

THE SANITARY REGENERATION OF HAVANA.

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PAIN took possession of the "Pearl of the Antilles" in 1511, but it was not until after the capture of Havana by the English in 1762 that it became a city of importance. At the date last mentioned the whole island contained only one hundred and twenty thousand inhabitants. The city was evacuated by the English in July, 1763; but, according to the Spanish historian Pezuela, "new life was given to agriculture in Cuba by England's commercial activity, and by the desire to open a new mart to her African slave-trade." More than four hundred thousand African slaves are said to have been imported to Cuba during the sixty years following the English occupation.

There is historical evidence to show that yellow fever prevailed as an epidemic in Havana in 1648, and subsequently up to the year 1654, when it disappeared, and for more than a hundred years, if we can rely upon negative evidence, the city of Havana was free from this pestilential malady. The historian already quoted (Pezuela) says: "Although Havana is situated on the northern boundary of the torrid zone, it was very justly considered one of the most healthy localities on the island before its invasion, in a permanent manner, by the vomito negro (yellow fever), imported from Vera Cruz in the summer of 1761." This quotation and others in the present paper are from the report of Dr. Stanford E. Chaillé of New Orleans, made, as chairman of the Havana Yellow Fever Commission of 1879, to the National Board of Health. The other medical members of the commission were the present writer and Dr. John Guiteras, then of the Marine Hospital service, now professor of pathology in the University of Pennsylvania.

The author already quoted gives the following account of the reintroduction of yellow fever into Havana in the year 1761, after a period of immunity from this disease of one hundred and seven years:

"In May there came from Vera Cruz, with materials and some prisoners destined for

the works on the exterior fortifications of Havana, the men-of-war *Reina* and *America*, which communicated to the neighborhood the epidemic known by the name of the 'vomito negro.' At the end of the following June there were stationed in this port nine men-of-war, despatched from Cadiz, and sent to the chief of the squadron, Don Gutierre de Hevia; they brought a reinforcement of two thousand men. To the epidemic more than three thousand persons succumbed on this *the first appearance* of the vomito; from May to October occurred the greater number of victims in the garrison and in the squadron."¹

The historical evidence relating to the prevalence of yellow fever subsequently to the year 1761 indicates that the city of Havana has not been free from the disease since that date—in other words, that it is now, and has been since the date mentioned, endemic, *i. e.*, that the city is permanently infected with the germs of the disease. The question of the sanitary regeneration of Havana, therefore, from our present point of view, relates to the possibility of placing this city in such a sanitary condition that it shall be exempt from yellow fever.

Before considering this question, let us inquire whether there is any good reason for the belief that such immunity exists elsewhere as a result of improvements in the sanitary conditions of cities lying within the area of yellow fever prevalence. We know that there may be an immunity due to latitude or altitude quite independent of local sanitary conditions. With reference to this I may be permitted to quote from one of my own published papers:²

"Yellow fever is essentially a disease of the sea-coast, and especially of large cities in an unsanitary condition; but when circumstances are favorable it may extend into the interior, following routes of travel, and especially navigable rivers.

"It is, however, confined to the lower levels, even in tropical or subtropical regions.

¹ "Pezuela," vol. iii, p. 27.

² Article on yellow fever, in "The American System of Practical Medicine." Lea Bros. & Co., publishers.

In the Antilles the disease rarely prevails at an altitude above seven hundred feet. In Mexico the cities of Orizaba, Jalapa, and Puebla, which are more than three thousand feet above the sea-level, have never suffered from the disease, although they have unrestricted communication with the infected sea-port, Vera Cruz. In Spain, where several severe epidemics have occurred, the disease has rarely prevailed at an altitude above one thousand feet. The epidemic at Madrid (altitude, two thousand feet), which occurred in 1878, was, however, an exception to this rule. In the United States a severe epidemic occurred at Chattanooga, Tennessee, in 1878. This town has an altitude of seven hundred and forty-five feet, which is the highest point at which the disease has prevailed in this country.

"*Temperature* is an essential factor in determining the prevalence of yellow fever in those places where it is endemic, and in the establishing of new centers of infection. Although the disease prevails to some extent throughout the year in the cities of Havana, Vera Cruz, and Rio de Janeiro, it is especially prevalent during the hot season in these cities, and its epidemic extension occurs only in the summer months."

The researches of the Havana commission of 1879 showed that during the ten years preceding our visit to Havana deaths from yellow fever had occurred not only every year, but every month in the year. The average number of deaths was greatest in July (328), and least in February (14).

In places which have a mean winter temperature below 65° F., the disease, when introduced, cannot establish itself as an endemic. The development of an epidemic requires a temperature of 75° to 80° F., maintained for some time, and upon the approach of cool weather the progress of the disease is checked. When the temperature falls below the freezing-point it is usually completely arrested, and, as a rule, the disease does not recur during the succeeding summer, unless it is again introduced.

Probably the only reason why yellow fever has not established itself permanently at any one of our Southern seaport cities is because the winter temperature is too low to preserve the vitality and favor the multiplication of the germ. It therefore dies out during the winter, or, according to the popular idea, is killed by the first frost. This being the case, we must not be too ready to assume that if we had possession of Havana this pestilential malady would be promptly stamped out by

the sanitary improvements which we would make. For, as a matter of fact, we have not accomplished this in our own cities on the Gulf coast. When yellow fever is introduced into one of these cities during the season favorable for its prevalence, history shows that it extends, with more or less rapidity, until the epidemic is terminated by the cool weather of autumn; and all efforts to arrest its progress by sanitation have heretofore been attended with a very unsatisfactory degree of success. Why, then, should we expect to be more successful in Havana if the task were thrown upon us of effecting the sanitary regeneration of that city to such an extent as to make it immune from the disease under consideration? Two questions present themselves: 1. Could the government of the United States effect the sanitary regeneration of Havana, if we had possession of that city? 2. Would the Congress of the United States appropriate the money necessary to accomplish this result?

Without attempting to answer the second question, I may remark that Congress has not heretofore appropriated money for the sanitary improvement of cities within the limits of the United States, and each municipality has had unlimited authority to be as dirty as it pleased. Questions relating to water-supply, disposal of sewage, paving of streets, etc., are disposed of by each city according to its own good pleasure, and it would be a new departure for the general government to appropriate large sums of money for these purposes.

That it is practicable to put the city of Havana in such a sanitary condition that it would be exempt from yellow fever I fully believe. But that this is an undertaking of considerable magnitude, involving the expenditure of large sums of money, and requiring much time, will be apparent when we have taken account of the nature of the sanitary improvements necessary for the accomplishment of the desired result.

The assertion has repeatedly been made that General Butler kept yellow fever out of New Orleans during the Civil War by "cleaning up" the city; and those who have accepted this statement have naturally inferred that by the same methods the city of Havana could be made proof against this disease. The reasoning is good, but it is based upon erroneous data. The street-cleaning and other measures of police enforced by General Butler, in my opinion, had nothing to do with the exemption of New Orleans from yellow fever during his administration as

military commander of the city. It was my fortune to be on duty in New Orleans during the administration of General Banks, which immediately followed that of General Butler, and the police regulations inaugurated by Butler were followed, to some extent at least, by Banks. The city of New Orleans remained free from yellow fever during Banks's administration also, but that this was due to its condition as to cleanliness is not credible. Many cleaner places have suffered from yellow fever when it has been introduced during the season favorable for its extension. I have had personal experience in support of this assertion, and may mention in this connection the epidemics at the Pensacola navy-yard in 1874, and at Fort Barrancas, Florida, in 1875. These places, under strict military surveillance, were kept in a better state of sanitary police than Butler ever attained in New Orleans. The true explanation of the immunity of New Orleans during the Civil War is to be found in the absolute quarantine restrictions by which the exotic germ of the disease was kept out of the city. This was rendered more easy by the fact that very little commerce was maintained with Havana and other infected ports. In 1861 the native-born citizens of New Orleans were to a large extent immune from yellow fever, because of the frequent epidemics which had occurred in that city during the ante-bellum period. During the great epidemic of 1853, 7970 deaths resulted from this disease in the city of New Orleans, and this was followed by 2423 in 1854, 2670 in 1855, 74 in 1856, 199 in 1857, and 3889 in 1858—a total of 17,225 during the decade preceding the war. This probably represents at least 170,000 cases. As many of the older inhabitants of the city were immune from having suffered from the disease in previous epidemics, it is evident that to a large extent the citizens of New Orleans were immune to yellow fever when it was occupied by the Federal troops in 1861.

The immunity of the creoles of New Orleans was not a birthright, as they generally supposed, but was due to an attack during childhood, commonly unrecognized, or at least to postnatal exposure during successive epidemics. The idea also prevails in Havana that native-born citizens have an immunity from the disease, and as a matter of fact the deaths from yellow fever are largely among strangers, and in the mortality statistics of the city this disease comes third, the first place being occupied by pulmonary con-

sumption, and the second by the group of intestinal diseases, including diarrhea, dysentery, and cholera infantum.

The death-rate of a city is, as a rule, the best index of its sanitary condition, and, judged by this standard, it is evident that there is great room for improvement in this city, which at one time was "justly considered one of the most healthy localities on the island" (Pezuela). Chaillé, in the report of the Havana Commission, from which I have already quoted, says:

"The actual sanitary condition of the principal ports of Cuba is very unfavorable, since in recent years their death-rates have ranged from 31.9 to 66.7. It also proves that the sanitary condition of the inland towns is very little, if at all, better than that of the seaports. The high death-rates of Guanabacoa and of Marianao are especially notable, because these suburban towns, within three and six miles of Havana, are summer resorts, and enjoy, especially Marianao, a high repute for salubrity."

The annual death-rate of Havana, estimated from the best attainable sources, was found by Chaillé to be 36.3 per 1000; of Guanabacoa, 39.8; of Marianao, 39.5. If we compare these rates with that of London (18.8), or of some of our principal seaport cities in the United States,¹ it will be evident that there is ample room for sanitary regeneration.

Let us now consider for a moment the actual sanitary condition of Havana at the time (1879) that the Yellow Fever Commission of the National Board of Health made the investigations to which reference has already been made.

"In Cuban cities generally good drainage is never found, except in such comparatively inextensive parts where nature requires little or no assistance. Even in Havana, the oldest and wealthiest city, the visitor is often astounded, especially in the rainy season, by impassable mud-holes and green, slimy, stagnant pools in the streets and in the back yards. This condition was found even in the Pueblo Nuevo ward, which is located so admirably for good drainage that little labor would be required to make it perfect.

"Messrs. Ariza and Herrera reported: 'Havana has no sewers, save in a few principal streets. These sewers have been built at interrupted intervals, and without reference to any general plan for drainage. They

¹ Boston, 22.5; Philadelphia, 20.17; Baltimore, 18.43; New York, 21.52; New Orleans, 27.88.

are seldom cleaned, and are generally obstructed in part or wholly with sediment or filth from the streets, and exhale offensive odors. As the sewers are few in number, the greater part of the water of the city empties through the streets into the harbor or the sea, but the quantity flowing into the sea is comparatively small.' Mr. A. H. Taylor, a civil engineer thoroughly informed on this subject, testified that the sewers of only three streets subserved any good purpose whatever, and that the remainder were so defective that the city would really be much better off without them. Covered by gratings which have large interspaces, the dirt and refuse of the streets find such ready entrance that a number of these sewers were seen filled up, with apparently solid materials, to within a few inches of the gratings. Since very few houses are connected with sewers, these are less offensive than they would otherwise be; but no one who has seen them can find any words except of unhesitating condemnation for their grossly defective structure.

"Less than one third of the population live on paved streets, and these are as well paved, and kept as clean—it is believed cleaner than is usual in the United States. The remainder live on unpaved streets, which for the most part are very filthy. Many of these, even in old and densely populated parts of the city, are no better than rough country roads, full of rocks, crevices, mud-holes, and other irregularities, so that vehicles traverse them with difficulty at all times, and in the rainy season they are sometimes impassable for two months. Rough, muddy, or both, these streets serve admirably as permanent receptacles for much decomposing animal and vegetable matter. Finally, not less, probably more, than one half the population of Havana live on streets which are constantly in an extremely insanitary condition; but these streets, though so numerous, are not in the beaten track of the pleasure tourist, in which capacity the writer, in 1856, spent ten days in Havana without witnessing many of the evils now testified to with emphasis.

"At least twelve in every thirteen inhabitants live in one-story houses; and as the total civil, military, and transient population exceeds two hundred thousand, there are more than twelve inhabitants to every house. Tenement-houses may have many small rooms, but each room is occupied by a family. Generally the one-story houses have four or five rooms; but house-rent, as are also food and clothing, is rendered so expen-

sive by taxation, by export as well as by import duties, that it is rare for a workman, even when paid from fifty to one hundred dollars a month, to enjoy the exclusive use of one of these mean little houses. Reserving one or two rooms for his family, he rents the balance.

"In the densely populated portions of the city the houses generally have no back yard, properly so called, but a flagged court, or narrow vacant space, into which sleeping-rooms open at the side; and in close proximity with these, at the rear of this contracted court, are located the kitchen, the privy, and often a stall for animals.

"Messrs. Ariza and Herrera report that in Havana the average height of the ground floor is from seven to eleven inches above the pavement; but in Havana, and more frequently in other Cuban towns, one often encounters houses which are entered by stepping down from the sidewalk, and some floors are even below the level of the street. In Havana some of the floors, in Matanzas more, in Cardenas and Cienfuegos many, are of the bare earth itself, or of planks raised only a few inches above the damp ground.

"The privy and the sink for slops, the open kitchen shed and the stable, immediately adjoin each other, confined in a very contracted space close to sleeping-rooms. The privy consists of an excavation which often extends several feet laterally under the stone flags of the court. Even if the sides be walled, the bottom is of the original porous earth or subsoil rock, thus permitting wide-spread saturation of the soil.

"Of the various evils recounted in connection with the subject of houses, there are two which deserve special attention. Many facts, besides those associated with the holds of vessels, justify the belief that the growth of the poison of yellow fever is specially favored in warm, moist, ill-ventilated places, where air is closely confined. The low-lying floors touching the earth, the small, densely packed houses, the unusually contracted ventilating-space in their rear, the large unventilated excavation for privies and sinks, all furnish, as is firmly believed, the most favorable breeding-places for the poison of yellow fever. In addition, statistics prove that in great cities subjected to ordinarily unfavorable conditions, the denser their population, the sicklier and shorter the lives of their inhabitants. Common sense and experience unite to teach that the denser a population, the more wide-

spread and frightful the havoc, especially of communicable diseases. Elsewhere will be found a special report on the density of the population of Havana compared with numerous other cities, and it therein appears that more than three fourths of the people of Havana live in the most densely populated localities in the world. A tropical climate renders this enormous evil still greater. Not only in Havana, but throughout Cuba, the average number of inhabitants to each house is unusually great; and this fact enables us better to understand the great prevalence in Cuba of those communicable diseases which its climate and other local conditions favor."

There is no reason to believe that the sanitary condition of Havana has materially changed since 1878, and the quotations made indicate some of the improvements necessary for the sanitary regeneration of the city. These are a complete and satisfactory system of sewers, pavements for the unpaved streets, and reconstruction of the unsanitary dwellings in accordance with modern sanitary regulations.

That the sections of the city which are in the worst sanitary condition afford the largest proportional share of deaths was shown by the investigations of the Yellow Fever Commission of 1879. Dr. Chaillé says:

"The portion of the city in worst repute is the fifth district, and especially Jesus Maria, one of its wards. This is, to considerable extent, reclaimed swamp-land, filled in largely with street refuse and garbage. It fronts the bottom of the harbor. Its rough, unpaved streets are in many places almost impassable in wet weather, even to pedestrians. Great mud-holes, covered with green slime, and fit only for the abode of hogs, are numerous. The houses, as well as the streets, have an uncared-for, filthy, and disgusting appearance; and the sickly, anemic residents look as dirty and cheerless as the streets and houses.

"The Punta or Colon wards, in the third district,—at least, the portions which immediately front the sea,—have a reputation almost as bad as the Jesus Maria ward. The foundation rocks were, during the last century, excavated to build fortifications, and these excavations were filled up with street refuse and garbage; hence this ward is, like Jesus Maria, to some extent, reclaimed land. These portions are alleged to be very unhealthy, while houses only six or eight blocks distant are not so. Comparatively light rains flood the banquettes and run into the houses.

The streets are wider and the houses better than in Jesus Maria. Some consider the location of the latter, at the bottom of the harbor, a chief cause for its unhealthfulness; but the unhealthy portion of the city now referred to fronts the sea.

"The Pueblo Nuevo ward, still farther to the west, also fronts the sea, and is built on a slope which attains an altitude of nearly 70 feet. Notwithstanding these advantages, it is very badly drained, and has, as it apparently deserves, an ill repute for healthfulness.

"The three suburban wards, Jesus del Monte, the Cerro, and Vedado, enjoy the best reputation for salubrity, and also for their freedom from yellow fever. Intelligent residents are readily found who will assert with great assurance that no one is ever attacked in these wards, except those who have been elsewhere infected.

"The summit of Jesus del Monte has an altitude of 67 meters, or 220 feet, the highest point in Havana or its immediate vicinity. However, there are few, if any, houses about the summit. The average level of the ward is only 80 feet, and more inhabitants live below than above this level. The natural drainage is excellent; the houses in the elevated portion occupy more ground and are better ventilated than in Havana."

Let us now turn for a moment to the sanitary history of two cities in the United States which have, apparently, been made immune to yellow fever by the very improvements above referred to.

One hundred years ago New York and Philadelphia were, to a large extent, destitute of pavements and sewers, and no doubt unsanitary conditions existed in many parts of these cities which were not materially different from those found by Dr. Chaillé in the Jesus Maria ward of Havana.

The city of Philadelphia suffered a devastating yellow-fever epidemic in 1793. The population of the city at the time was estimated at about 40,000, and of these more than 12,000 fled from the city. The total number of cases was about 11,000, with over 4000 deaths. In 1797 yellow fever again prevailed in Philadelphia, and caused about 1300 deaths. The following year a more fatal and wide-spread epidemic occurred, resulting in a mortality of 3645 in Philadelphia, 2080 in New York, and 200 in Boston. An epidemic of smaller proportions occurred in Philadelphia in 1802, and limited outbreaks have occurred in the vicinity of New York during the past fifty years (Fort

Hamilton in 1848, Governor's Island, 1870), but the great cities of New York and Philadelphia are now practically immune from this pestilential malady; and, in my opinion, Havana would enjoy a similar immunity if it could be placed in as satisfactory a sanitary condition as regards its dwellings, sewers, pavements, etc. I have said nothing about water-supply, for, as a matter of fact, Havana is now supplied with much better water than that furnished the citizens of Philadelphia, and its typhoid-fever rate is extremely low. There is no evidence that the prevalence of yellow fever is materially influenced by the quality of the water-supply of a city; but quantity of supply is an important factor in connection with the flushing of sewers and general cleanliness.

The idea has frequently been advanced that the prevalence of yellow fever in Havana depends upon the foulness of the water of its landlocked harbor, and the cutting of a canal through from the bottom of the cul-de-sac to the sea has been proposed as a remedy for the evil. This matter was carefully considered by the Havana Commission, and there are excellent reasons for believing that no results of importance would be attained by carrying out this expensive undertaking. In the first place, we know that the crews of vessels anchored in

the harbor at some distance from the shore rarely contract yellow fever. Again, the Punta or Colon wards, which front immediately upon the sea, "have a reputation almost as bad as the Jesus Maria ward," which is at the bottom of the cul-de-sac formed by the harbor.

The conclusion reached by Dr. Chaillé, after a most careful investigation of the subject, is stated in the following words:

"Colonel Albear seems to have completely demonstrated the impracticability of these proposed canals; and my own conviction is that, if practicable, they could not possibly place the small harbor of Havana in as favorable sanitary condition as are by nature the large harbors of Matanzas and Cienfuegos, where yellow fever none the less prevails."

While I do not consider the proposed canal an essential feature in the sanitary regeneration of Havana, there are certain important improvements in connection with the harbor which would contribute greatly toward the accomplishment of the object in view. These are a substantial sea-wall along that part of the city fronting on the harbor; and an intersecting sewer, in connection with a complete system of sewers, with a pumping-station for the discharge of sewage into the ocean.

KNIGHTS ERRANT.

BY L. H. HAMMOND.

THOU Pain, before whose strength I reel,
 Thou of the iron grip,
 Beneath thy mailèd clutch I feel
 My life-blood slowly drip.

Thine eyes burn downward through the dark;
 Helpless, I writhe and strive;
 Uplifted, through the gloom I mark
 The hand that holds the gyve.

Fettered, I watch in the slow dawn
 The free knights riding by,
 The knights to whom men's hopes are drawn,
 Who neither yield nor fly.

They beckon, and I learn at length
 The price for knighthood paid:
 Thy fetters are their secret strength,
 Thy clutch their accolade.