yellow fever (and let it not be forgotten that it will also keep it free from a number of other diseases which collectively are quite as important as the fever). This is about one dollar and a half annually per head for the entire population. The epidemic of 1878 cost the city of New Orleans about ten millions of dollars, without reckoning indirect damages due to interruption of business, which have been estimated as amounting to from five to ten millions more. The cost of this epidemic, therefore, would certainly have been sufficient to put the city into good sanitary condition, both as regards quarantine and civic cleanliness, and to keep it so. This subject of public hygiene is by no means a mere matter of gushing philanthropy and sentimental oratory; it is a plain, straightforward matter of business, and must be governed by financial considerations mainly.

Let us turn now to the city of Memphis, whose population we may estimate at forty-five thousand. In this city, also, at least one million dollars should be at once expended to put it in thoroughly good sanitary condition. There is much rotten wood-pavement to be removed, sewerage to be provided for, water supply to be improved, etc. After this has been done, an annual expenditure of about fifty thousand dollars will be required for sanitary purposes, and an annual emergency-fund of ten thousand dollars should be available. Memphis, then, requires the interest on about two millions of dollars to keep her free from yellow fever, to say nothing of the malarias, typhoid fevers, infant mortality, etc. which will be got rid of at the same time. This is about two dollars and a half per head annually of the whole population. The last epidemic cost Memphis ten times what was necessary to have secured its freedom from such a calamity; for we believe that Memphis might have been kept free from the epidemic, and that it may now be freed from a return of the disease. We may take it for granted that any good business man who owned the cities of New

Orleans and Memphis would find the annual expenditure for sanitary purposes of three hundred and twenty-five thousand dollars for the former city and one hundred and twenty thousand dollars for the latter a good investment, and pass on to the questions, Under actually existing circumstances, how can this money be raised? and, should the State or the United States, or both, contribute aid for the purpose? The city of Memphis is bankrupt and in the hands of receivers, and it cannot impose or collect a tax for sanitary purposes without a special act of the State legislature. This legislature will not meet in the ordinary course of events until the fall of 1880, whereas the money should be collected and used at once. Owing to the course taken by the legislature in financial matters, and for other reasons, there is much hesitation in calling an extra session; and the State itself would find it extremely difficult, if not impossible, to borrow money at present. The necessary funds must therefore be raised by direct taxation,—municipal, or State, or both; and this taxation must be upon real estate, which alone should bear the burden of sanitary improvements.

New Orleans is not in much better financial condition than Memphis, since there also the necessary funds can hardly be raised except by direct and immediate taxation. Such taxation is never a popular measure except during the almost immediate presence or threat of some great calamity; and usually the majority of voters who would be affected by such taxation are disposed to argue, that, as the measures of local sanitation and quarantine necessary to protect New Orleans or Memphis from yellow fever do not benefit these cities exclusively, nor so much as they do the surrounding country or other cities having commercial intercourse with them, therefore the State and the United States should contribute a portion of the funds required. Evidently this is a politico-economical question as to direct *versus* indirect taxation. Undoubtedly in a certain sense the country supplied by and supplying a city must support that city; but to require it to do this directly is to subsidize the city and give it an undue advantage over other cities,—of which they may justly complain, especially as they are to contribute the funds for such subsidy.

So far as the securing cleanliness, pure water, good drainage, and prompt and thorough removal of excreta and garbage are concerned, all will probably agree that these are duties of the city itself, and that it will pay the city to perform them. If it does not, the city is not worth preservation, and good business men would do well to abandon

it. The fact that very few cities in the United States do take all proper measures in this respect is beside the question. But it may be worth while to consider the plan adopted in Great Britain, by which the Government loans to a city, under certain conditions, the amount necessary to carry into effect plans for sewerage, drainage, or water supply, after such plans have been approved by the Local Government Board. In the present emergency, and in view of the fact that prompt action is necessary, might it not be justifiable for the United States to try the experiment of aiding Memphis and New Orleans in some such mode, provided it be legally possible for it to do so.

As regards the expense of quarantine, the question is somewhat different. Quarantine is like a chain, no stronger than its weakest link. When yellow fever is established at one of our ports, it greatly impairs the utility of quarantine against it at other ports, owing to the great difficulties in enforcing inland quarantine; and hence arises the demand for a national and uniform system. In discussing this question, it should be remembered, as above remarked, that it is not one of national quarantine *versus* no quarantine, but of national quarantine *versus* local quarantines.

Whatever may be individual opinions as to the inutility or inexpediency of quarantines, the great mass of the people agree with the old farmer, that "Yellow fever can't go anywhere unless yer tote it," and insist upon the prevention of such transportation so far as regards their own communities, at all events. If this is not done legally, it will be done illegally, spasmodically, and with utter disregard of the rights of travellers or of business men; and the shot-gun quarantines of the Southwest are the inevitable result of leaving the people to the influence of fear of the epidemic acting on ignorance and the instinct of self-preservation. As an educational measure, if for no other reason, it seems upon the whole desirable that the nation should undertake—at least, tentatively—the supervision of quarantine; and should attempt, by such supervision, to secure at least the minimum amount of precaution considered necessary, and at the same time the minimum amount of interference with commerce and travel. Theoretically, the United States should be able to make it certain that at each port or place reasonable precautions shall be taken to prevent the occurrence or spread of preventable diseases, and also to prevent unnecessary and unreasonable interference with communication between different ports of the country,—interference which, while nominally exercised for the preservation of health, may in reality

be dictated by the desire of injuring the commerce of a neighboring locality, or of disposing of an overstock of goods, or of inflicting annoyance upon some special person or corporation. If the United States cannot do this, it lacks one of the special characteristics of a civilized nation ; namely, the power of protecting its citizens as to their lives and liberties. Under existing laws, it is theoretically possible for the United States, acting through its National Board of Health, to compel State or municipal organizations to exercise a minimum amount of precaution against the spread of preventable diseases ; but it is not possible for it to prevent such organizations from taking excessive precautions, even to absolute non-intercourse.

The best practical remedy for this state of things is education of the people, until they shall know what amount of restriction is really necessary to insure safety ; and it seems on the whole expedient that the cost of this education should be borne by the General Government. It follows, therefore, that the United States should for a time bear a much larger proportion of the expenses of a quarantine system than it will need to do when the States and municipalities are equally well informed as to their duties, and as to their true interests. It does not, however, follow that the United States should carry out quarantine regulations directly through its own officers or agents. If it does so, it will effect little in the educational way. The question as to the proper methods to be pursued is practically a very difficult one, and the answer to it depends much upon that to be given to our fourth query ; namely, In case of neglect or refusal of a municipality to take the precautions necessary to prevent the occurrence of yellow fever or any similar disease, or in case the precautions taken are excessive or injurious, how far, and in what way, is it expedient that the State should interfere ?

It would certainly seem that the State should have the power to compel a municipality to do its duty, in a sanitary point of view, in the same way that the municipality should have the means of compelling the individual householder to abate nuisances on his premises ; but that, while the municipality should have actual powers of administration, the State should confine its work to supervision of the manner in which the several municipalities exercise these powers. As Mr. Jenkins remarks, "There is a difference between central supervision and central administration. The first is compelling others to do their duty ; the second is doing duty by means of others." The great difficulty in the matter is to decide in each case as to what are proper

and reasonable precautions in a sanitary point of view, or to provide a proper authority to make such decisions. The only practical test in the matter is that of expediency; and this test must vary according to location, climate, race, education of the people, etc. At the present time it would be impossible to carry into effect in Memphis the sanitary regulations which work well in Providence; nor can the work now being done by the State Boards of Health of Michigan or New Jersey be carried out in Arkansas or Georgia. These principles must apply in any decision as to the duties and powers of the General Government in relation to the public health in the several States. This decision depends on public opinion, which varies from year to year, but which on the whole has for the last twenty-five years been steadily tending to the point of view, that the United States should exercise whatever power may be needed to secure protection to all her citizens against diseases recognized as preventable. In saying that opinion has been taking this direction, it is not meant to assert that it has yet become so strong as to compel action on the part of legislators; nor is such action to be urged in advance of the growth of public opinion, except tentatively, and as an educational measure. The passing of sanitary laws, and the creation of Boards of Health,—local, State, or national,—will not insure action nor good results until the public is prepared to support such laws, and to consider the expense of their administration as a good and paying investment.

The practical questions before Congress and the country in this connection relate to two subjects, which, although often spoken of as one, are really very distinct; namely, (1) The propriety of having a national health-organization in the United States; and, (2) The advisability of having a national superintendence of quarantine, maritime or inland, or both. A provisional National Board of Health was created in April last; a so-called National Quarantine Act was passed in June, and five hundred thousand dollars appropriated to carry it into effect; and yellow fever appeared at Memphis and at New Orleans before the work of organization under this new legislation had been completed; so that the merits of this legislation were subjected to a severe test. The result from a business point of view may be summed up in the statement that the National Board of Health has spent about one hundred and twenty thousand dollars during the summer and fall; that the fever did not spread in New Orleans, although two separate outbreaks occurred there; that for two months it was confined to Memphis; that at least five millions of dollars have thus been saved;

and that as soon as the people saw the effect of its operations the non-intercourse quarantines were abandoned. From the point of view of the sanitarian the results have been much more important than this financial statement would show, since their value as a means of education, and of showing what can be done, is great for the future.

To the operations of the National Board the public has, on the whole, been indifferent. It has been objected to by a few newspaper correspondents, on the ground of useless extravagance; but none of the leading journals have thought it worth while seriously to investigate the complaints. The particulars of a walking match have been of much greater interest to the reading public. Such an interest in the vagaries of Yellow Jack as existed in this country in the fall of 1878 will probably not again exist until the disease again appears on our Atlantic seaboard. That in the absence of precautions it will so appear may be considered as almost certain; and it is an even chance that it will exist in epidemic form in New York, Philadelphia, or Baltimore before the end of the present century. When it does so appear in those cities, their personal help must come from the South, for it is worse than useless for unprotected persons to attempt to combat the disease. The physicians and nurses, the sanitary officials, police, laborers, etc. must all be persons who have had the fever, if they are to be of practical use. They must in the main come from New Orleans and Memphis, and other points of like character; and hence the cost of educating these people, if it is to come at all from the Commonwealth, should not be defrayed too grudgingly. And by educating is not meant alone the teaching of that which is already known.

Whatever may be thought as to the duty of the General Government in regard to quarantine, there can be little doubt as to its duty in regard to obtaining information on yellow fever. It does not stand upon the same ground as those surveys or scientific investigations for which Government patronage and aid is urged, but which will be carried on by individual effort, sooner or later, if Government does not assist. Such an investigation as is necessary to discover the causes of yellow fever and the best modes of preventing it will require much time, skilled labor, and money, and can never be supported by individual enterprise, and is unlikely to be carried into effect by any other Government than that of the United States. Yet it is only by means of such an investigation that we can hope to succeed in freeing the country from this pest.

Finally, it is to be remembered that to prevent the introduction of yellow fever either absolute, rigorous, almost total non-intercourse

quarantine is necessary at Southern ports; or else some system of co-operation between different ports, different States, and different countries must be devised and cordially supported by the respective Governments. If the United States is to keep up comparatively free commercial intercourse with the intertropical Atlantic ports, and at the same time to prevent the introduction of yellow fever through such intercourse, it must become a party to some international agreement with the several powers to whom such ports belong. Under existing circumstances it is impossible for the United States to become a party to any comprehensive international sanitary code, because it cannot guarantee that the ships of another nation shall not be interfered with by State or local quarantines, provided such ships have complied with the regulations of the code. But it has full power to enter into an agreement for an international system of notification as to the actual sanitary condition of ports, and of vessels sailing from said ports. Such a system would be a long step towards an international sanitary code, and would be of great aid to commerce. At present, owing to the impossibility of obtaining reliable information as to the freedom of West Indian and Central American ports from yellow fever, the majority of our ports assume that they are all so infected from May 1 to November 1, and treat all ships coming from them as if they were infected, although in reality there is no yellow fever in the majority of such foreign ports.

In sanitary matters no single man, city, State, or nation can protect itself except by non-intercourse, and not always even by that. To get the best results with the least cost and interference with freedom, we must help one another; but this help must be given, received, and regulated on business principles, "because it will pay," and not be considered as sentimental charity, which will sooner or later be grudgingly bestowed and unthankfully received. We want our citizens and cities, counties and States, to take care of themselves in sanitary as in other matters as far as possible; but there should be some power competent to interfere in the exceptional cases in which ignorance, selfishness, or terror lead either to danger of pestilence or to obstruction of commerce. This power, however, cannot be established arbitrarily, or in advance of sufficient education of the business portion of the community, to create a powerful public opinion to support it. Whether it is possible to give this education otherwise than through the lessons which epidemics themselves give, is the problem which the sanitarians of this country are at present practically trying to solve.

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