# FIRST ANTI-MOSQUITO CONVENTION

## 1903

SECOND EDITION

# PROCEEDINGS

OF

## THE FIRST GENERAL CONVENTION

TO CONSIDER THE QUESTIONS INVOLVED

IN

# Mosquito Extermination

HELD BY INVITATION IN THE
ROOMS OF THE BOARD OF TRADE AND TRANSPORTATION
MAIL AND EXPRESS BUILDING
BROADWAY AND FULTON STREET, NEW YORK CITY

ON

## WEDNESDAY, DECEMBER SIXTEENTH, 1903

AT TWO-THIRTY O'CLOCK P. M.

SECOND EDITION

BROOKLYN
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1904

EDITED BY

HENRY CLAY WEEKS.

# PREFACE.

THE commodious rooms of the Board of Trade and Transportation, by courtesy, were opened to the convention, which begun with about one hundred persons present and was increased by others, so that including those who stayed only part of the time there were in all about 150 in attendance.

In the preparatory correspondence it was universally conceded that such a convention was desirable, but some thought it doubtful whether enough interest could be awakened to get any number together, considering the time of year, the hour of day, and all. The convention adjourned at 5 P. M.

*Engineering News*, one of the most progressive publications issued, had a long summary of the addresses and the following is taken from its editorial page:

From ridicule to respect has been the changing attitude of the public on the recent proposals to exterminate mosquitoes. Such tangible results have now been achieved and the hearty co-operation of such a large number of property owners, entomologists, engineers, sanitarians and public-spirited citizens generally has been secured as to make possible a well-attended conference of representative men, at which papers on various aspects of the mosquito problem were read and steps taken to form a permanent national organization to combat the mosquito nuisance and menace. As a conference the gathering was notable for its many brief and forceful addresses, and the character of the men who presented them. As a discussion of vital, economic and sanitary questions, affecting the comfort, prosperity and health of millions of people, the remarks were of a distinctly practical, rather than theoretical character. Prominent New York men of affairs told of the satisfaction they had derived from money and time expended in exterminating mosquitoes on their Long Island, Staten Island and New Jersey estates. Engineers and entomologists told of their part in the study of the problem and in its successful solution. No one questioned the possibility and feasibility of reclaiming any mosquito-infected section and of suppressing both malaria and yellow fever, if individuals and municipalities would co-operate, and, in case of large areas, if State and perhaps National governments would join in the work. Except for preliminary studies, however, local action alone will generally be sufficient. Once the biological side of the question has been determined, funds raised, and private and public co-operation secured, the work of mosquito extermination generally resolves itself into the engineering problems of drainage, filling, and, in some cases, the construction of dams or tide gates to control water levels. Quite aside from the advantages of mosquito extermination, great as they may be, are the possible commercial profits due to the reclamation of vast areas of rich swamp and marsh lands, now serving as breeding grounds for mosquitoes.

The walls of the room were placarded in large type with some appropriate sentences from workers, as follows:

"It is my firm opinion that, widespread as the interest in mosquito extermination seems to be at present, it is not a temporary interest but the beginning of a great and intelligent crusade."—*L. O. Howard in the Century, July, 1902.*

"Mosquitoes should not be tolerated in a community any more than smallpox."—*W. J. Matheson, 1900.*

"It is possible to practically rid our region of mosquitoes."—*North Shore Imp't. Ass'n., L. I. Report, 1901.*

Form the Anti-Mosquito Habit!

"One can positively assert that malaria annually costs Italy incalculable treasure."—*Celli.*

Let our Motto be: "No Stagnant Water."—*Worcester Board of Trade, March, 1903.*

"Newark marsh section has about 40,000 acres in all, worth say $400,000. Manhattan Island has about 10,000 acres net on which the taxable valuation (1903) is $3,483,000,000; real value probably five billions. Ratio, 1 to 50,000. Thus do mosquitoes and mosquito conditions affect other considerations besides public health."—*H. C. W.*

An illustrated article from the Mail and Express December 12, 1903, on "Reclaiming Waste Land in South Brooklyn," by H. C. W.

# CONTENTS.

***Participants' Papers, Addresses, Letters, Etc.***

*CONTENTS—Continued.*

# ILLUSTRATIONS.

# PROCEEDINGS.

The Convention was called to order by Henry Clay Weeks, acting chairman, who spoke as follows:

LADIES AND GENTLEMEN: This gathering to-day is the result of a demand that the standing of the movement looking to the extermination of the Mosquito shall be known to the country so that all may be encouraged to take a part in it when they shall realize who and what are behind it. The movement has now long passed beyond the humorous stage, through which all radical measures have to pass, though a few belated writers are still trying to keep it there. Its practicability is now generally undisputed and though to some uninformed minds this exceptional year of heavy, continuous rains seemed to discourage the idea, yet, to those who best understand its plan and scope, even this season's experience simply showed the necessity of more urgent action in getting rid of the places where water has the chance to accumulate and become stagnant, as was so generally the case. They had the true ring of a reformer—those words from a well known New Jersey worker, who said in the midst of the summer trouble, "I have been pleased to see mosquitoes so plentiful because they have done more in a week to arouse sentiment against themselves than I could do in a year." Some people of the other kind said and even printed their sayings, that the prevalence of mosquitoes showed the error of the idea of extermination—and even mentioned the fact that so many gallons of oil had been scattered abroad, not knowing that relatively but a drop had been used, even if the idea had been to rely entirely on oil for extermination—apparently ignorant of the fact that the plan involved the destruction of breeding places and not the temporary work of killing them after they had reached the larval and pupal stage by sprinkling oil on the water.

The need in all reforms is a campaign of education, and this convention is a start in this direction—to let people know what is being done, and by whom and the how and why of it. A few of the workers and those who understand the value and success of their work have been asked to participate to-day as officers or speakers, and the surprising heartiness with which all whose names are in print responded, is an indication of the force of their purpose. A few only of those who were asked

to participate declined, and then generally with words which showed their great interest and sympathy, and regrets for other engagements. Mr. Cornelius Fellowes voiced this sentiment in his note: "I am with you heartily and prepared to fight the enemy to a finish."

To attempt to get a convention in the middle of December to review the mosquito question—though really the best time—was, as some have said, a large undertaking, but the response shows that those who antagonize the mosquitoes and mosquito conditions are the men of the real crusader type—willing to forego everything to carry their plans. Many already have given most valuable time and large sums of money to forward the crusade.

A year ago a few talked of a convention, but only of engineers to look at the subject from their standpoint, but the matter passed and no convention was held. At the end of this year's work in the field—in October—the matter came up again but in a broader scope, viz., to consider the subject in all its bearings, and though the printed program touches many of the points it does not, and, in so short a time, could not touch all. For instance, you will notice there is no special representative of real estate announced, and yet there are numberless men dealing in realty who could have told us of the depressing effect of the mosquito evil on values in beautiful and otherwise desirable parts of the country—of investments of hundreds of thousands of dollars in places where it has been sunk on account of this evil. And there are some I know who could have told you of the hope that many owners have, that this movement is going to restore lost fortunes.

One gentleman suggested another omitted topic—the need of a Publicity Bureau, that would force the people to know about this matter. The idea is gaining rapidly, but all will say there is room for it to gain. The dense ignorance even among educated people, the willful opposition, the careless habits, have all to be overcome. The press has much to do, and is now generally doing it splendidly as you will see by these imperfect statistics:

One person's mosquito clippings from general press:

| | | |
|---|---|---|
| 1898—4 | 1900—31 | 1902—141 |
| 9—6 | 1—53 | 3—366 so far |

From about 1 a year to 1 a day.

There is now a widespread demand for information. Within a few days a letter was received from a friend of President Diaz of Mexico, suggesting that the President be furnished with some of the literature on the subject, and we have already sent printed matter by request from Atlantic to Pacific, and from all parts North to Cuba in the South.

At the first Mosquito Luncheon, held last May at the Sheepshead Bay Club House, Dr. Howard emphasized the fact that then for the first there was shown a humane interest in the brute creation as against the mosquito pest, and yet we have no speaker assigned to that very important subject directly in our program. But that subject was thoroughly emphasized in three or four of the addresses at that luncheon, and it cannot be too strongly emphasized.

And so, addresses might have been provided on other points, for as it is considered it is seen that the subject has a most widespread bearing.

But this little priming talk must not exceed the time limit of six minutes in this convention of rapid firing.

When the point was reached as to who should be asked to preside at the Convention, attention centered on one who has the unique honor of being the Governor of the first State to take State action, and one who, when there was some informality in the action, personally saw to it that money enough was forthcoming to go forward with the work last season.

Governor Murphy is not present to-day. He writes that he had before written of his prior engagement in the Court of Pardons, but his letter has never reached us. It is now incumbent on us to choose a Presiding Officer from among those who have consented to act as Vice-Presidents, and I nominate one whose range of work and interests are very broad, and yet who will be known more by his work for the benefit of the less favored class—Mr. Robert W. de Forest, the President of the Charity Organization and the Tenement House Commissioner of the City of New York.

Mr. de Forest's nomination was duly seconded, and upon being put to a vote he was unanimously elected.

Mr. de FOREST: I thank you for the honor which you have conferred upon me. I saw in one of the daily papers, in connection with the announcement that Governor Murphy of New

Jersey was to be Chairman of this first meeting. That I took as evidence that the mosquito was not without honor in the home of his friends, and it may be that the particular selection of myself from among the Vice-Presidents is due to the fact that for many years my own summer home was in the same State as that of which Governor Murphy is Governor, and my present summer home is in another place not unknown to the mosquito, Long Island. I see by the order of exercises which has been handed to me that the next thing in order is the nomination and election of Vice-Presidents, Secretary and Treasurer.

Mr. MATHESON then nominated Mr. Henry Clay Weeks as Secretary.

The nomination was duly seconded, and upon being put to a vote he was unanimously elected.

CHAIRMAN: We will now proceed to elect Vice-Presidents.

It was moved that the names on the list of Vice-Presidents selected be accepted as the Vice-Presidents with the addition of any replying later who were invited to act.

This motion was duly seconded, and upon being put to a vote was carried.

## VICE-PRESIDENTS.

Mr. William C. Whitney.
Judge Howard J. Curtis, Bridgeport, Conn.
Dr. Alvah H. Doty, Health Officer of the Port of New York.
Prof. Nathaniel S. Shaler, Harvard University.
Mr. Louis C. Tiffany, New York.
Mr. Otto H. Kahn, Kahn, Loeb & Co.
Mr. G. Waldo Smith, President of the United Civic Societies of Queens Borough.
Mr. Colgate Hoyt, New York.
Prof. Franklin W. Hooper, Director Brooklyn Institute of Arts and Sciences.
Prof. Charles B. Davenport, University of Chicago.
Ex-Mayor R. T. Barton, Winchester, Va.
Prof. L. H. Bailey, Cornell University.
Mr. L. C. Weir, President Adams Express Co.
Mr. T. T. Pitman, Editor Newport (R. I.) Daily News.

Mr. A. J. Cassatt, President Pennsylvania Railroad.
Mr. Cornelius Fellowes, President Nat. Horse Show Association of America.
Mr. C. W. Wetmore, President New York and Milwaukee.
Hon. John Kean, U. S. Senator, New Jersey.
Dr. Walter B. James, New York.
Mr. Oliver E. Cromwell, New York and Albuquerque, New Mexico.
Mrs. John Nicholas Brown, Providence and Newport, R. I.

CHAIRMAN: Nominations for Treasurer are now in order.

Mr. William J. Matheson was nominated as Treasurer by Mr. G. Waldo Smith.

The nomination was duly seconded, and upon being put to a vote was unanimously carried.

Letters of co-operation and regret were then read from a number of the gentlemen whose names are on the list of Vice-Presidents, as well as from Secretary Wilson, Department of Agriculture.

CHAIRMAN: We now come, gentlemen, to the papers and addresses. The first gentleman whom I shall call upon is Dr. John B. Smith, New Jersey State Entomologist. It is due to his energy and persistency that the first appropriation was made by a State for the extermination of mosquitoes, and I call upon him first because I am advised he has a later engagement at Camden, and we wish to convenience him as much as possible.

Mr. E. L. DICKERSON: Dr. Smith was not able to be present this afternoon on account of another engagement, but he has handed me a paper which he would like to have me read.

CHAIRMAN: If that be agreeable we will have this paper read.

There being no objection, Mr. Dickerson read the following:

## HOW A STATE APPROPRIATION MAY BE SPENT.

DR. JOHN B. SMITH, NEW JERSEY.

The topic in its present form is unfortunate, because a State appropriation is usually made for a specific purpose and must be spent in accordance with its terms. I will assume,

however, that what is really wanted is a statement of how I have spent the appropriation made by the Legislature of the State of New Jersey for the mosquito investigation.

First of all, I determined to inform myself as to just what species of mosquitoes occurred in the State, under what conditions they lived, and which of them were troublesome, either as carriers of disease or as annoyances.

Second, it was important to know the life history of at least the troublesome forms, how they passed the winter, how many broods there were, and whether the breeding areas were general or restricted.

So, during the summer of 1903, I had seven men in the field almost continuously. One was permanently stationed at a point on the coast and watched only the salt marsh species. Another was kept along shore, moving from place to place and collecting everywhere. A third spent much of his time in the valleys of the Hackensack and Passaic, and in the swamps of the interior—and so on. In this way we raked every section of the State, collected thirty-three different species and actually bred thirty-one of them. We may find one or two more; but I believe the mosquito fauna of the State is now pretty well known.

Not more than one-fourth of these species are at all troublesome, and four species are practically confined to the salt marshes for breeding places—the adults unfortunately have a wider range.

Of the salt marsh species, two were found to be migratory as a rule; one was an occasional migrant, and the fourth rarely got beyond the edge of the marsh.

The tendency is to wander from the theme and state results; but the first item of expenditure in my case was for ascertaining all the facts comprised under my first and second head. This gives what may be termed the scientific base upon which the practical work is to be built.

A third point is the determination of the remedial measures to be adopted; and this includes experiments with all or any materials that will kill any stage, and the trial of methods for reaching and curing conditions that favorably or unfavorably affect development.

It is fair to carry on such experiments on a somewhat large scale, to make certain that they can be practically used, and to

find what the real cost will be. So I spent $100 for 10,000 feet of ditching on the Newark meadows to test the effectiveness of a system and to make sure it could be done for that same price no matter how much ditching was needed.

The study of the natural enemies of the mosquito as a fourth topic falls well within my plan, and the results have already been very important.

It is also quite fair to do a certain amount of surveying, and to lay out drainage schemes for very bad areas to stimulate local work and to show how such work should be planned.

Finally, the outcome of such an appropriation as that which I have been handling should be a comprehensive report which will enable local communities to plan intelligently for their own relief.

Wherever mosquito breeding areas are of limited extent, in a well populated region, the State should not go further than to furnish the advice and, perhaps, general direction for the work. The work itself should be at the cost and carried out by local communities.

The matter is more doubtful where from a large extent of marsh area millions of mosquitoes migrate to communities in other counties that have no jurisdiction over the breeding places. Here, it would seem, the State must at least assist; though just how, is as yet a little obscure.

I am quite aware that this matter of migration does not seem of such dominating importance to all persons, and further inland it is probably not so great a factor; but in New Jersey, with its long coast line, the mosquito problem is dependent for its satisfactory solution upon our ability to control those forms that breed on the salt marsh and thence fly an outside distance of say 40 miles into the upland.

In brief, my idea is that we should first of all spend time and money in learning the character and extent of our task—that we may save time and money wasted in makeshifts, and the loss of confidence resulting from failures.

CHAIRMAN: I will next call on Mr. Walter C. Kerr, Staten Island, President Westinghouse, Church, Kerr & Co., New York.

Mr. KERR: I know of no better way of stating what a rural community can do than by reading very briefly what one small community has done. Of course, one could not judge from it how much greater good can be done, but in our little community we ran against some difficulties which may be typical of some similar other cases, and in a few words I will explain them.

## WHAT A RURAL COMMUNITY CAN DO.

MR. WALTER C. KERR.

Any rural community can rid itself of mosquitoes and their capacity for disseminating malaria, providing it is free to act along the well known lines which have been adopted for accomplishing this purpose.

My personal experience is limited to an area on Staten Island, containing about two square miles, ranging from Arrochar to New Dorp, and from tide water to the top of the hills lying about one mile back from the shore and rising to an elevation of 400 feet.

All the watershed of this area finds its way to the sea through New Creek, which with several branches wanders through the low land between the hills and tide water, and is bordered by marshes formed by overflowing of the creek at high tides. The higher levels are composed of serpentine hills whose characteristic undulations cause numerous storm water ponds in pockets, the natural drainage of which is imperfect.

The conditions of this locality favor the breeding of mosquitoes; the salt and brackish water varieties breeding in the salt marshes of the lower lands approaching the beach, while many fresh water varieties breed in the highland ponds.

In the spring of 1898, a purse was raised among the principal residents, and an oil wagon with pumps and hose secured. Men were trained to handle the oil spraying outfit, while others were employed to cut drains from the hilltop ponds. The work was prosecuted diligently during all of one season, and some 25 or more ponds were treated with oil about once a month. The ponds were finally drained.

The oil treatment was successful in killing the mosquito larvae, but the practical limitation was found there, as elsewhere, in getting the oil onto some of the ponds, where the mechanical operation was impeded by boggy shores, bushes,

weeds, and undergrowth, while in other cases it was difficult to keep the oil on the surface of exposed ponds where it could be blown ashore by winds.

Altogether, the results on the higher levels, both of oil treatment and drainage, were eminently successful. In certain regions, which were so infested with mosquitoes that one could scarcely walk through them, the pest was so completely removed that scarcely a mosquito could be found. The oil was a temporary expedient, the drainage a permanent one.

The great difficulty, however, was found in the marsh areas bordering New Creek behind the beaches. There the areas were too large for the proper application of oil, and though it was industriously applied the frequent tides carried it away. There were also large areas which could not be reached by any appliances at hand.

The prevailing winds would blow a sufficient supply of mosquitoes from these marshy areas to the near-by residence districts to reduce the apparent value of the successful work done on the highlands. During the remainder of the season in question, the only mosquitoes found in abundance were those known to breed in brackish water.

It became obvious through the experience gained on this area that the true remedy lay in dyking the mouth of New Creek just above the beach line, and with flood gates lower the water level in the marshes behind the beach to practically the level of mean low tide. Such dykes are, of course, common in other countries, and some of the dykes built by the early Hollanders on Staten Island are still in service.

Arrangements were being slowly and with great difficulty perfected to accomplish this dyking of New Creek when Richmond County became the Borough of Richmond in Greater New York. The processes of administration changed, resulting in new conditions which have since held this work in suspense.

It is hoped and intended, however, that it shall proceed at an early date, and when done it will offer an exceptional opportunity to show what can be done in a community of sufficient size to demonstrate the effectiveness of methods, and for reasons which are obvious, upon observation of the area it can be done for a nominal expense as compared with the cost in many other situations.

This rural community has done enough by private subscription to show what needs be done to effectually accomplish the desired end—the complete remedy being one which can now be handled only through municipal action.

If the City of New York will through its proper departments and at a nominal expense of a few thousand dollars do that which only the City can do, the neighboring rural community will further show what can be done to complete the operation.

I have no hesitation in saying that the results will be such that other neighboring communities will rapidly follow with similar protection, even though it entails greater expense. What has heretofore seemed a more or less mysterious operation will soon become common practice. Common practice will quickly become a matter of course, and the mosquito as a pest or as a germ carrying insect will cease to exist.

CHAIRMAN: Dr. Howard, Permanent Secretary American Society for the Advancement of Science, is, unfortunately, not able to be present. He has written a letter, which I will ask the Secretary to read.

Mr. WEEKS: On Monday morning I received two letters from Dr. Howard, in one of which he said in the strongest terms and most hopeful manner that he would be with us, and in the other letter, when I opened it, I found that he had received a subpoena from a Congressional Committee which compelled him to be absent. I telegraphed asking if he could get the matter postponed, but he telegraphed back that it was "impossible to change the date of the meeting of the Special Emergency Committee."

## THE WORLD WIDE CRUSADE.

DR. L. O. HOWARD.

**U. S. DEPARTMENT OF AGRICULTURE,**
DIVISION OF ENTOMOLOGY,
WASHINGTON, D. C.
L. O. HOWARD, Entomologist.

December 14, 1903.

MY DEAR MR. WEEKS:

I am extremely disappointed that at the last moment I am compelled to remain in Washington, and shall not be able to attend your "First general convention to consider the questions involved in mosquito extermination." Nothing less than sudden death, or, what has actually occurred, a summons to appear before a Congressional Committee, could have prevented my attendance. Your movement is so important from many points of view that it is a duty as well as a matter of great interest for those who appreciate this importance to attend.

I enclose a letter from Mr. Whitney, the Chief of the Bureau of Soils, in which he gives his ideas as to the value of reclaimed swamp-land for agricultural uses, which is of course a most important matter for the consideration of individuals or communities who are entering upon the problem of mosquito extermination.

You were quite right to have worded the title of what you

Courtesy of McClure, Phillips & Co., Publishers of Dr. Howard's "Mosquitoes."

DR. L. O. HOWARD.

EXTRACT

From an address before the New Jersey Sanitary Association on "Some Practical Suggestions in Mosquito Extermination in New Jersey," by Henry Clay Weeks:—

HISTORICAL REFERENCE:

It is now nearly a century since it was suggested in a London publication that oil might be used to diminish mosquitoes. Probably that was not the earliest suggestion of the idea. It was followed during a half century by many confirmations, but nothing resulted of it all, until a schoolboy in Central New York, interested in Natural History, experimented in destroying "wrigglers" by using a little oil on the water, but it was not until that same experimenter, about ten years ago, published the results of his later work of destruction on a larger scale, that attention was generally attracted to the idea coming as it then did from one who represented the knowledge of the government on the subject.—Dr. L. O. Howard Washington.

expected me to say "The World-Wide Crusade," for mosquitoes have a world-wide distribution and all civilized countries and communities have within the last few years become awakened to the importance of such a crusade. England has been a leader, for, although the mosquito plague is not a serious one in the Island of Great Britain, her tropical and sub-tropical colonies suffer severely from the diseases which are borne by mosquitoes. In fact, we may safely say that the abundance of mosquitoes in many of England's colonies has been the most serious obstacle to the health of the colonists, and, therefore, to the material progress of the colonies. She has sent out repeated expeditions of scientific men to many of her colonies, and the English residents of many others have followed the lead. The imperial government has given no very material assistance in the way of large amounts of money, but private philanthropy has been of great assistance. Germany, with her infinitely smaller colonial area, has taken hold of the question of mosquito extermination as an imperial measure. Italy, with a large part of her home territory devastated by malaria, has been a leader in the fight against malaria. Italy, however, has not extensively entered upon a campaign against mosquitoes themselves, but against the disease by protecting her exposed subjects against the bites of mosquitoes and by fighting malaria with drugs. Japan has done some important work. The new republic of Cuba is continuing the work outlined by the United States officials when in occupation of that island. Mexico has become alive to the importance of the work, and her scientific men are studying the distribution of mosquitoes and are entering upon the crusade with energy. In our new territory of Hawaii the authorities have, within the last year, become fully alive to the importance of the work, and energetic steps are being taken.

The main incentive to all this world-wide movement has been the prevention of disease. Probably nowhere else in the world has the motive of personal comfort entered into the crusade as it has in the United States, and we have already carried this aspect of the work much further than any other country. When we consider the enormous sums of money spent in the United States for luxuries, how much more should be spent for bare comfort and peace!

Abundant evidence has been gained in the important work

which has been done here and elsewhere during the past two years to show that mosquitoes in any definite region can be reduced to a point far below the danger line and quite within the comfort line, and in many instances it has been shown that they can be exterminated at least for a time. This work will undoubtedly continue, but there are many communities which need constant prodding. The organization of the anti-mosquito forces in this convention which you are to hold will greatly stimulate public opinion, and will induce many of the indifferent to take a more sanguine view of possibilities, and perhaps more energetic action towards actual work.

Yours sincerely,

L. O. Howard.

Chairman: I propose next to call upon Mr. William J. Matheson, who is "The Father of the Movement on the North Shore of Long Island." Mr. Matheson is a near neighbor of mine. My family state that they never had any mosquitoes at their home until Mr. Matheson moved in the neighborhood and began his efforts to exterminate the mosquitoes upon his premises. I take pleasure in introducing Mr. Matheson.

Mr. Matheson: I have talked mosquitoes so frequently during the past four or five years that I felt it was only safe to dictate what I had to say for fear of over-running the limit of six minutes of time given me.

## DOES EXTERMINATION EXTERMINATE MOSQUITOES?

Mr. William J. Matheson.

Some five years ago, when I purchased an estate on Lloyd Neck, Long Island, with a frontage on Oyster Bay and Lloyd Harbor, I was told by my friends who were familiar with the property, and by residents of the town in which it was situated, that I had secured one of the most desirable places in the vicinity of New York for a summer home, but that I could only occupy it in the winter, on account of the mosquitoes. Confident as I was of the possibility of exterminating the pests, the uniform testimony that came to me, directly and indirectly,

of the fame of the locality for mosquitoes, caused me to have some misgivings. The only note of encouragement came from Dr. Walter B. James, who stated there surely were ways to exterminate the pest, and I could probably have more fun in accomplishing it than I could in fishing, shooting or similar sport. That view of the situation, as novel as it was fascinating, I have realized, I think, beyond his wildest and wickedest prediction.

It had been established for many years that mosquitoes must have water to breed in and that they did not breed in tidal waters; but this conclusion was questioned by unscientific observers who maintained that they mysteriously bred in grass, trees and bushes, and what was worse, that their flight with strong winds was scores of miles. These men were very influential in the community and felt called upon to combat the theory now so well established. I sought information from every publication I could lay my hands on; most helpful to me was Dr. L. O. Howard's personal advice and suggestions and the Bulletins of the Department of Agriculture, issued under his direction. The obvious breeding places were rapidly controlled and a marked diminution of the pests was manifest, and the natives of the town, who were highly amused at my operations as about the most ridiculous thing that could happen, admitted that the mosquitoes had disappeared, but stated that this was probably one of the off-years that came once in a while, and that they would surely reappear. (As a matter of fact, the mosquitoes had not all disappeared.) Our work became continually more thorough and we eliminated one breeding place after another until now, at the end of four years, we may be said to be practically, if not absolutely, free from mosquitoes, their appearance, on the rare occasions they do come, indicating invariably that some breeding place has been overlooked or some new one undiscovered, which, when eliminated, removes the pest, and our country neighbors who scoffed at our early efforts, have now become converted and helpful.

We found mosquitoes breeding in gutters of the house that were out of alignment, in the cisterns that were out of use or rarely used, in broken boxes, in tin cans, in springs on the hillsides, in cattle hoof-prints on the borders of ponds, in springy grounds, in salt water meadows, in water holes

left by branches decaying from the sides and trunks of trees, in the crotches of trees, in water tanks in the greenhouses, and even in a well, the water of which was 110 feet below the surface and at a temperature of 56, while the air temperature was 80. The cisterns we filled up and put out of use. The gutters we leveled so that they pitched to the leaders without interruption. The cattle hoof-prints we filled with earth, the tree holes we filled with earth, and latterly with cement. The salt water meadows we ditched and filled so that there were no pools or spots that were not reached and drained by every rising and flowing tide. The wells we screened. The greenhouse water tanks we stocked with gold fish. The springs on the hillsides we sub-drained with porous tile. The boxes we broke up. Tin cans and bottles we buried. During the first season, after taking most of these precautions, we still had some mosquitoes, and Dr. Howard, who kindly came from Washington and looked over the situation, identified them as the brackish water mosquito (Culex Sollicitans), which we thought we could trace to a large salt water marsh on Centre Island, across the bay one mile west of us. Thither we went and succeeded in interesting in the movement there the two most enterprising and public-spirited of its residents—Colgate Hoyt and C. W. Wetmore. The movement has been extended and successfully carried on by such intelligent and public-spirited men as Paul D. Cravath and other members of the North Shore Improvement Association in a thoroughly organized way.

As the result of numerous experiments that have been made under the direction of the North Shore Improvement Association during the past four years, it has been pretty thoroughly demonstrated that, with the exception of the Culex Sollicitans, the flight of the mosquito is very limited, perhaps to a few hundred yards at the most, and the nuisance can be controlled and abated in almost any locality where intelligent co-operation can be secured and a systematic inspection made of the premises for the purpose of destroying the breeding places. Extermination can, in my opinion, exterminate just as far as the intelligent landowner is willing to carry it. It cannot be done once and for all any more than weeding a garden or the cropping of a lawn can be done once and for all.

So far as my experience goes, it has been demonstrated

that mosquitoes can be as completely exterminated in any locality as dirt can be swept from a building, or as weeds from a walk, with the possible exception of the Culex Sollicitans, and with the exercise of no more intelligence and much less labor than is required in the performance of many domestic duties. My experience would lead me to conclude that if mosquitoes continue to exist in any locality, it is because the people are too indifferent to the annoyance to take the trouble to be rid of it.

CHAIRMAN: We will now pass back from Long Island to New Jersey again, and call upon Mr. John Claflin, President of The H. B. Claflin Co., New York. Mr. Claflin is President of the Morristown, N. J., Improvement Society. He may not be known in this community by that title, but he is known by a great many others.

## REMARKS ON EXTERMINATION WORK AT MORRISTOWN, N. J.

MR. JOHN CLAFLIN.

I have no paper to read and I have not prepared any speech. Before I say what I have in mind, which may possibly interest you as to my practical experience, I would like to ask Mr. Matheson, if I may, a question regarding the wells and cisterns in which he found mosquitoes breeding, Were they covered?

Mr. MATHESON: The only well I spoke of was one that had been dug by some former occupant there; it was 110 feet deep to surface of water probably, 4 feet in diameter, and we were surprised to find, after drawing a bucketful one day in July or August, something that looked like mosquito larvae. We carefully screened the water for we found this same condition often. The temperature of the water was 56, while the air temperature was 80. The larvae we intended to save to breed from, but the difference in temperature seemed to affect them, and they all died within a few hours.

Mr. CLAFLIN: Did you observe what kind they were?

Mr. MATHESON: We couldn't tell, they perished so soon.

They did not appear to be anopheles. The cisterns I referred to were those about the premises which were scarcely used; they had no circulating chain pump, and were for use only in case of an emergency in case the water supply should fail. In them we found numerous instances of larvae. I feel that we could have obviated that trouble by screening or introducing gold fish.

Mr. CLAFLIN: Were the cisterns dark or covered?

Mr. MATHESON: They were very dark.

Mr. CLAFLIN: Thank you very much, Mr. Matheson.

Mr. Claflin spoke for about ten minutes, holding the close attention of all present by his recital of the interesting experience of the Morristown, N. J., Improvement Society in drainage and extermination. On account of his departure from the city for some time the proofs of his remarks could not be corrected by himself, much to our regret, and he advised that only the summary be printed, which was given in Engineering News:

"He prefaced his remarks by saying that sunshine seemed to favor the breeding of anopheles, the malaria-bearing mosquito, and that it had been a great grief to him to do away with a swamp and pond which were particularly attractive. The swamp gave no trouble until a railway embankment was built through it, increasing the stagnant water, and bringing in, presumably, both anopheles, mosquitoes and malarial Italian laborers. Within two years some 25 per cent. of all adult persons living within 1,000 feet of the swamp, previously healthy, were attacked by malaria. Subscriptions were secured, the dam removed, the pond emptied, and the swamp was drained by pipes, supplemented by open ditches where the ground was yet too soft for the pipes. The mosquitoes, previously numerous, and including anopheles, had almost disappeared from the section, and scarcely an anopheles was found during almost weekly inspections last summer."

Mr. CLAFLIN: I would like to ask some one, if there is any one here who can tell me, how large and deep a pond should be in order, under usual circumstances, to sustain the life of gold fish and top minnows and such other fish as may best be adapted. Can you tell me, Mr. Weeks?

Mr. WEEKS: I was going to suggest that Dr. Felt answer that.

Dr. FELT: Do you want to know the greatest depth or at the sides?

Mr. CLAFLIN: I want to know how small a depth and how large a pond is a safe habitat for fish.

Dr. FELT: My experience and so far as I know is, in some places it ought to be two feet deep.

Mr. CLAFLIN: About how large?

Dr. FELT: That would be governed very largely by conditions. I suppose your idea of making the pond is to cover a certain surface. It would be simply a question of having fish enough, and not having too much to take care of the supply of mosquito larvae.

Mr. CLAFLIN: Would not the sun kill them, being exposed in a small place, four or five feet wide?

Dr. FELT: I don't think so. I never had any experience under just those conditions, but in a case of sun I don't think it would—they like the sun.

Mr. CLAFLIN: Mr. Chairman and gentlemen, I thank you for your attention.

CHAIRMAN: The Federal Government is also represented here. Surgeon-General Wyman is represented by Surgeon Preston H. Bailhache. I will call upon him.

The Chairman then states that, owing to an important engagement which must be met by him, he will have to leave the meeting at this time, and asks, if there be no objection on the part of the company present, that Mr. G. Waldo Smith take his place as presiding officer.

There being no objection, Mr. Smith then took the chair.

SURGEON BAILHACHE: I wish to say, in the first place, that I was notified that I was to speak or write on the subject of the work of the Army. Not belonging to the Army, I wrote Mr. Weeks of the fact and told him that I would be glad to write or say a few words about the extermination or exclusion of mosquitoes from our dwellings or public institutions. I will proceed to read a few lines about the subject I mention.

The Surgeon then read the following paper:

## THE EXTERMINATION AND EXCLUSION OF MOSQUITOES FROM OUR PUBLIC INSTITUTIONS.

By Preston H. Bailhache.
Surgeon U. S. Public Health and Marine Hospital Service.

Before beginning my remarks on "The Extermination and Exclusion of Mosquitoes from our Public Institutions," I wish to correct an error in the program issued on the 8th instant, in which the name of Surgeon-General Wyman, by Surgeon Preston H. Bailhache, appears to be slated to speak upon "The Extermination Work of the Army Medical Corps." Much credit is due to this Corps, but it would be a piece of presumption on my part to even try to do justice to a subject which belongs to another branch of the public service. The Army Medical Corps and the Public Health and Marine Hospital Service, of which latter Surgeon-General Wyman is the Chief, are two different organizations, one under the War Department and the other under the Treasury Department, and while they both work on the same lines so far as public health is concerned, it would hardly be proper for me to speak on the subject indicated on the program.

In regard to the subject I have selected, "The Extermination and Exclusion of Mosquitoes from Public Institutions," I may be permitted to say that, so long ago as the summer of 1897, Passed Assistant Surgeon A. C. Smith, an officer of the then Marine Hospital Service (now the Public Health and Marine Hospital Service), accepted the idea of Dr. Finlay, of Havana, Cuba, regarding the dissemination of yellow fever by the bites of mosquitoes, and after screening all the windows and doors at the National Quarantine Station on Ship Island, Gulf of Mexico, no case of yellow fever developed at the station, although he treated some thirty cases of the disease brought there by infected vessels. I may add, while speaking of yellow fever, that the Pasteur Institute Commission, now in session in Paris, France, has absolutely settled upon the mosquito as the sole agent in the dissemination of yellow fever.

I believe it is now accepted by all persons familiar with the subject, that malarial fevers are disseminated by a certain genus mosquito, not the yellow fever mosquito, Stegomyia Fasciata, nor the ordinary mosquito of the genus Culex, which,

though very troublesome, is quite harmless in this respect, but it is the "Spotted Wing" mosquito of the genus "Anopheles" that disseminates malaria, and which must be guarded against and exterminated.

The first thing to do, then, is to protect the house or institution against the entrance of these pests, and the next thing to exterminate all that may have lodged therein before necessary precautions had been taken.

The plan for screening is that inaugurated by the Health Officer at Havana, Cuba, which, in brief, consists in placing galvanized iron or brass wire screens, about 18 or 20 meshes to the inch, in all windows and doors, the entrance door being protected by vestibules separating two sets of doors, with sufficient space between to allow the outside door to be securely closed before opening the inside door. The window screens should be permanently fastened in place, so that they cannot be opened at any time, and the wire of very fine fibre to allow as much air as possible to pass through the screens.

The building is now mosquito proof, but it is necessary to exterminate all mosquitoes which may have gained entrance previously.

If but few are present, a simple method is to fasten a small tin cup partially filled with kerosene oil upon a stick and hold it under the mosquito, which will almost immediately fall into the liquid; but if the house is largely infested, the plan suggested by Dr. L. O. Howard, entomologist of the Department of Agriculture, for the destruction of household insects, is efficient, and obviates the necessity of removing any of the furnishings of the rooms. His plan is to use Hydrocyanic acid gas for this purpose, and he suggests that it can be prepared by the mixture of one fluid ounce of commercial sulphuric acid, diluted with two fluid ounces of water to increase the bulk of the fluid, and insure complete chemical action, and one ounce of high grade (98%) Cyanide of potassium for every 100 cubic feet of space. This gas will not only destroy mosquitoes, but all kinds of household insects, such as cockroaches, bedbugs, clothes-moths, ants, houseflies, etc., are quickly killed by its fumes, and even rats and mice may be included in the slaughter.

While Hydrocyanic gas is so very efficient in the destruction of insects, it is also a dangerous gas for man to breathe, and should only be used by experts.

For the benefit of those who may not have read Dr. Howard's paper on this subject, I quote as follows:

"Before performing the operation the house must be vacated, and it is well to do this just before nightfall. It is not necessary to remove any of the furniture or household belongings unless of polished nickel or brass, which may tarnish a little. Liquid or moist foods, as milk or other larder supplies that are not dry and might absorb the gas, should be removed from the house. All fires should be put out, for while the gas will not burn under ordinary conditions, it is as well to take no risks.

On the floor of each room should be placed a large porcelain wash basin, and into each wash basin should be poured the proportionate amount of water and sulphuric acid. It may be well to place under each wash basin a thick layer of newspapers, in order to avoid damage to carpet or rugs by the possible spattering of the acid acting upon the cyanide. All windows must be closed, and if they are not tight they should be calked with thin paper or cotton batting. Then the operator, beginning at the top of the house, drops the proportionate amount of cyanide of potassium, previously weighed out into thin paper sacks, into each washbowl, running rapidly from room to room and instantly closing the door behind him, descending ultimately to the ground floor or even to the cellar, running finally into the open air through the open door, which is instantly closed.

Hydrocyanic acid gas is lighter than air and consequently rises. Therefore, the operation must be begun at the top of the house. The next morning the operator returns to the house, opens the last door, allows a certain amount of airing; then enters hurriedly and opens the windows of the first room or floor; then, after the thorough airing of this one, another in turn, thus gradually airing the whole house. The fumes quickly overcome and are fatal to human beings; hence the necessity for the utmost care and greatest speed in the initial operation and in the subsequent airing, and the undesirability of performing the experiment alone. The house should not be reinhabited until all trace of the odor of the gas has disappeared. This odor resembles that of peach kernels."

Dr. Fernando Lopez, of Mexico, at a recent meeting of the American Public Health Association, presented a paper on the

same subject, and stated that for the destruction of mosquitoes, 10 grammes of cyanide to the cubic metre should be used, the exposure lasting six hours. His plan for large rooms, like hospital wards, was as follows, which he stated would obviate the danger from violent ebullition, as occurs when large pieces of the salt are dropped in the acid, and will also give plenty of time for the operator to leave the room.

"The process consists in placing the salt with a little water in a porcelain cask of sufficient capacity, and the sulphuric acid conveniently diluted in another cask which has a faucet. Place a porcelain or enameled iron vessel in the mouth of the first cask, holding it in place by wires, giving it a slight inclination, so that the liquid poured into it will run into the interior of the cask; place the cask containing the sulphuric acid upon the table so that the faucet will be in the air; place the second cask upon the floor so that the vessel attached to its mouth will be just beneath the faucet. Having prepared everything in this way, and the time comes to verify the reaction, calmly turn the faucet so that the solution of sulphuric acid will fall on the small vessel and run into the cask containing the cyanide. It is easily understood that by using this artifice there will be plenty of time to escape from the action of the gas and to complete the operation with calmness and surety."

Other plans for ridding a house may be used, such as the burning of bubac, or Persian powder, etc., or roll sulphur, but the latter would require the removal of fabrics, etc.

For a full and interesting account of the use of this acid, in the destruction of household insects, with a description of its practical application, I refer you to Dr. Howard's article published in the Government Public Health Reports, November 13, 1903, pages 1977 to 1982.

Dr. PRESTON H. BAILHACHE added the following remarks: Of course, this hydrocyanic acid gas is a very dangerous gas to be used, and would probably never be necessary except in a very thoroughly infected house. But for railroad cars it seems to me it would be ideal; where they infect railroad cars it can be emptied and the gas put in. In this case I think the operation would be perfect.

CHAIRMAN: We will now be addressed by Dr. J. C. Perry, Passed Assistant Surgeon, who also represents General Wyman.

## GOVERNMENT ANTI-MOSQUITO WORK.

DR. J. C. PERRY.

I have not prepared a paper because I did not expect to be called upon to read one. However, I notice on the program a reference to the work done by the United States Public Health and Marine Hospital Service and I would like to make a few remarks upon that subject. I shall be brief and will detain you only a short time.

The Public Health and Marine Hospital Service is keenly alive to the danger of transmission of disease by mosquitoes and I have been much interested in the subject. All varieties of mosquitoes and their extermination are interesting subjects, but sanitarians are particularly interested in two varieties, the anopheles and stegomyia. These are the most dangerous, although the ordinary species of culex cause some trouble.

The anopheles mosquito is domestic in its habits, but wild in birth. It generally breeds in shallow ponds and any stagnant water, but not as a rule in broken bottles and rain-barrels about the house, and the elimination of this species of mosquito is principally an engineering problem. The measures to be adopted are the drainage of ponds and other accumulations of stagnant water. These measures would be the most efficient, because they would give permanent results. General policing of the premises should also be carried out, and as a temporary expedient coal oil should be used to kill the larval forms. This temporary expedient is to give immediate protection, while organic improvements are instituted for permanent results. Stagnant pools should be filled or drained.

The Marine Hospital Service has obtained marked results by the screening of patients suffering with transmissible diseases and using oil to destroy the larvae.

The most dangerous species and one of special interest is the *Stegomyia fasciata*, which is a factor in the transmission of yellow fever. This is a domestic mosquito. It breeds around the house in broken bottles, water barrels, flower pots, tracks

of animals, etc., and seldom goes far away from its place of birth. In a town or province, especially in tropical countries, where yellow fever prevails, it is important to carry out work relative to protection against this mosquito. The first thing to do is to screen your patients. If you can isolate your cases promptly and screen them, so that mosquitoes cannot be infected, you have half the battle won. At the same time supplement this by using oil on the water barrels to kill the larvae present. Then look after the general policing of the premises, draining small pools, filling up cattle tracks, destroying broken bottles and flower pots. These should not be overlooked.

In this work our service has had considerable experience in epidemics, and the plan has been to first isolate the cases of fever and screen them as quickly as possible, then screen the containers of water around houses if a city is without a modern water supply, and the use of oil to kill the larvæ present. Another function that falls in their province is that relating to maritime quarantine—the surveillance of vessels sailing from infected ports. We know, and it is generally accepted, that the mosquito is a transmitter of infection. If a vessel can leave an infected port with no infected mosquitoes aboard and no fever cases develop on a five days' trip, that vessel is safe. This has been proved by work of our officers on duty in Central American ports, where vessels were disinfected immediately before departure for the purpose of killing the Stegomyia. Of course, the possibility arises of a person having been infected before the vessel left; but that would develop during the five days at sea or the danger of spreading infection could be eliminated by detaining the vessel in quarantine a very short time, only sufficient to complete the five days from date of sailing. Such procedures simplify the problem and obviate the long quarantine detention.

The question naturally arises, What are the best disinfectants or insecticides for killing mosquitoes? On ships, sulphur is the best agent for this purpose; it should be burned in the proportion of one pound to 1,000 cubic feet and two hours are necessary. Another factor in dissemination is a railroad car coming from an infected place. The best agent to use in killing mosquitoes in such coaches is hydrocyanic acid gas. For this purpose the car should be placed on a siding

or in the yard, where there are not many people around, as this gas is a very dangerous one and I would rather do the manipulation from outside. The best way in which to do this is, after placing the receptacle containing the acid in the car, lower the cyanide contained in a muslin bag by a cord run through a transom. As far as the disinfection of houses is concerned, sulphur is the best thing to use unless there are fabrics that it would destroy. It should be used, one pound to 1,000 feet, and will kill the stegomyia and other species of mosquitoes. Hydrocyanic acid gas is dangerous for use in a house, except under very favorable conditions. Tobacco smoke can also be used, but it is not a good agent; it will kill the mosquitoes, but stains the fabric and leaves a very disagreeable odor. Pyrethrum is an efficient agent, provided the mosquitoes are promptly brushed up and burned, as only a portion are killed, the others being simply stupefied and will recover in the fresh air. Used as above, it forms a desirable agent in killing mosquitoes in houses, especially in thickly inhabited districts.

CHAIRMAN: We had expected to have with us to-day Dr. Ernst J. Lederle, President of the Department of Health of the City of New York. He has written a letter, which Mr. Weeks will read.

NEW YORK, December 14, 1903.

*Chairman Anti-Mosquito Convention:*

DEAR SIR:— I regret very much that a promise of mine to address the Connecticut State Board of Health in New Haven on December 16th will prevent my attendance at the Convention over which you have been invited to preside. I know that the occasion will be important and profitable, and beg to assure you, and, through you, the other members of the Convention, of the continued interest of this Department in the work of mosquito extermination in this city and vicinity. I am deeply sensible of the importance of united effort in this respect, and I doubt not that your interest in the matter will lend to the movement the co-operation of the State of New Jersey.

The Convention will learn through Mr. Weeks of the work which this city, through the Department of Health, has been able to do (Appendix A), and I look for even greater progress in this work with the co-operation of your State, and perhaps also of the Federal Government.

Respectfully,

ERNST J. LEDERLE, President.

A paper on assigned topic was forwarded later.

## "THE SPHERE OF HEALTH DEPARTMENTS."

ERNST J. LEDERLE, PH.D.

DEAR MR. WEEKS:—I have not the time at present, as you may imagine, to say more than a word regarding the sphere of Health Departments in work for mosquito extermination. That I regard this work as highly important seems to me to be plain from the amount of attention given to it during my administration in the Department of Health, where, as you know, numerous other matters are constantly claiming the time of the head of the Department.

I believe that the chief function of a Department of Health in this connection is educational. People must be taught the danger as they already know the annoyance from mosquitoes. They must be taught in the second place how mosquitoes are to be eradicated from any given section of the country, and, in short, they must be enlightened to the point where they will gladly co-operate in the work of any central organization which is endeavoring to abate the nuisance and disease caused by mosquitoes.

I have put the matter in this way because it seems to me that the powers, for example, of the Department of Health and Borough President in New York City are so great that they might in certain instances be used oppressively. It would be extremely unwise for any City administration to adopt any such policy. To use its powers in forcing owners of large tracts of low lying property to fill and drain these tracts, especially if they were unproductive, would be an abuse of the function of government. On the other hand, by educating owners up to the point where they can see the advantage of this drainage work as we know it, public and private interests will go hand in hand for the improvement of all parts of the

City, and of all sections of any city whose Health Department adopts this policy in mosquito work. I feel that even the beginning which we have made here would not have been possible without the public interest and co-operation which we succeeded in arousing. This ought to be the keynote in anti-mosquito enterprises begun by private owners. They must have the co-operation of all citizens if they are to succeed. We do not need any further law about the matter. We should not need the interference of official authority if all private owners were equally public spirited. The strict function of the Health Department, therefore, would seem to be to work, for the general good, upon certain selfish property owners who are not sufficiently careful of the interests of the greatest number to see that their own unoccupied lands are properly drained. Such men should feel the weight of official authority and be made to comply with the orders of Boards of Health. To all others the Department should be an aid and educational force rather than an instrument merely of menacing authority.

Respectfully,

ERNST J. LEDERLE, President.

CHAIRMAN: We will now be addressed by Dr. William N. Berkeley, of New York, Author of Works on Mosquitoes.

## THE EXACTNESS OF PROOFS OF TRANSMISSION OF MALARIA BY MOSQUITOES.

BY WILLIAM N. BERKELEY, A.M., M.D.

MR. PRESIDENT, LADIES AND GENTLEMEN:

The relation of mosquitoes to malaria is no longer a hypothesis comparable to the famous theories of Newton and Darwin. It is a demonstration. The evidence is (A) scientific, and (B) practical, and, omitting technicalities, it may be easily summed up in the allotted time.

(A) *Scientific.*—Laveran, the French military surgeon, stationed at Algiers during 1880, first noticed in the blood of persons showing the clinical symptoms of ague a peculiar parasite. He published his discovery, calling his parasite the *Plasmodium* of malaria. Competent observers all over the tem-

perate and torrid zones in the next few years confirmed his discovery. To-day intelligent medical students, even after a single lesson in the technique of blood examination, can demonstrate the germ. On the other hand, when the germ is absent after a properly conducted blood examination the malady invariably proves to be some other disease than malaria. Moreover, if human blood infected with this parasite be injected into a healthy man, the germ multiplies in the new subject and in from nine to fourteen days he sickens with the same characteristic and periodic chill, fever and sweat shown by the previous patient.

The life history of the malarial parasite (of which there are several species) being further worked out, the important additional fact was discovered that the germ takes a definite number of days in which to grow to full size,—that when of full size it splits up or *sporulates* into a fairly definite number of small segments, and that these young germs burst the parent blood cell and are set free in the blood, soon entering other cells heretofore healthy, and ultimately repeating exactly the process just described. In most cases a vast majority of the parasites are of the same age, and a chill and fever invariably ensue within an hour or less after each crop of full-grown germs had been shown under the microscope to begin to sporulate. Every logical canon of experimental science is thus satisfied.

The next link in the chain of evidence began to be fashioned when it was found that besides those germs which sporulate at regular intervals in the blood, other germs appear which, though of nearly the same size as the sporulating forms, take up aniline dyes in a different way and are never seen to segment, but only at times to send out one or two or more long vibrating threads. The threads (technically called *flagella*) do not appear till the blood has been drawn from the body, *i. e.*, till the germs are subjected to a chemical or mechanical stimulus other than any received in the blood vessels. Already, as early as 1895, this process (with something akin to an intuition of genius) was interpreted by Dr. Patrick Manson of London as having to do with an alternate mode of reproduction. He ventured the prophecy, basing his induction upon similar biological processes already known, that the body of some blood-sucking insect (most likely a mosquito) would be found to be the sphere of development of a new generation of malarial

germs outside the human system. His pupil, Dr. Ronald Ross, at that time an English military surgeon, studying in London, went to India in 1896 with the determination to discover the insect concerned. After nearly two years of laborious experiment, during which Ross reports that he must have dissected "nearly a thousand mosquitoes," he actually found a mosquito of peculiar structure and external markings (Anopheles), in whose stomach wall pigmented bodies appeared after such an insect had bitten a malarial patient. The subsequent discoveries, in brief, are that the mosquito in question is born innocuous and never shows such malarial bodies unless it has itself first received them from a human being. If it has once bitten an infected human being, the parasites from the patient's blood may be found within 30 hours after to have settled upon the insect's stomach wall; they may be observed by dissection of successive mosquitoes to grow day by day until on the 6th or 8th day in favorable conditions of food and temperature the parasites are visible under a low-power microscope, and are seen to possess a thin transparent capsule, inside of which immense numbers of minute sickle-shaped rods are gathered. This capsule finally bursts, the rods are scattered in the general body cavity of the host, and carried in great numbers to the poison gland, from which they are injected, when the mosquito next bites, into the blood of a new victim. The person bitten sickens in about 14 days after the bite. This process, also, though its observation involves many technical difficulties in the laboratory, has been successfully worked out in various parts of India, in South Africa, West Africa, Holland, Italy, and the United States. A precisely similar process has also been observed with another malarial parasite (*Proteosoma*) peculiar to sparrows, canaries and certain other birds; the avian parasite is conveyed not by Anopheles but by certain species of the Genus Culex.

Experimental malaria has been voluntarily produced (London, Italy, India) in persons not otherwise exposed to any known cause of the disease, by the bite of infected insects. The subject bitten had his first chill 14-17 days after the bite.

Negative evidence is that persons have experimentally lived for several months (sleeping in wire gauze cottages) in the most highly insalubrious sections of the Roman Campagna

during the malarial season,—enjoying complete immunity from attack though nearly every one unprotected in the villages about them was ill.

(B) *Practical Proofs* are briefly (1) that the Anopheles mosquito is coextensive in geographical distribution with malaria; that is, while Anopheles mosquitoes may exist in non-malarial regions, indigenous malaria has never or hardly ever been found when Anopheles was proved by repeated search to be absent.

(2) That standing water which has long been associated with malaria is dangerous simply because it breeds mosquitoes.

(3) That excavations and upturned soil are dangerous because they favor standing water.

(4) That the eradication of Anopheles mosquitoes from a neighborhood by effectual drainage of the breeding pools, or other methods, has been found again and again to eradicate malaria.

Finally, to the question, Are there other modes of producing malaria besides actual inoculation by infected blood or the bite of an infected Anopheles mosquito? Science at present can not definitely answer No. But there seems every reason to believe that Anopheles is, at least in 99 per cent. of the cases, the only practical source of the disease.

How many species of Anopheles are inculpated is also not yet fully known. In G. M. Giles's last monograph (just out), on the *Anophelinæ*, he announced some thirty new species of Anopheles besides the forty-four or forty-five so far described. Of these seventy odd species, only about fifteen, or, at most, twenty, have been rigidly connected by scientific experiment with malaria. The ten or twenty mentioned, however, are far the commonest, and are practically the source of all the various types of malarial disease.

No other genus of the *Culicidæ*, except Anopheles, has been experimentally connected with human malaria at all. Immense numbers of experiments with many species of Culex were always negative. A few experiments with the very rare giant mosquito, *Psorophora*, by myself two summers ago, were also negative.

The balance of scientific authority tends to show that Anopheles is the definitive host, and the only definitive host, of the parasites of human malaria.

40 East 58 Street.

Mr. WEEKS: I wish to offer resolutions just at this juncture because I see from the importance of the papers the urgency of the resolutions and the necessity of having these papers, which are of worldwide importance, published, and these resolutions propose also to cover that point.

Mr. Weeks then read the following

## RESOLUTIONS ON

PERMANENT ORGANIZATION, PUBLICATION OF PROCEEDINGS, ETC.:

IN ANTI-MOSQUITO CONVENTION ASSEMBLED:

*Whereas,* a rapidly growing interest in the subject of this Convention seems to emphasize the need of there being some central organization of a national character with which the many local organizations could affiliate and thus afford the means of spreading information of their methods, their work and their conclusions for the benefit of all and for other purposes of a co-operative character;

*Resolved,* That the Presiding Officer of this Convention appoint ten persons as a Provisional Committee to consider the question of forming such an organization, who, if they shall decide affirmatively, shall be empowered to prepare a Constitution and By-laws to present to the next Convention to be held at the call of said Committee.

*Resolved,* That said Provisional Committee is hereby empowered to act for this Convention pending final organization, if so decided, in relation to any matters as to the presentation, of the subject to legislative bodies and to any authority charged with such matters, with a view of advancing the idea and the actual work as widely as possible and otherwise to act for this body.

*Resolved,* That if the Committee shall decide that it is advisable and practicable to publish the proceedings of this Convention and spread the same gratuitously or otherwise, the Committee is hereby so authorized.

Mr. WEEKS: This leaves the matter entirely, so far as organization goes, for the consideration of the Committee of ten, because we have not to-day the opportunity or time for a long discussion. (See Appendix C.)

CHAIRMAN: You have heard the resolutions, gentlemen; what is your pleasure?

The resolutions were duly seconded, and upon being put to a vote were unanimously carried.

CHAIRMAN: We had expected to have with us Mr. William H. Baldwin, Jr., President of the Long Island Railroad Company (Penn. R. R. Co.), to talk on the subject of "What Railroads Can Do." He is not here, but Mr. Weeks has a communication from him which he will read.

## LETTER FROM WM. H. BALDWIN, Jr.

**LONG ISLAND RAILROAD,**
OFFICE OF PRESIDENT,
128 BROADWAY, NEW YORK, N. Y

December 9, 1903.

DEAR SIR: I have your letter of the 7th asking me to prepare something to be read at the Anti-Mosquito Convention to be held on December 16th, in view of the fact that absence from the City will prevent my attending the meeting.

It seems to me that the preparation of papers on this very important subject should be left to the scientists who have made it a study. My experience, as a member of the North Shore Improvement Association, gave me a general understanding of the scope and magnitude of this problem, but as a layman I can not compete with the scientist who would approach it from a technical standpoint. I realize that whether as individuals or as citizens, or as members of corporations, we must all co-operate to do what we can to minimize the attacks of this pest. It is not only a torment, but, as has been clearly shown by the experiments in Cuba and elsewhere, a menace to public safety, much greater than influences which receive a far larger share of public notice. A very slight epidemic of typhoid fever causes the greatest concern, and methods for preventing its spread are promptly forthcoming; but the dangers from malaria, which are far more serious, hardly attract attention.

Since I have come to understand this subject somewhat I have felt it to be one of such gravity that the State should take an

Photo. Chas. H. Kilbourne for Dept. of Health. Courtesy Mail and Express, N. Y.

TRESTLE OVER CONEY ISLAND CREEK AT MANHATTAN BEACH R. R. CROSSING, WHERE A TIDE GATE AND FILLING IN ARE PROPOSED; LOOKING TOWARD MANHATTAN BEACH HOTEL.

active part in its successful solution. The City of New York—the largest city in the United States, and soon to be, in point of numbers, probably the greatest in the world—has at its very door a region, which, for residence and recreation purposes, and for variety of scenic effects, is unsurpassed. It is a region "where every prospect pleases, and only the mosquito is vile," and both State and local aid should be generously extended to prevent its charm being lessened by this annoying and dangerous insect.

I take it that on such an occasion as this you desire the support and co-operation of those present, and I am glad to send my assurances that The Long Island Railroad Company will, in the future as in the past, do what it properly can to aid in the good work of mosquito extermination.

Very truly yours,

W. H. Baldwin, Jr.

Mr. Weeks: May I supplement that with just a word? The Long Island Railroad, I think very largely, through the recommendation of Mr. Baldwin, has done a large amount of work already in this matter, in the work in which we are engaged in the southern part of Brooklyn; last season they trimmed out some sunken lots of brush taking 90 days; later they sent hundreds of carloads and filled in spaces whose waters were uncovered and have others in view, and have finally consented to the plan proposed of filling in the trestle over Coney Island Creek and putting a tide gate at the crossing of the Manhattan Beach track and thus drain an area of 500 acres. (Appendix A.) Mr. Baldwin's efforts also covered work in the vicinity of Flushing which the road did in the way of draining pools, etc., made by its causeways over meadows and also in the neighborhood of Bayside and Douglaston, the outlay in all amounting to hundreds of dollars. So that Mr. Baldwin's modest statement that he is not sufficiently versed in this matter is, I think, rather disproved by the fact that he has shown in a very interesting and substantial way his co-operation in this movement.

CHAIRMAN: Mr. Spencer Miller, South Orange, N. J., of the Lidgerwood Mfg. Co., New York, is the next speaker.

## THE LONG DISTANCE THEORY.

MR. SPENCER MILLER, ENGINEER.

MR. PRESIDENT AND GENTLEMEN:

I do not wish to say much on the subject assigned me, that is the "Long Distance Theory." I realize fully that it is an important question. The season of 1903 probably gave us more mosquitoes than we have known for years. We had an abnormal rainfall, and logically an abnormal mosquito supply. I spent practically the entire season in South Orange and was in the field nearly every day, and made a great many observations on the question of mosquito extermination. It must be remembered that there are over 30 species of mosquitoes in this part of the country, and every one of these different species has different habits, the same as do different birds and fowls. Most of these species are purely domestic, they breed in fresh water, fly short distances and habitually enter houses; these are the mosquitoes which we have with us very largely. The malarial mosquitoes (Anopheles), are one of this species, and the common house mosquito (Culex Pipiens) is probably the most abundant of our domestic mosquitoes. On the other hand, we have breeding in the salt marshes mosquitoes that have the migratory habit. These mosquitoes, with their migratory habits, however, also have a fortunate habit of remaining outdoors. It is most exceptional, and in fact it might be said purely accidental, that they ever enter houses. Dr. John B. Smith has stated that these mosquitoes may travel 20 miles. On August 2, 3, 4 and 5, with a gentle wind blowing directly from the Newark Meadows the mosquitoes reached South Orange, five miles west, and Morristown, double that distance. At the same time that these mosquitoes were in our fields in great abundance, they were also in the fields in Morristown. In both places the people said they were not bothered with mosquitoes indoors. I know that the salt marsh mosquitoes have been found breeding in fresh water, but taking all the circumstances into consideration, I am inclined to believe that these mosquitoes did come from the salt marshes. Even

admitting that salt marsh mosquitoes are long-distance travelers their presence is only a matter of chance. The domestic mosquito, as I have said, enters houses to feed; logically, therefore, when it wishes to reproduce its kind it seeks the first stagnant water near the house that it has departed from. The very fact, therefore, that a mosquito has the habit of entering a house is evidence of the fact that it breeds near the house.

The great battle against mosquitoes that must be taken up will be against the mosquito that breeds locally. The domestic mosquitoes include in their number the malarial mosquitoes, It may be somewhat discouraging to think that the salt marsh mosquitoes may travel considerable distances. I do not think we should feel discouraged at all. If the migratory mosquito does reach a point distant from its breeding place by chance, it is wholly a matter of chance. In fact, out of the 153 days from May 1st to October 1st, 1903, the wind was *from* the Newark Meadows 22 days out of that time (practically one day out of seven). The marsh mosquito, however, reached South Orange only twice during the season. Had the Newark Meadows been thoroughly dry we still would have had a prodigious local supply of mosquitoes coincident with the prodigious rainfall. The mosquito is inseparably connected with the weather. The sun can usually be depended upon to dry up the great bulk of the water remaining standing after a rainfall. What the sun does not dry up, man must drain, fill, oil or stock with fish—that is mosquito extermination. In just so far as we do this will we reduce our mosquito supply. It is a little unfortunate for us that we cannot find a better expression than "mosquito extermination." Many people believe that by that we mean the "total extinction of mosquitoes." This, while immensely desirable in itself, is very far removed from our expectations. I have yet to find the town where they *never* see mosquitoes. But I do know many places where window screens and bed canopies are *never* needed. It is in the power of any single town to produce that result at a cost within reason.

I will not say more than to draw attention to a circular (Appendix B, pages 78-81) which has just been issued by the Village Improvement Society of South Orange. This will be distributed at the beginning of the season there. We are now entering upon the fourth year of our campaign, and I am pleased to say that the subscriptions are coming in as readily

as ever before. This, I believe, is proof of the fact that we have succeeded extremely well. Surely if our people felt that the salt marsh mosquito formed even a considerable part of our local supply we would not be given so great a financial support. The fact that the malarial and the house-entering mosquitoes are purely local in their habits is justification enough to encourage local anti-mosquito work. In fact, I may say more, a local Board of Health which neglects to take up the campaign should be censured for not doing so.

Mr. CLAFLIN: May I ask the gentleman who has just spoken how far, in point of fact, he has ever known an Anopheles to go from the point of breeding? Of course, one cannot always tell what that point is.

Mr. MILLER: All I can say is I have never traced them over 200 yards. It is a matter of a work of years to determine that question.

Mr. CLAFLIN: Of course, that cannot be determined with certainty.

Mr. MILLER: Two hundred yards, I think.

Mr. CLAFLIN: I think it ought to be made clear in the proceedings of this Convention that these mosquitoes, carried a long way by the wind, are the non-malaria mosquitoes. It has been very difficult to impress this fact upon those who do not understand. I am continually met by persons who have given the question no thought, and they say what is the use of trying to eradicate malaria when you have the mosquitoes blown in by the wind from marshes, 10, 20 or 30 miles away? Now, I I understand quite well that anopheles travel only a little distance and it is very likely that Dr. Ross' statement is quite within the truth. Apropos of all that, there is a most interesting fact which perhaps all the ladies and gentlemen here know, but it may be that some do not, and that is that many years ago when they were draining around Rome, it was discovered that when a square mile was drained, in the middle of that square mile and for an undetermined, but considerable distance about the center of that tract, malaria absolutely disappeared, and Prof. Crudelli so reported to the Roman Government, and in consequence of that report a great deal of additional work of draining was done. Now, that entirely

carries out the theory, which I am sure is a fact, that the anopheles travels only a very short distance and when you drain any very considerable tract of land, there is practical immunity from malaria. Mosquitoes coming from afar, while troublesome, are absolutely without danger to human health.

Mr. KERR: Just a word. Dr. Howard told me, some years ago, to the best of his knowledge, they were sometimes blown a long distance, but when they came to the end of their journey they didn't amount to very much.

Mr. E. L. DICKERSON: In the last number of the "Science" there was strong proof of the carrying powers of the Culex Sollicitans. In all our investigations of the marsh mosquito we found that they traveled a great distance. On the 28th of July there were thousands coming out of the Jersey marshes and these were found thirty or forty miles away.

Mr. SCOTT: In my work this season, another matter came to my attention, and that is that the anopheles breed in rain barrels occasionally; that has been overlooked very largely. It is important to educate the public in all these things. I found from a house to house investigation I made that at one time we had a large influx; this would last generally for a short time, probably a few days. I went to the rear of one of these residences and I found a large water barrel, probably one-third full of water. The lady of the house was on the front stoop, who, upon inquiry, stated that the mosquitoes were very numerous, and I had to take a great deal of abuse from her before I was able to give her my opinion. She stated that she didn't consider that oiling was of any benefit. I asked her to go to the back of the house with me, and she finally did. I said, my dear lady, you are supplying the mosquitoes yourself, and I called her attention to the barrel. She stepped back and said, are those mosquitoes? and I said, they certainly are. I showed her our method of disposing of the mosquitoes, and she promised to follow it.

CHAIRMAN: Our Secretary will now read a letter from Prof. Whitney. We had hoped that Prof. Whitney could be with us, but instead we will have to hear his letter read.

Mr. WEEKS: Let me say something in anticipation of this

letter. In our crusade we have endeavored to show the importance of reclaiming marshes for commercial purposes and the government has made examinations to show the value of the soil. If we are correct in our argument on the value of marsh lands for commercial purposes, we have gained a great point.

## VALUE OF RECLAIMED SWAMP LANDS FOR AGRICULTURAL USES.

LETTER OF PROF. MILTON WHITNEY.

**U. S. DEPARTMENT OF AGRICULTURE,**
BUREAU OF SOILS,
WASHINGTON, D. C.
MILTON WHITNEY, Chief.

December 5, 1903.

DEAR SIR: In reply to your recent request for information upon the value of reclaimed swamp land for agricultural uses, I submit the following general statement:

Swamp lands, by virtue of their position, become the repository of highly fertile material washed from the uplands by the rains. As a general rule, the immediate surface of any soil is the most fertile portion of that soil, resulting from the fact that this surface material is in better physical condition, and most exposed to the action of the weather, the sun, rains, and air. This surface is the first portion removed during rains, and is the portion carried down into the swamps and deposited. When erosion goes on at such a rapid rate that both the surface and the underlying raw soil are washed away, the resulting bottom land deposit is frequently sterile. Witness the mud flats and swamps along the Sacramento River in California, which have been covered with mud from the hydraulic mines of the Sierra Nevadas. Here large areas have been ruined by the mud, and will not become fertile until the weather has acted upon the material long enough to make the soil an acceptable medium for plant growth. Fortunately, most of our lowlands and swamps receive only the more gentle washings or the most fertile materials from the uplands.

Swamp lands contain an unusual amount of organic matter, and for that reason are easy to maintain in proper tilth, light

to work, and warm. From their low position, water is generally abundant, or easy to obtain for irrigation by pumping or diversion from nearby streams.

Swamp lands and tide marshes are considered the most valuable of lands in the world's older countries. Their inherent fertility is recognized, and the ease with which they are cultivated and irrigated is greatly appreciated. In England, for two hundred years the tide lands have been under reclamation, and to-day over 1,000,000 acres are in "a matchless state of fertility."

In Holland extensive areas have been reclaimed from the sea. The greater part of the country lies at or below the level of the sea, and is reclaimed from a jungle of swamps and savannas. Holland to-day represents one of the most successful attempts at swamp reclamation. Lakes have been drained by dyking and pumping, and plans are now on foot to drain the Zuyder Zee, an arm of the ocean.

In our own country swamp reclamation has been carried out on a large scale in the Middle Western States. Ohio, Indiana, Illinois, Michigan, and Wisconsin have great areas of productive land once swamp, but now the most fertile and reliable land in those States. The tide marshes around Puget Sound in Washington have been lying untouched until within the last few years, but the recent great influx of Scandinavians has resulted in a movement toward the reclamation of these lands, and excellent farms are being established.

In California one of the greatest areas of swamp peat land in the world lies in the Sacramento-San Joaquin Delta. Over 1,500,000 acres of peat from 6 to 40 feet thick are ready for reclamation. Small areas have been farmed for 40 years without reduction in productive capacity, and to-day large areas are being reclaimed. Yields of 500 bushels of potatoes, 6,000 pounds of asparagus, 60 bushels of barley and oats have been common, and with proper farming such yields should continue to be common.

Wherever properly reclaimed swamp lands are found their fertility is recognized; almost without exception they are more fertile than surrounding uplands. They are frequently used in special crop production, such as in growing celery, asparagus, cranberries, or onions, but in dairying or general farming they are unexcelled as permanent pasture or hay land. The

consensus of opinion in districts where swamps have been reclaimed and farmed for many years is that there is no more valuable portion of the farm than the swamp, properly reclaimed.

Very truly yours,

MILTON WHITNEY,
Chief of Bureau.

Owing to the inability of the acting Chairman, Mr. G. Waldo Smith, to remain longer at the meeting on account of another engagement, Mr. Claflin was requested to and did thereafter preside.

CHAIRMAN: I am informed that we have with us Colonel Gorgas, of the U. S. Army, and I know all present would be pleased to hear from him.

## ANTI-MOSQUITO WORK IN HAVANA.

DR. W. C. GORGAS,
Colonel and Assistant Surgeon-General, U. S. A.

I came to-day for the purpose of learning, rather than for the purpose of trying to say anything with regard to our work at Havana. My experience has been altogether within the tropics, but I can agree entirely with the general tenor of the remarks made here this afternoon, namely, that mosquito work is entirely practicable—that it is entirely possible to exterminate the mosquito in a limited area, such as a municipality and its suburbs. Our work in Havana was from a slightly different standpoint from that of most of the speakers this afternoon. We did not care so much to get rid of mosquitoes as to get rid of the diseases which they spread. While we necessarily gave a great deal of attention to general mosquito work, our greatest efforts were turned in the direction of destroying infected mosquitoes and exterminating disease. I suppose that in the year after the discovery by the Army Medical Board that the mosquito was the means of spreading

yellow fever, we spent a hundred thousand dollars, outside of the routine sanitary work, on mosquito extermination. Our experience was that the mosquito was entirely local. I would require, on receiving a report that mosquitoes were bad in a particular house, that the inspector locate the cause on the premises. In many instances, it occurred that the inspectors had to be sent back several times, with orders to look more carefully over the premises. I do not think that there was a single instance, in which the mosquitoes were reported as being unusually bad, in which the cause was not located on the premises immediately concerned. For the year 1900, the year preceding the beginning of our mosquito work in Havana, we had 325 deaths from malaria. In 1901, the first year of our mosquito work, we reduced this by half, and had 151 deaths from malaria. The second year of mosquito work, we reduced the results of the preceding year again by half, and had 77 deaths, and up to the 1st of September, 1903, I see from the Havana health reports that they have had but 39 deaths from malaria. This is a very fair measure of the amount of general mosquito work done and of the results obtained from this class of work, because, from the nature of the disease, the malarial patient could not be isolated and followed up, as was the yellow fever case, and therefore no special work could be done toward destroying the malarial infected mosquito. The decrease in the number of malarial cases is entirely due to the decrease in mosquitoes at large. In many parts of Havana, when I left there in October, 1902, mosquitoes had entirely disappeared. The inspectors of the various districts made daily reports of the condition of the houses inspected by them, as to whether or not there were mosquito larvæ on the premises. These reports were consolidated day by day and month by month, and we could thus keep a pretty close estimate of the results of our work. The consolidated report of January, 1901, just before our mosquito work commenced, showed 26,000 water deposits containing mosquito larvæ within the city limits. The same consolidated report for the following January showed less than 300 for the same area.

Dr. Smith has stated here to-day, and given very good evidence in support of his statement, that the culex sollicitans will travel twenty miles or more. This is very interesting and new to me, although not very important as far as the

transmission of disease is concerned. While this mosquito is a great biter and very annoying, she does not transmit the disease, as far as we know.

CHAIRMAN: If Mr. Cravath is here, I hope we will have the pleasure of hearing from him. He has done a great deal of good work in the matter of mosquito extermination and we were in hopes of hearing from him.

(Mr. Cravath did not respond to the invitation to speak, but later forwarded his paper.)

## "HOW THE LAW SHOULD AID."

MR. PAUL D. CRAVATH, COUNSELLOR.

I very much regret that other engagements have prevented me from being present at the first anti-mosquito convention, and from saying a few words on the topic assigned to me. I think that it is now demonstrated to the satisfaction of every one who has studied the subject that any community can substantially rid itself of the mosquito nuisance by concerted action. The chief obstacle to the success of the movement in most communities is the difficulty of securing this concerted action. It often happens that the most troublesome breeding places are controlled by persons who are either unwilling or unable to incur the expense involved in treating such breeding places, and very often they are unwilling to permit others to do the work for them. This difficulty can to a great extent be met, under the present state of the law in this State, and in most other States, by the boards of health taking up the subject and exercising their authority. It is just as much in the province of the boards of health to require persons in their jurisdiction to exercise reasonable precautions to prevent the breeding of mosquitoes as it is in their power to abate any other nuisance which is likely to affect the public health. Indeed, in many communities, no single measure would do so much to prevent sickness and misery as the prevention of the breeding of the Anopheles mosquito, and in nine cases out of ten the expense involved in the remedy would be insignificant compared with the benefit to the public.

Of course, until the abatement of the mosquito nuisance is made one of the specific duties of the boards of health, they will in many cases be slow to act. It will also be found in many localities that complete immunity from the mosquito nuisance cannot be secured without considerable expenditures for drainage, etc., for which it would not be possible to provide without legislative authority for the issue and sale of bonds to raise funds for the purpose.

It, accordingly, seems to me that while very much can be done by the public authorities under the existing laws, legislation for the following purposes is desirable:

1. To authorize appropriations of public moneys to boards of health and State entomologists to aid in the investigation of subjects connected with the mosquito extermination problem and stimulating public interest in the subject.

2. To specifically make the mosquito nuisance one of the subjects requiring attention from the boards of health.

3. Permitting counties, cities, villages and towns to issue bonds to provide for the expense of comprehensive measures for mosquito extermination. In this connection, I think a very important legislative step would be to authorize the creation of mosquito extermination districts, which might be subdivisions of a county or a town, the taxpayers of which could be required to bear the expense of the mosquito extermination measures within their respective districts. Such a measure would obviate the difficulty which exists under the present law of taxing an entire county or town for the expense of mosquito extermination work which would benefit only a single community. Precedents for such legislation are found in the lighting districts, school districts and drainage districts which exist under present laws.

CHAIRMAN: The Secretary informs me that Dr. E. Porter Felt, State Entomologist, has had the kindness to come here from Albany. I know this Convention will listen with very great pleasure to Dr. Felt.

Dr. FELT: I wish to assure the parties present here that it affords me much pleasure to be present, but I don't know

but what an entomologist is somewhat out of place here, judging from the technical way the people have spoken. You want some one who has given his attention entirely to mosquitoes—a culologist. I am here to outline in a brief way what appears to me possible for the State to do in this work. It is, of course, a very important undertaking, and I wish to state for those interested in economic problems that we claim this should have a part. I learn here to-day that within a radius of 25 miles of the city limits you have 300 square miles of swamp area, 200 in New York and 100 in New Jersey. As a State official, that on the other side does not interest me very much, but as a citizen it does.

## NEW YORK STATE'S PART IN MOSQUITO EXTERMINATION.

By E. Porter Felt, Sc.D.
New York State Entomologist.

The recent discoveries that mosquitoes were active agents in the dissemination of malaria and yellow fever excited great interest, and this has been materially increased by operations in various parts of the world, showing that it was not only possible but eminently practicable to check the spread of these diseases by fighting mosquitoes. It is a very natural step from this to attempt to reduce the annoyance and discomforts caused by swarms of these pests, even though they may not be carriers of disease. This work has been taken up in earnest in several localities in New York State, and it suffices only to mention the excellent results obtained by the North Shore Improvement Association in its attempts to abate the trouble over extended areas, and also the very laudable work of the Board of Health of Lawrence, L. I.

It is surprising, though nevertheless true, that there are practically 200 (199.15) square miles* of swamp land within twenty-five miles of City Hall. A little over 100 (101.85, 41.40 being fresh water swamps) square miles are in New Jersey. This entire area is of interest to residents of this city, while we are primarily concerned with the nearly 100 (95.55) square miles of salt marsh within this radius in New York State, and the very small amount (1.75 square miles) fresh

*Planimeter determinations from U. S. Geological Survey.

water swamps. Portions of these areas produce billions of annoying pestiferous insects, which, under certain conditions, are a serious menace to public health as well as a nearly unendurable nuisance. The practicability, as previously stated, of reducing this annoyance and danger to a minimum, has been demonstrated, and it is our pleasure to discuss briefly what the State should do to aid in bringing about more sanitary conditions, not only in the vicinity of this great city but in other sections of the State.

In the first place, this is not a matter which can be adequately controlled by general laws, except possibly those giving, where necessary, a larger degree of authority to Boards of Health. This problem is something which must be taken up largely by local authorities and carried as far as the community interested will permit. It is very true that not all marshy areas lend themselves kindly to political boundaries, and in not a few instances it will probably be necessary for the authorities in one place to co-operate with those in adjacent towns. There are, in addition to these smaller areas, some extensive ones, the treatment of which would hardly devolve upon adjacent towns and which might be attended to by counties. It is possible that where these extended areas are of more than local importance, that the State should do something toward remedying the difficulty.

The work so far done about New York City has been performed under considerable disadvantages, because it has been impossible for local associations, with the funds at their disposal, to give proper attention to the scientific aspects of the case and at the same time carry on the extensive practical operations necessary. Experience in other fields of applied entomology has demonstrated time and again not only the advisability but the necessity, from an economic standpoint, of basing practical work upon scientific investigations. No one thinks of employing an architect to superintend the construction of a dry goods box, and yet the man who undertook to erect one of these large buildings without such skill at his command, would engage in a foolish undertaking. In the same way, it requires little scientific knowledge to drain a small swamp or kill a few mosquitoes. It is entirely different when we undertake to apply these processes to large areas and secure results extending over a period of years. This can be

done to advantage only after extended studies have demonstrated the advisability of certain courses. The time and money expended by the specialist in solving these preliminary problems is exceedingly well invested, and the saving resulting from his service should pay for the cost of his work many times over.

It must not be assumed that we know all about mosquitoes. Much valuable work has already been done, but there is great need in this State of a general biological survey of the more important swamp areas, particularly those about large cities, for the purpose of determining the places most prolific of mosquitoes and the times when they are most likely to appear. We can do no better in this respect than to imitate to some extent the course of our sister Commonwealth, New Jersey, which would doubtless be very ready to co-operate so far as this could be done to advantage. The effect of climate and other conditions upon the abundance of these insects should be carefully studied, since there is evidently considerable variation in this respect. The number of kinds or species occurring in different areas should be determined, and their habits, powers of flight, etc., carefully ascertained. It has long been known that there are various species of mosquitoes, but up to recent years it has been assumed that relatively slight differences in habits exist. In reality, there is a very great divergence, and possession of this knowledge is a prerequisite to effective economic work.

These fundamental facts acquired, we are in position to determine by experiment the best method of solving the problem under various conditions. Every effort should be made to find solutions which will result in the increased value of these swamp lands paying very largely or entirely for the improvement. In other words, aim wherever possible to make permanent betterments which will pay for themselves and incidentally solve the mosquito problem. These extensive swamp areas, if reclaimed, are near enough to New York, so that they would have considerable value either for market garden purposes, or, in the course of time, as residential areas. This change can, in many instances, be brought about without excessive expenditure, by series of dykes and ditches, which either shut out the water or provide for its prompt removal. Certain wastes from this city are now being used to fill up low

places, and this work may be continued to great advantage for a series of years and result in very material improvements without much cost. Temporary methods of controlling this pest should be regarded, generally speaking, as makeshifts, and most of our efforts directed toward securing permanent improvements. Exceedingly valuable work may be accomplished by Boards of Health of cities and villages, as has been pointed out in an earlier paper.

A general biological survey cannot be conducted without funds, and it is only proper to state in this connection that, in our judgment, from three to five thousand dollars annually for a period of three or four years would be sufficient for a close study of the entire situation and would result in securing a vast amount of information which would be of supreme importance to all communities attempting to solve this problem. It would seem only proper that the initiation of any such movement should be from the communities likely to be benefited, and certainly the residents of New York City and its environs are more deeply concerned in solving this problem than those in any other section of the State.

Our position may therefore be summarized as follows: Generally speaking, mosquito control should be undertaken by local communities. We, however, recognize the necessity of expert advice, and hold that the State, owing to the general utility of such knowledge, should make ample provision for its acquirement and dissemination.

CHAIRMAN: I am informed that Mr. Frederick C. Beach, of Stratford, Conn., editor of the Scientific American, has been with us. It would have been a great pleasure for us to have heard him in person. But Mr. Beach has left a paper which the Secretary will read.

## WHAT THE GENERAL GOVERNMENT SHOULD DO.

FREDERICK C. BEACH.

The mosquito plague is now so old and familiar and is of such universal annual occurrence that its partial elimination only is of the utmost public importance.

In olden times sparsely settled communities were able to withstand the nuisance and annoyance of this pest from force of habit, but as centres of population increased the disagreeable, disquieting mosquito aroused greater attention, until the time has come for large public improvements planned to check the wholesale multiplication of the insect.

The fact that certain species of the mosquito conveys from person to person malarial poisons, is of itself of such consequence in injuriously affecting the public health as to demand from the people and public authorities the promotion of measures to prevent the propagation of these insects.

It is only by broad, well-planned, extended means, aided by the public sentiment and money, that these greatly desired ends can be accomplished.

Vast areas of swamp lands surrounding thickly populated sections are the breeding places for mosquitoes. Treatment of such land in the way of drainage, to render it mosquito proof, requires expenditures far in excess of the abilities of local communities to stand, and for this reason aid should be given either by the State or the general Government on the same principle that aid is now given in the betterment of public highways, irrigation and agriculture.

The Government could assist in the betterment of the drainage of rivers and canals in connection with localized plans for the improvement of mosquito breeding grounds, and could cooperate to make the plans effective.

Congress should enact special legislation upon this subject, conferring power upon the Agricultural or War Department, under certain restrictions, to aid States or other communities in intelligently carrying out comprehensive plans for the extirpation of the mosquito.

Experience has proven that when scientific, systematic, well-engineered methods of draining have been pursued in a broad, comprehensive way, remarkable benefits have resulted. It is to be hoped a new era has begun in eradicating this common pest from our midst.

Dr. JUNOR: I would like to ask a question. I would like to ask the gentlemen here for its solution. The question is whether the mosquito, Culex Sollicitans, will live in pure sea

water. I have suggested in Brooklyn and for Brooklyn for the extermination of malaria and the mosquitoes in the Park that, in my opinion, the only solution will be the introduction of sea water, substituting it for the present fresh water in the Park. That question is not absolutely settled, as to whether the Culex Sollicitans can live in pure sea water. My own experience in connection with it for the last two summers is it will not, but I would like to have the gentlemen interested in this question examine that in order that it may be fully and distinctly known, so that the question of the transformation of Prospect Park may be settled. As yet it is not fully determined, and I want to have the scientific question settled as to whether the introduction of sea water would absolutely preclude the presence of the Sollicitans; all others it certainly would, and therefore I put the question before the gentlemen here so that it may be taken up and that question brought to a solution.

The question of fish is already solved. The introduction of sea water would necessitate the proper inflow and outflow similar to the tide and certainly allow the introduction of fish, but the question is simply an abstract one, namely, Can the sollicitans live and propagate in sea water? I would like that settled.

CHAIRMAN: That is a most interesting question, doctor, and if there is any gentleman here who can throw any light on the question we should be very glad to hear from him. I presume, however, that there is no one more competent to speak in that regard than the doctor himself.

Dr. JUNOR: That is my experience. I received a letter from Dr. Howard in which he has a little hesitancy regarding the question of the Culex Sollicitans. I wrote to Virginia Beach to a hotel owner there, where there was a lake immediately behind the house, and that lake was a fresh water lake, and they were pestered with mosquitoes and malaria and were about to give up the hotel. They transformed that from a fresh water into a salt water lake, and the gentleman who owns the hotel writes me that they have neither mosquitoes nor malaria. At the same time Dr. Howard says he sent an agent to the lake to find out if there were any mosquitoes there, and he found no mosquitoes and no malaria about the lake. That is eight years since the transformation was made. That would seem to be enough proof in this line, but I would like to have it absolutely settled.

QUESTION: May I ask whether in that case at Virginia Beach, there was free access of the tide?

Dr. J.: The engineer who built it used a very ingenious plan. He built a canal, boarding it at the bottom, and at the sea outlet he had an inclined plane and then a sharp turnout, and when the sea came in it threw enough water over that inclined plane which could not get back to the ocean, but ran down into the lake, and then the outlet being made for the fresh water, the salt water completely annihilated the fresh water. That is a very important question to Brooklyn, and I would like to have it settled; many people are moving away from that section on account of the malaria.

QUESTION: Are there not fish in the Prospect Park Lake?

Dr. J.: Only a few. The edges permit of mosquitoes.

Dr. FELT: May I have just one word? I think if you could keep those lakes in the Park normally salt, at the same degree as the sea, you would have very little difficulty, but I imagine if you don't provide for a constant change you would soon have brackish conditions.

Dr. J.: In connection with that, I have experimented with the mosquitoes and find that they will not live in the sea water. Necessarily, in the introduction of sea water into the Park the margins would have to be obliterated and either asphalted or stone put there. Everything would be done in order to keep fresh water from percolating into the lake and making it brackish.

Dr. FELT: How would you cut it off from overhead?

Dr. J.: That would amount to nothing. I don't believe that would be any injury whatever.

Mr. WEEKS: I have some resolutions of thanks that I would like to offer. I will also say in regard to my own paper that I will not take the time of those present to listen to it, but I will have it incorporated at the end of these proceedings, and then if they are printed it will appear with the others. I also want to say, before Dr. Junor leaves, that the Doctor has been in service in China, in adjoining hospitals, with Dr. Manson, of whom we all know, in connection with mosquito investigations, which connection accounts for Dr. Junor's first interest in the subject. Now I would like to offer the following:

## VOTE OF THANKS.

For gratuitous publishing of the Convention we are greatly indebted to many friends of the cause—Prof. Hooper, of the Brooklyn Institute of Arts and Sciences; Mr. Edward Hagaman Hall, Secretary of the American Society for Scenic and Historic Preservation, the Borough Authorities and Mr. Kerr, for all of Richmond; Dr. Becker, of the Newark Board of Health; the Secretary of the American Institute, New York City; Dr. Roeder, of the Civic Societies, of New Jersey; Dr. A. H. Elliott, Chairman of the Anti-Mosquito Brigade of Flushing; the Secretaries of the Civic Associations of Queens; The Department of Health, through President Lederle and the Sanitary Superintendents of the Boroughs; Mr. Spencer Miller, Mr. John Claflin, Mr. G. Waldo Smith and others. All these have given aid in distributing announcements in their respective sections as well as throughout the country to those interested.

The Mail and Express and the Evening Post have contributed the placards on the wall.

And to the scientific, medical and daily press we are indebted for generous notices and editorial references to the Convention.

To the Board of Trade and Transportation we are greatly indebted for the use of its conveniently located and very desirable room for our meeting.

The vote of thanks was duly seconded and unanimously carried.

A motion was then made to adjourn, which was carried.

## "MOSQUITO ENGINEERING."

HENRY CLAY WEEKS.

(See p. 58.)

In every new discovery or movement words always are coined which are required by the exigency. So that new words or combinations of words are yearly added to our language.

In this campaign against the mosquito the word petrolize came from over the sea and the word petrolier was found convenient and so was home made—the one referring to the spraying of petroleum on water surfaces and the other to the man who does the spraying.

As to the combination of the two words assigned as my subject, "Mosquito Engineering," its origin is somewhat in doubt. My impression is that it was first used in an article by Dr. Howard, but I find it very distinctly used by a special writer who has made this subject a study, in an article in the New York Times about two years ago.

If the subject be taken in a very broad sense, the term is well used, but to confine it merely to getting rid of mosquitoes as a pest that is a limited though highly important work for an engineer. A preferable term is economic engineering, which would cover all the ideas involved in extermination—such as drainage of saturated areas, large or small, salt or fresh, and their utilization for agricultural or residence purposes; the improvement of the living conditions of those adjacent to such places, generally the poorer and more helpless class; the increase in the tone of life of a community by its riddance from malaria; the stoppage of the yellow fever plague with all its consequences; the scenic attractiveness which comes of the abolition of foul wet places which are generally used as dumping grounds of the wastes of a community; the reflex and the direct effect of humanity to animals; the increase of comfortable outdoor living and other results. All this is closely allied to health not only in the meaning of freedom from malaria and other diseases, but in a general way in the lessening of the irritations of life on which health so greatly depends. So that the sphere of mosquito engineering, or better economic engineering, is very broad. It becomes a powerful aid to bettering the conditions of life, health and the pursuit of happiness.

Mosquito extermination is essentially an engineering problem.

Much of the engineering of the past has been for and not against the mosquito. This is true in every line of work of the engineer. It is seen in road building, in railroad construction, in house construction and even in landscape gardening—anywhere that there is a chance to form a breeding place or to prevent one in the disposition of the surface of the soil. There is in mind the case of a wide street filled across a low stretch of land and the drain pipe under the road set six inches high instead of six inches low at what should have been made the outlet end. A pool was formed of necessity and an avoidable

breeder created. That man was engineering for mosquitoes. A low place near by the above was shut off and no outlet left under the road. Water always had stood here, probably for over 200 years until recently, and mosquitoes always bred there abundantly—results of the old methods.

There is an adapted sense in which the term mosquito engineering can be used, and that is the *engineering* of conditions so that others, possibly all, will aid in the betterment—the enlistment of co-operation—the proving to the people by words and acts that extermination is possible and is advantageous every way. In that way as much can be done towards the success of the movement as can be done by the outlay of hundreds of dollars in physical work.

To a degree, then, we may all be mosquito engineers, preventing breeding places, destroying those that do exist, the enlisting of the interest of every one. And after a regular course in the work we will be entitled to put M.E. after our names, as a correspondent facetiously did to the speaker, and we can go forth to aid in bettering the conditions of life.

# Appendix A.

## THE WORK OF THE DEPARTMENT OF HEALTH, NEW YORK CITY.

HENRY CLAY WEEKS.

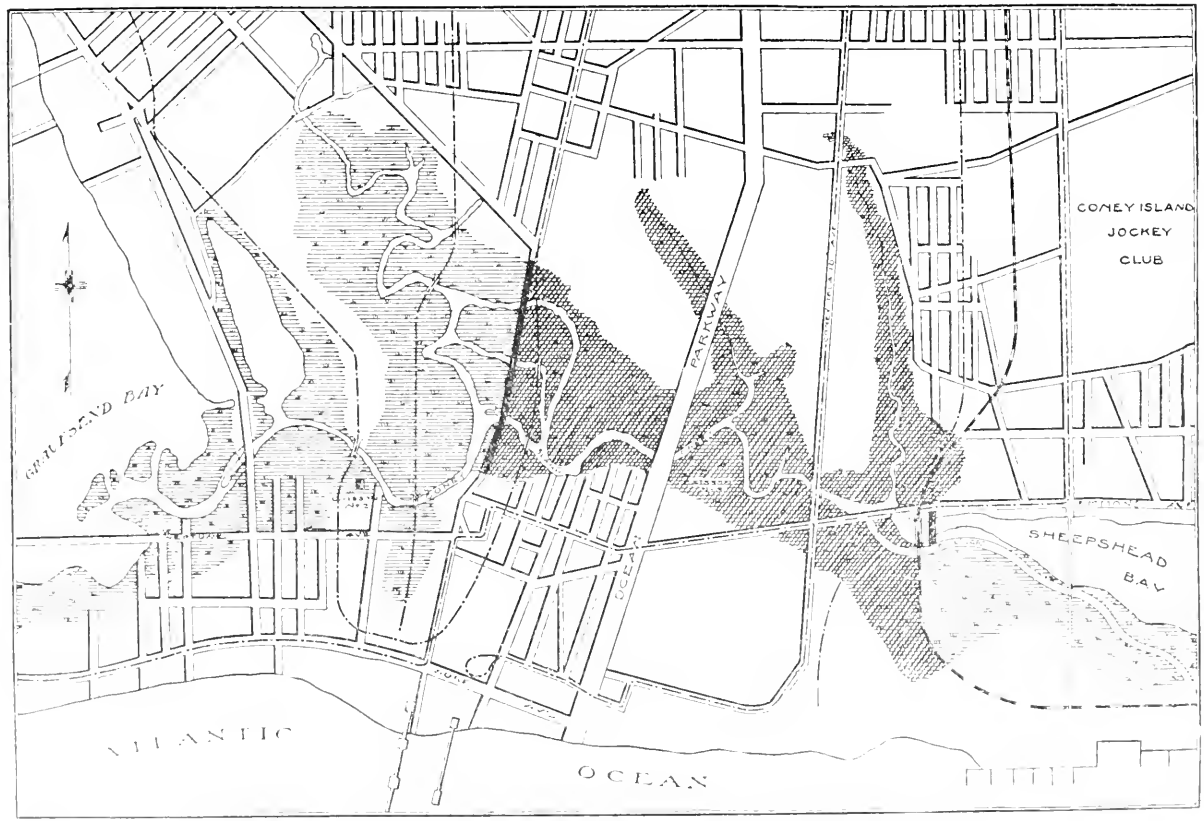
I understand the statement of President Lederle to the Convention, that I will write of the Board's work, refers more particularly to the engineering and related work (see page 34). However, I may briefly state that there has been much preliminary educational work against mosquitoes by the department in its different branches.

A "Circular of Information in Regard to the Causation and Prevention of Malarial Fever" was first issued, and afterwards enlarged to a seven-paged illustrated pamphlet in 1903. In 1902 another circular on the "Notification and Microscopical Diagnosis of Malarial Fever" was issued. Blood from cases of suspected malarial fever was made a part of the routine work of the Diagnosis Laboratory, and all the physicians of the city so notified. Special report and instruction blanks and outfits consisting of two glass slides and a needle in a wooden slide carrier were issued to all stations and sub-stations. These circulars are reproduced hereafter for examples to other municipalities. The latter calls for reports of malaria from all the physicians of the city. The former have been supplied free to all the associations and communities on request. The brief regulations drawn for domestic breeding places were distributed (about 8,000) by the police and others in the Sheepshead Bay section in the work of the writer there in 1903—some on cards to be tacked up and some in the writer's report of July 1 to Mr. Wm. C. Whitney. These regulations were also printed by the Board separately. An examination by inspectors has been made in all the boroughs to locate all sunken and wet places and the owners of same. A biological survey has also been made of some sections of the city, ascertaining the different kinds of mosquitoes, and indicating the same on maps and tables; this with a view of planning the necessary work to get rid of the breeding places. Some hundreds of orders have been issued on owners against wet foul places, and a large proportion of such places are corrected. A full Report to January 1, 1904, to Mr. Whitney and others has not yet been printed.

The President and Engineer have spoken at meetings at different times in the interests of the work of extermination.

The Board supplied some sprayers to the different boroughs and furnished some fuel oil for destroying larvæ. It also furnished at Sheepshead Bay the transportation of a larvicide to be used in cesspools. In the same section the Department issued orders against over one hundred violators of the domestic regulations—the effect of which will be apparent next season. There were no prosecutions for violations of these rules begun last season, that being the first of their operation.

As to engineering work, which strikes at the main root of the mosquito trouble, the writer was invited to coöperate with the Board




Coney Island Creek and its Inlets and Marshes.

The section cross-hatched can be redeemed under the report of September [illegible] above.

through an appointment as sanitary engineer, to examine and make recommendations on wet places in the different boroughs of which complaints were made. Sanitary Superintendent Dr. Chas. F. Roberts planned that the procedure as provided for in the charter (Sec. 1215, et seq.) be followed. This requires the making by the engineer of a map of the section to be condemned, covering its extent, its plan of drainage, etc., engineering recommendation for relief of same, an examination by the Sanitary Superintendent, and his endorsement of the plans, if approved, coupled with his statement of the danger to life and health. As required, one copy of the map is filed in each case with the Department of Health, one with the County Clerk and one with the President of the Borough, on whom the Department of Health issues an order to carry out the proposed work, and who is required to do so forthwith. This has been done in a number of instances, covering three of the boroughs. The instance which affects the largest number of persons, viz., that of the

CONEY ISLAND CREEK SECTION, IS CITED TO ILLUSTRATE THE PROCEDURE

taken in all cases in other boroughs:

ON PRINTED FORM.

DEPARTMENT OF HEALTH OF THE CITY OF NEW YORK.

BOROUGH OF BROOKLYN.

*Report of Inspection* in reference to premises being that portion of Coney Island Creek section between the bridge of the Old Plank Road on the west and the trestle of the Long Island Railroad (Manhattan Beach Branch) on the east, and being all the territory covered by said creek and its tributaries between said points.

*To the Board of Health:*

I, Henry Clay Weeks, holding the position of a Sanitary Engineer and Inspector in the Department of Health of the City of New York, do report, that on the 30th day of September, 1903, and many times previously from April last, I personally examined and carefully inspected the premises situated as above described, and found the facts as follows: Said premises consist of a marsh and marshy lands, of which various persons, corporations and the city are owners, and in violation of the Sanitary Code, were found in a condition dangerous to life and detrimental to health, for the following reasons, viz.: That, by the action of the tide, this area is kept saturated so that the surface and other water stand upon many parts of same periodically or continuously, thereby forming breeding places of the anopheles or malaria bearing mosquito and others in vast numbers; that the waters become foul and offensive to smell; that many parts of the section and stream are used for domestic and other refuse, adding to the evils mentioned.

I respectfully recommend to accomplish the drainage of the said easterly portion of the Coney Island Creek marshes that the creek be

cut off at its east by a tide gate and filling in at the Manhattan Beach railroad trestle, and on its west at the Old Shell Road, by filling in the creek under said road, and raising the road at some low points to form a dike, all of which work can be done without recourse to the general government, being within closed constructions over said creek. The existing streams as shown and explained will be compelled to become drainage ditches by the action of the tide gate, and will carry the water of the section off and empty same at low tide. Small ditches from pools may later be necessary to take their waters to the drain creeks.

Map herewith of even date.

HENRY CLAY WEEKS,
Sanitary Engineer and Inspector.

New York, September 30, 1903.

BOROUGH OF BROOKLYN, NEW YORK, October 19, 1903.

*To the Sanitary Superintendent:*

SIR—I forward herewith a complaint and report of Henry Clay Weeks, sanitary engineer and inspector, with reference to that part of Coney Island Creek section between the bridge of the Old Shell Road on the west and the trestle of the Long Island Railroad (Manhattan Beach Branch) on the east, and being all the territory now watered by said creek and its tributaries between said points.

On October 16th, in company with yourself and Mr. Weeks, I made a personal examination of the locality referred to in the report of Mr. Weeks. In my opinion the protection of the public health requires the drainage of the lands in question, and I would recommend that the creek be cut off on the east end by a tide gate and filling in at the Manhattan Beach trestle, and that the creek be closed by filling it in on the west under the Old Shell Road, and that this road be raised at such points as is necessary so as to form a dike, and that after the tide gate and dike are constructed, such ditches be dug as may be necessary to drain off whatever stagnant water may remain. Respectfully,

JOSEPH H. RAYMOND, M. D.,
Assistant Sanitary Superintendent.

SANITARY BUREAU.

NEW YORK, October 21, 1903.

Respectfully forwarded. In company with Henry Clay Weeks, Sanitary Engineer, and the Assistant Sanitary Superintendent of the Borough of Brooklyn, on the 16th of October, I inspected the premises in the Borough of Brooklyn bounded by Old Shell Road on the west, the Manhattan Beach Branch of the Long Island Railroad Company on the east, the Neck Road on the north, and the Atlantic Ocean beach on the south.

This consists of meadow and marsh land which is saturated by the surface water and the tide water from the Coney Island Creek and its

tributaries, which run through various portions of the same. This saturation is maintained by the ordinary tides, but is markedly increased at the high tides. These conditions cause the property mentioned to become a great public nuisance in that it is so saturated as to become a breeding place for mosquitoes, which breed here in vast numbers, and the soil emits very foul and offensive odors.

This condition endangers the lives of the occupants of the adjoining property, and also the large number of persons visiting the seashore during the summer season, which sometimes amounts to from fifty to one hundred thousand people a day, who suffer from the ravages of the mosquitoes bred on these premises.

This nuisance can be abated by preventing the water from entering same through the Coney Island Creek on the westerly side by making the Old Shell Road a solid roadway, in lieu of the two or three small bridges over the small streams, and raising the height of the roadway from one to two feet. This would act as a dike, and cut off the tide water entirely from the westerly side.

On the easterly side the trestle portion of the Manhattan Beach Branch of the Long Island Railroad Company should be made solid as far as Emmons Avenue, and a tide gate should be constructed across that portion of the Coney Island Creek between Emmons Avenue and the Boulevard. This tide-gate would prevent the inflow of water, and permit the draining of the land through the natural drains, in the bed of the creek, although some ditches would have to be made leading into this creek; the greater portion of the drainage would pass through what is now the natural waterways. Sanitary engineer Henry Clay Weeks informs me that the Long Island Railroad Company has expressed itself as being willing to coöperate with and bear (a portion of) the expense in filling in the roadway and in the construction of the tide-gate.

The condition above mentioned, in my opinion, endangers the lives and health of the community, and the protection of the public health requires the drainage of the lands herein described.

I therefore recommend that in conformity with section 1215 of Chapter 466 of the Laws of 1901 that the Board of Health issue an order requiring the President of the Borough of Brooklyn, City of New York, to construct drains on the said lands. Respectfully submitted.

CHAS. F. ROBERTS, M. D.,
Sanitary Superintendent.

### OTHER WORK ILLUSTRATED.

While the actual physical work during the season of 1903 in the southern part of the Borough of Brooklyn was not done at the expense of the Department of Health, being paid for out of a fund raised under an inspiring initial contribution of Mr. Wm. C. Whitney, the work was under consultation with the Board and with its full endorsement and active coöperation in connection with other branches of the city, State and general government. Two editions of a report of this work

to July 1, were printed by the fund and about 4,000 copies distributed in the section as stated, in order "that many who do not understand the plans and scope of the idea may be led to do their necessary part in the campaign. . . . The coöperation must be general. . . . There are conditions about here that are a shame in a civilized community, the result of man's carelessness, to put it mildly. (See photos between pages 66 and 67.) We think it will be seen from the report that while the smaller features of the work have not been omitted, there has been an effort, not always yet successful, to carry out comprehensive plans which will largely reach the root of the trouble in the section."

The one used above as an example (numbered twelve in some thirty points and methods of work reported on) quotes the original *Report to the Board,* of which the following is part:

"I beg to call your attention to some of the features involved and respectfully urge that you make a personal examination of the situation, inasmuch as many of the conditions are quite beyond the power of words to describe.

"Coney Island Creek is a narrow tidal stream running between Sheepshead Bay and Gravesend Bay. It has numerous inlets extending from both its sides, those on the north, for miles up into the almost level country. These inlets are, at their extremities, generally only slightly affected by the tides. At the period of monthly high tides, the land through which these tortuous streams run is overflowed and at extraordinary tides is submerged for some feet. Between the monthly tides, especially during a rainy period, the many marsh holes throughout hundreds of acres of adjacent marsh lands, become most favorable brackish breeding places for mosquitoes. Occasional springs along the edge of the uplands add another source of like difficulty, only graver, for they become the habitat of the *Anopheles* mosquito.

"These marshes, incomplete as the marsh holes indicate, are, in the present condition of things, saturated, though not overflown, twice a day. This saturation increases the difficulty by reason of its preventing a rapid absorption of the water of the monthly high tides and of rainfalls.

"Along the edges of the uplands, as well as in the creeks and inlets, there are accumulations of filth and wastes such as are likely to occur among persons who live in such situations.

"The conditions on the south side of the Coney Island Creek, which may aptly be termed the back yard of Coney Island, often caused by streets and railroads being run through and enclosing stagnant water, are frightfully foul and produce odors which often become sickening. Debris of all kinds is here deposited. (Photos between pages 66 and 67.)

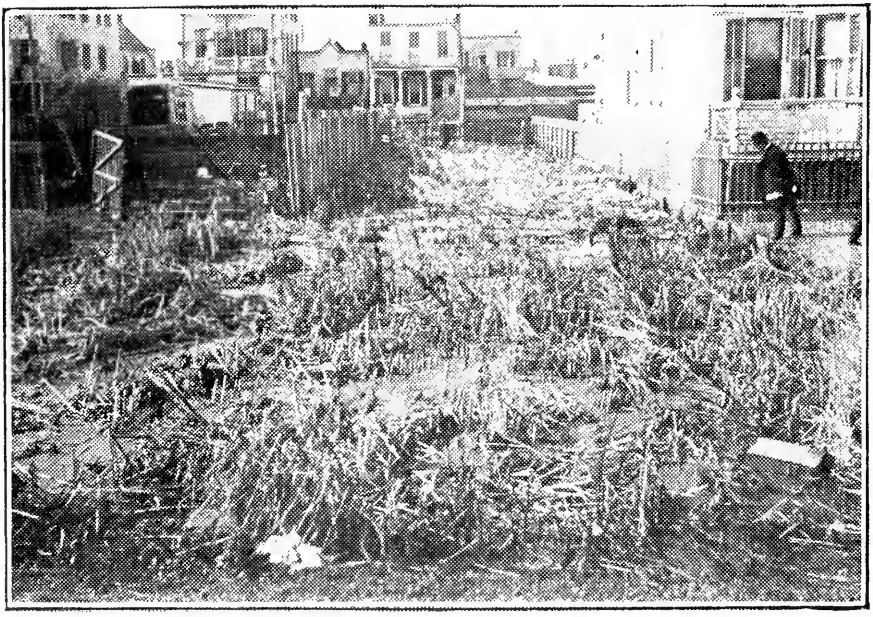
"The situation, taken as a whole, is one of grave magnitude. The conditions for breeding mosquitoes are perfect, and such as to earn for the section an unenviable reputation of monumental character.

"It will easily be appreciated that, if the saturation of these hundreds of acres of practically level land can be prevented, the breeding places of the mosquito will be obliterated as to these features of nature. The result of keeping tide water from this soil would have the effect

PLATE 12. DUMPING GROUND ON DOOLEY LANE IN A WET AREA IN THE MIDST OF SHEEPSHEAD BAY; BREEDING CONSTANTLY GOING ON IN WATER UNDER DWELLINGS AND IN THE OPEN.

Photos., Chas. H. Kilbourne for Dept. of Health. Courtesy Brooklyn Eagle.

DOOLEY LANE, SHEEPSHEAD BAY.



STANDING WATER ON VAN SICKLEN AVE., SOUTH OF NEPTUNE AVE., CONEY ISLAND. DWELLINGS REACHED BY BRIDGING OVER THE WET SPACES.

Courtesy Brooklyn Eagle

MARSH ON SOUTH OF NEPTUNE AVE., CONEY ISLAND.

Photo. Chas. H. Kilbourne for Dept. of Health. Courtesy Mail and Express.

MARSH AT HOG POINT CEDARS; BRIDGE CROSSING SAME AT VOORHEES AVENUE TO DWELLINGS NORTH OF THE EAST END OF EMMONS AVE., SHEEPSHEAD BAY, WHERE COMPLETE PETROLIZING WAS IMPOSSIBLE.

of so drying it out that whenever a rainfall occurred it would be almost immediately absorbed by the dry soil, and the spring water also would be less exposed for breeding. Thus the results would be against the very prevalent *Culex* as well as against the malaria-bearing *Anopheles*.

"Stringent rules as to depositing any old cans or other receptacles of water along the edge of the uplands, as is now the practice, would prevent breeding of mosquitoes from such artificial sources. And the enforcement of existing rules as to rain barrels and the like around all premises would complete the absolute freedom of the territory from the mosquito, so injurious to all the interests of the section.

"To accomplish this result, so far as the conditions of nature are concerned, I make the following recommendations:

"1. That Coney Island Creek and its inlets and all the adjacent meadow lands, be placed under the condemnation of your Board.

"2. That necessary steps be taken to secure the said Creek from the effect of tidal inflows.

"3. That, to accomplish the physical part of this recommendation, automatic tide-gates, of the most effective construction, be placed at each end of said Creek and as close to said ends as may be found possible. (This was modified to one gate in final report.)

"The operation of these recommendations would reduce the level of the water in the enclosed parts of the Creek and its branches about four feet, thus drying out the whole area, especially after the pools shall be filled or opened out to the creeks. In case of a heavy rainfall, the surplus water, if any, which the dry marsh land would not hold, would find its way into the creek and branches, and flow out to sea automatically at the next low tide. The further effect of these recommendations would be to so thoroughly dry out the far reaches of these marshes as to make them at once firm enough to turn over in cultivation, and would so dry out the whole area that it could be brought under treatment for cultivation within a few weeks after the water was so excluded. This now worse than worthless vast stretch of territory, with its soil, fertile as is determined by the investigations of the Division of Soils, United States Department of Agriculture, could thus become a garden spot for the present and later a site for residences as the demand warranted.

"This cutting off of Coney Island Creek could be the more easily accomplished by reason of there now being bridges, some impassable by vessels, against or near which the constructive works could be erected. Nor would such cutting off of the creek ever interfere with the proposed ship canal through this section, whenever it is determined to build the same."

### Scandalous Breeding Places Easily Avoided.

As pestiferous as are the conditions of these five hundred acres referred to they are more excusable than many places in the centre of Sheepshead Bay. For here, right in the streets, were found innumerable breeding places caused by clogged gutters and catch basins, stag-

nant water cut off by street and railroad constructions, tides restrained and spreading over vast areas, and, worst of all, a public dump on a marsh surrounded by nice residences, and in its midst houses of the poor with water beneath and all about them—the entire water of the section alive with larvæ. See photos. between pages 66 and 67.

### Some Work and Its Results.

Fifty-four barrels of fuel oil were sprayed by two (at times three) petroliers, but no amount of such work could reach all these places. They have all been reported on, and orders are issued by the Board. Under the private fund, employing a large gang of laborers, several thousand feet of ditching was run through all the places that could be engineered, with the result that they were all dried out and all breeding here was completely stopped in a large territory, with Gerritsen's mill pond as a centre. Verbal and written testimony from several persons, a number of whom had lived there for about twenty-five years, was given of the fact that there were less mosquitoes in the section than ever before, notwithstanding they were vastly more plentiful throughout the country generally.

(Referred to on page 62 as reproduced circulars of)

# DEPARTMENT OF HEALTH,

## CITY OF NEW YORK.

**55th Street and Sixth Avenue.**

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### CIRCULAR IN RELATION TO THE LIFE HISTORY AND THE EXTERMINATION OF MOSQUITOES, AND THE PREVENTION OF MALARIA.

The Department of Health has become convinced, from many successful efforts elsewhere, that the mosquito evil in and around New York, bringing with it great discomfort and annoyance, a needless depreciation of property values, and THE DANGER OF MALARIA, is preventable. Prevention, moreover, in many instances is comparatively simple and inexpensive, requiring on the part of householders and property owners only a reasonable willingness to cooperate with the Department. This circular is issued in order that the general public may be informed as to the steps which are necessary to exterminate mosquitoes altogether, or render their numbers insignificant.

### THE CAUSATION OF MALARIAL FEVER.

Recent investigations have shown that malarial fever (also called "ague," "chills," "chills and fever," "dumb ague") is a disease which requires for its transmission the active services of a definite kind of mosquito, *i. e.*, Anopheles.

The organism causing malarial fever (the Plasmodium malariæ) is a true parasite, and so far as we know finds the conditions necessary for its existence only in the human blood, and this species of mosquito. The insect becomes infected by sucking the blood from an infected human being. The malarial organism having thus entered the stomach of the mosquito, passes through certain changes of its existence in the body of the insect, and at the end of about 8 days reaches the poison gland. After this time, if the mosquito bites another human being, the malarial organism is introduced into the circulation of the latter, and malarial fever follows.

So far as we know certain localities are malarious only because they furnish favorable conditions for breeding the Anopheles mosquito. Malarial fever, however, would not occur in any malarious district unless some infected human being were in it, or came into it, and infected the mosquitoes, which in turn, infected other human beings.

(Reduced from original)

Recent observations in the intensely malarious districts of Italy and Africa have shown, that even newcomers in these regions, who purposely expose themselves by living in the most highly malarious areas (for example, the Roman Campagna), do not develop malarial fever, if they are carefully protected from the bites of mosquitoes; and further it has been shown that this disease may be produced with certainty if an Anopheles mosquito is allowed to bite a person suffering from malarial fever, and then after a sufficient time elapses, is allowed to bite a healthy person.

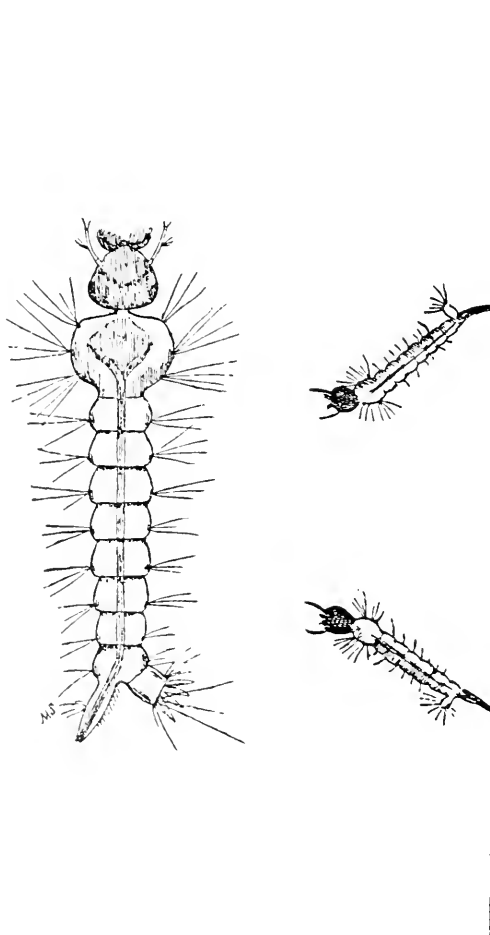


Fig. 1.—Larva of Culex.

(Reduced from original)

## THE LIFE HISTORY OF MOSQUITOES.

The mosquitoes (*Culicidae*) are a family of two-winged insects with long "beaks" and the instinct (in the female) for sucking blood. There are many different *genera* or kinds of mosquitoes, but the only ones which are of practical importance around New York are the two kinds called respectively *Culex* and *Anopheles*. These can be easily distinguished from each other.

Mosquitoes have four stages of development; the *egg*, the *larva*, the *pupa*, and the *winged insect*.

The eggs are very small, oval, black objects not so large as a fly-speck. In the case of Culex they are mostly stuck together side by side in little flat masses, each mass containing several hundred eggs. In Anopheles they are only lightly adherent, end to end. The eggs are laid on water, upon which they float. The end of the egg, after 36 or 48 hours (or more, in cool weather) opens, and the *larva* escapes.

The *larva* of Culex is the familiar "wriggler" of pools and water barrels. A larva of Culex is drawn in Fig. 1. It will be noticed that the insect in this stage hangs downward, only its breathing tube or wind-pipe connecting with the surface of the water. When disturbed, it dives and can remain without air for half an hour or more, though it usually rises to the surface again in about half a minute. After the lapse of from one to three weeks (according to the temperature of the water) when it has grown to be about one-quarter of an inch long, the larva splits its skin and the *pupa* (which corresponds to the chrysalis stage of the butterfly) appears.

The pupa is drawn in Fig. 2. It has two wind-pipes instead of one, and

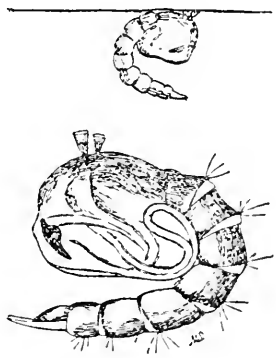


Fig. .2—Pupa of Culex.

these are located near the head instead of at the tail-end. It flaps its tail violently and sinks to the bottom of the water when disturbed.

After from one to four days in warm weather the pupa in turn bursts its skin up the back, and the *adult insect* appears, with wings, ready soon to fly,

(Reduced from original)

and in the case of the female to bite and lay more eggs. The complete female Culex is drawn in Fig. 3. The "beak," it will be seen, has a long

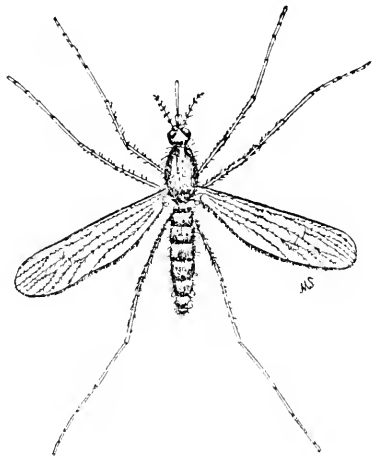


Fig. 3.—Adult Female Culex.

middle piece (*proboscis*) and two smaller projections at each side of the proboscis, which are called *feelers* or *palps*. These palps are very short in the female; but in the male Culex they are longer than the proboscis and very hairy. Just outside the palps are two long *antennae*, each with fourteen small joints; the antennae are much more feathery in the male than in the female.

This mosquito is the familiar pest of fields, gardens, woods and houses everywhere. Only the female bites. In warm weather she can digest a meal of blood in 36 hours or less.

The Culex mosquito selects for her eggs only still or slowly flowing water, but not even the most advanced degree of putrescence or contamination prevents the eggs from developing; thus cess-pools, brewery drains, and stable yard pools are favorite spots. One species, as has been recently proved by Prof. John B. Smith, of Rutgers College, develops with great rapidity in salt marshes. Eggs are usually laid in water-barrels, pans, tin cans, wells, springs, rain-pools, cess-pools, pots, kettles, drainage traps, ponds, marshes, holes in hollow trees—in short, anywhere where stagnant water remains in warm weather for a week or two at a time.

Larger and more permanent bodies of natural water may be cleared by the minnows and other small fish, most of which eat mosquito larvæ eagerly; but when the edges of the pool or stream are cumbered with grass, weeds, green slime or leaves, in which the larvæ are very expert at hiding, the fish are not able to gain access to them.

Anopheles, which is the mosquito that under certain conditions causes malaria, is not the common species of this region, but still is present in many localities. It differs from Culex as follows: The larva swims flat on the water instead of head down, and has a very short breathing tube. The adults, both male and female, have their palps or feelers *just as long*

(Reduced from original)

as the proboscis instead of much shorter, or much longer; and the wings of all the species found in this vicinity are spotted (see lower part of Fig. 4).

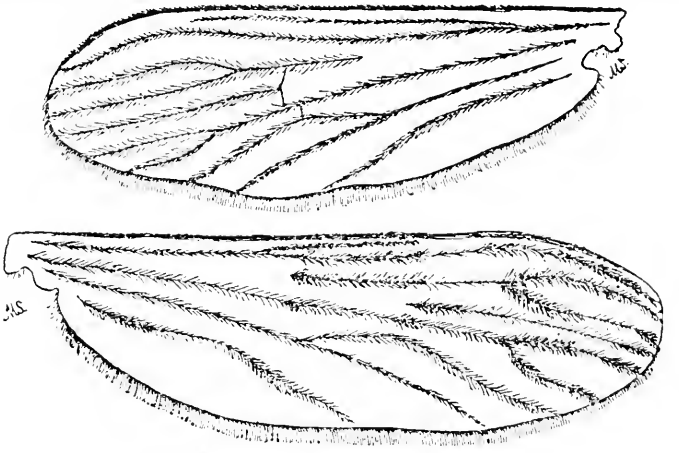
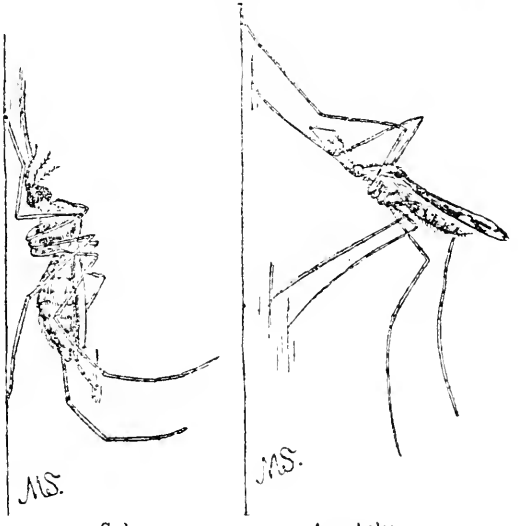


Fig. 4.—Wing of Culex (above) and of Anopheles (below).

These differences can be easily made out with the naked eye. Another point of distinction is that when Anopheles is at rest on a wall it sits with its body almost at a right angle; while Culex holds its body parallel with the surface it rests on (Fig. 5). Anopheles prefers for its eggs pools of rain



Culex. Anopheles.

Fig. 5.—Postures of Mosquitoes sitting on wall.

water on the ground, but will breed almost anywhere else, when such pools are lacking.

(Reduced from original)

Adult mosquitoes, as a rule, do not bite when the temperature is below 65 degrees Fah. The development of the young is greatly retarded by cold, and is completely arrested in freezing weather. Larvæ frozen in the ice will, however, complete their development with the appearance of warm weather. Adult females may live two months or more in summer, and are capable, after hibernation begins, of withstanding any degree of cold. They winter in caverns, in cold cellars and garrets, stables, etc. The males die soon after birth, and are not known to survive the winter.

## EXTERMINATION AND PREVENTION OF MOSQUITOES.

As has been explained, mosquitoes require for their development *standing water*. They cannot arise in any other way. A single crop soon dies and disappears unless the females find water on which their eggs may be laid. In order to prevent mosquitoes, therefore, the requirement is simple:

### NO STANDING WATER.

Pools of rain water, duck ponds, ice ponds, and temporary accumulations due to building; marshes, both of salt and fresh water, and road-side drains; pots, kettles, tubs, springs, barrels of water, and other back-yard collections, should be drained, filled with earth, or emptied.

Running streams should have their margins carefully cleaned and covered with gravel to prevent weeds and grass at the water's edge.

Lily ponds and fountain pools should, if possible, be abolished; if not, the margins should be cemented or carefully graveled, a good stock of minnows put in the water, and green slime (Algæ) regularly cleaned out, as it collects.

Where tanks, cisterns, wells or springs *must be had* to supply water, the openings to them should be closely covered with wire gauze (galvanized to prevent rusting), not the smallest aperture being left.

When neither drainage nor covering is practicable, the surface of the standing water should be covered with a film of light fuel oil (or kerosene) which chokes and kills the larvæ. The oil may be poured on with a can or from a sprinkler. It will spread itself. One ounce of oil is sufficient to cover 15 square feet of water. The oil should be renewed once a week during warm weather.

Particular attention should be paid to cess-pools. These pools when uncovered breed mosquitoes in vast numbers; if not tightly closed by a cemented top or by wire-gauze, they should be treated once a week with an excess of kerosene or light fuel oil.

Certain simple precautions suffice to protect persons living in malarial districts from infection:

First:—Proper screening of the house to prevent the entrance of the mosquitoes (after careful search for and destruction of all those already present in the house) and screening of the bed at night. The chief danger of infection is at night (the Anopheles bite mostly at this time).

Second:—The screening of persons in malarial districts who are suffering from malarial fever, so that mosquitoes may not bite them and thus become infected.

Third:—The administration of quinine in full doses to malarial patients to destroy the malarial organisms in the blood.

(Reduced from original)

Fourth:—The destruction of mosquitoes by one or more of the methods already described.

These measures if properly carried out will greatly restrict the prevalence of the disease, and will prevent the occurrence of new malarial infections.

It must be remembered that when a person is once infected, the organisms may remain in the body for many years, producing from time to time relapses of the fever.

A case of malarial infection in a house (whether the person is actively ill or the infection is latent) in a locality where Anopheles mosquitoes are present, is a constant source of danger, not only to the inmates of the house, but to the immediate neighborhood, if proper precautions are not taken. It should be noted in this connection that the mosquitoes may remain in a house through an entire winter and probably infect the inmates in the spring upon the return of the warm weather.

Malarial fever is prevalent in certain boroughs of New York City, and in view of the presence of standing water resulting from the extensive excavations taking place in various parts of these boroughs, is likely to extend, if means are not taken for its prevention.

*Regulations of the Board of Health, New York City, in Aid of Mosquito Extermination and the Prevention of Malarial Fever.*

(In Force from March 15 to October 15.)

1. No rain-water barrel, cistern, or other receptacle for rain-water, shall be maintained without being tightly screened by netting, or so absolutely covered that no mosquito can enter.
2. No cans, pails, or anything capable of holding water, shall be thrown out or allowed to remain unburied on or about any premises.
3. Every uncovered cess-pool or tank shall be kept in such condition that oil may be freely distributed so as to flow over the surface of the water. Covered cess-pools must have perfectly tight covers, and all openings must be screened.
4. No waste or other water shall be thrown out or allowed to stand on or near premises.

Information is requested as to the presence of standing water anywhere, so that the premises may be inspected and the legal remedies against the same be applied.

The prompt cooperation of all persons in the enforcement of the above regulations is earnestly desired, and they are assured that in this way the breeding of mosquitoes on their premises may be prevented.

Mosquitoes are, so far as known, the only means of conveying malaria.

Any inquiries or complaints in relation to the above matter should be forwarded to

The Assistant Sanitary Superintendent,
Department of Health,
(of the Borough where complaint originates).

ERNST J. LEDERLE, Ph.D., *President.*

HERMANN M. BIGGS, M.D., *Medical Officer.*

(Reduced from original)

## CIRCULAR OF INFORMATION

IN REGARD TO THE

# Notification and Microscopical Diagnosis of Malarial Fever.

---

It is the earnest desire of the Department of Health to acquire all possible information as to the occurrence and distribution of malaria in New York City, with a view to its eventual stamping out.

As this can only be done with the co-operation of the medical profession, all physicians are hereby requested to notify the Department of Health of all cases of malarial fever coming under their observation. Too great stress can not be laid upon the statement that it is not the desire or the intention of the Department to interfere in any way with the patients. They will only be visited with the consent of the attending physician.

Information is desired regarding the location of malarial fever in New York City, so that as far as possible proper measures may be taken to correct the unsanitary conditions which produce it.

Malaria, as far as we know, is always transmitted by means of the bites of certain mosquitoes (Anopheles).

These mosquitoes can be comparatively easily located and identified, and their breeding places found.

In the majority of instances the occurrence of a case of malarial fever in a given locality means the existence of a breeding place of the Anopheles mosquito close at hand.

Recognizing the above facts, it is the intention of the Department to investigate every case of malaria occurring in New York City, with reference to the source of infection—i. e., the breeding places of the mosquito. These discovered and destroyed, it is hoped that not only will the number of cases of malaria be greatly decreased, but also the spread of the disease from one section of the city to another be prevented. Malaria is common in the outlying sections of the city, and the excavations going on in the various Boroughs afford excellent starting points for local epidemics of the disease.

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To facilitate the desired notification of malaria by physicians, special postal cards for furnishing the wished-for information have been prepared. A supply of these cards will be sent to any physician on request; they are to be filled out and posted, just as is done in reporting a case of diphtheria or other notifiable disease.

In return for such helpful co-operation on the part of physicians, the Department of Health has determined to make free microscopical examinations of the blood for malarial parasites a part of its routine work.

Outfits consisting of glass slides, surgical needles, information blanks and full directions for preparing specimens, can be obtained at any of the culture stations of the Department, where they may later be left for collection and forwarding to the Diagnosis Laboratory. Reports will be mailed by noon on the day of examination. Where the telephone call of the attending physician can be ascertained, the results of examination will be telephoned at once.

If, for lack of time or other reasons, the attending physician is unable to take the blood himself, on notifying this Department (55th Street and 6th Avenue, telephone 1204 Columbus) an Inspector will visit the patient and prepare the specimens. Further, should any physician desire the inspection of any given locality with reference to the existence of the breeding places of mosquitoes and their subsequent destruction, he has only to notify the Department.

Attention is called to the "Circular of Information in Regard to the Causation and Prevention of Malarial Fever," previously issued by the Department, a copy of which is inclosed.

It is confidently believed that the help of the medical profession will be freely and fully given to this crusade against malaria, by means of which the Department hopes to accomplish great and lasting benefit to the community.

HERMANN M. BIGGS, M. D.,
*Medical Officer.*

ERNST J. LEDERLE, PH. D.
*President.*

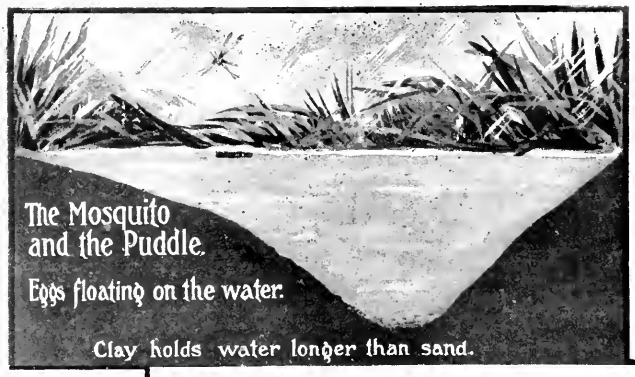
NOTE. The South Orange, N. J., circular is given as a good illustration of community work. Orders for similar circulars can be given through the Nat. Soc.

# Appendix B.

(See page 43)

## INFORMATION ABOUT MOSQUITOES

Issued by the Drainage Committee of the Village Improvement Society of South Orange, N. J.



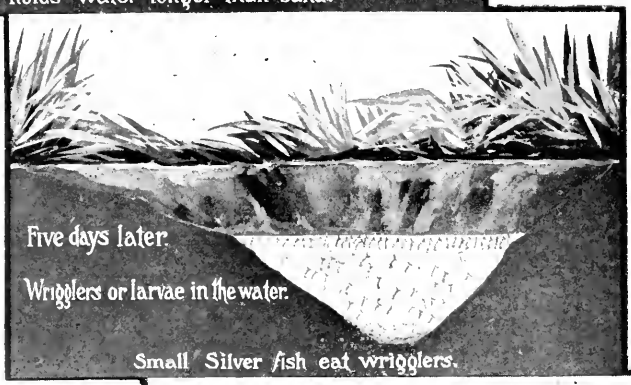

**This Mosquito**

has just laid from 150 to 400 eggs.

If the sun does not dry up this pool before ten days, or if no one fills the pool with earth nor drains it, or if oil is not put on the surface of the pool, then about 150 to 400 mosquitoes will be bred from this pool in about ten days. In cool weather mosquitoes breed less rapidly than in warm weather.

The eggs have become "wrigglers" or larvae. "Wrigglers" may be seen with the naked eye. The "wrigglers" at the bottom are feeding, those at the top are breathing.

Oil on the water would prevent the "wrigglers" from breathing and they would die in a few moments. The sun has evaporated half of the water. Without water the wrigglers would die. Mosquito larvae are scavengers; a foal pool breeds more than a clean one.

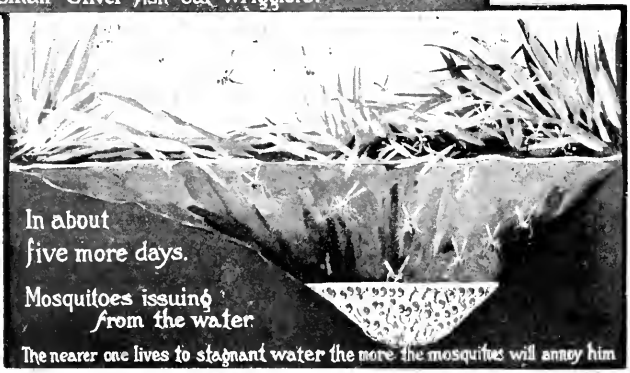



**The Mosquitoes Win**

The sun failed to evaporate the water. The pool was neither filled, drained nor oiled.

"Wrigglers" become pupae for at least two days before they become mosquitoes. Any receptacle holding water for ten days may breed mosquitoes; for example, barrels, tin cans, cesspools, culverts, manure pits, etc.

It will pay any one to abolish standing water near his home.




NOTE.—The above illustration is a correct representation of the breeding of the commonest of our domestic mosquitoes (*Culex pipiens*). The story of one puddle is the story of a million puddles. The sun may usually be depended upon to dry up the great majority of such puddles before 10 days elapse.

## SOME FACTS ABOUT MOSQUITOES.

1. There are over thirty species of mosquitoes in this part of the United States.

2. Different species have different habits, as do different birds and fowl.

3. Some species are domestic—breeding in fresh water, flying short distances and habitually entering houses. Others are migratory, flying long distances, and almost never (except accidentally) entering houses. The latter are occasionally seen in South Orange. Most migratory mosquitoes breed in salt water marshes.

4. All mosquitoes breed in stagnant water and require from one to three weeks to transform from eggs to winged mosquitoes.

5. The common house mosquitoes (*Culex pipiens*) are the most abundant of domestic mosquitoes.

6. The malarial mosquitoes (*Anopheles*) may breed in any sort of receptacle or puddle holding water, and are the most dangerous domestic mosquitoes. They never travel far from their breeding place. Ross, an eminent authority, says 600 yards is about the limit.

7. Mosquitoes do not breed in the grass, but tall grass forms a favorite harboring place. A mosquito a day old is full grown—females three days old may lay eggs.

8. Salt marsh mosquitoes breed 4½ miles southeast and 5 miles east of South Orange; these were present about ten days during 1903. About August 2d to 5th, with four days gentle east wind the marsh mosquitoes were very numerous in the fields and gardens for about five days. They were not noticed by most people because they did not seek to enter houses. They were also present July 5th to the 10th. The Newark and Elizabeth salt marshes are now being drained.

## THE WORK OF THE DRAINAGE COMMITTEE.

1. In 1901 we oiled every stagnant pool in the village. The mosquitoes were so greatly reduced in numbers that we were satisfied that our supply was chiefly of local origin. It was especially noticeable that they were very scarce in houses in the Fall. We expended about $1,000 during the season, but not a dollar for permanent improvement.

2. In 1902 we did some draining, filling of holes and oiling what stagnant water we could not abolish. The results were emphatic. We expended about $1.200—one half of this sum was for permanent work.

3. In 1903 we abolished more than half the wet places in the village, while the Board of Health did the oiling. The eighteen days continuous rain fall in June and the twelve days rain fall in August produced abundance of mosquitoes in towns and villages where they are seldom seen. Towns normally mosquitoless had a pest in 1903. South Orange suffered like the others, but for a far shorter time than those towns where anti-mosquito measures were not taken. We expended about $1,500—mostly for permanent work.

4. In 1904 we hope to complete the work of draining, filling and cleaning up the remaining wet places in town.

Our sewer system will be in use during the year, and the work of filling up over 1,500 cesspools will begin. These cesspools have been generally oiled, but many have escaped attention. They are great breeders of domestic mosquitoes unless covered with oil.

Our village trustees are now awake to the importance of caring for our waterways, and water from streets will not be allowed to pour into vacant lots to form breeding places.

The township authorities are keeping the east branch of the Rahway River cleaned out to its proper depth. They should also keep all street gutters clean and free from standing water. Many property owners have done a great deal of draining on their own account and much more is promised.

5. If we have about $2.000 to spend and an average Summer rain fall, we confidently predict a smaller supply of mosquitoes in South Orange than ever before.

6. We have every reason to expect West Orange, Orange and East Orange to join in the movement in 1904. Vailsburg and Maplewood may also do something. Newark and Elizabeth have already begun drainage work on the salt marshes.

We desire a subscription from every householder in the village, however small it may be. This work is for the benefit of all, and all should support the movement.

The improved appearance of our village, resulting from our work, should entitle the committee to receive the support of the whole community.

Forward subscriptions to

MR. E. S. ALLEN, *Treasurer,*
Scotland Road, South Orange, N. J.

## PHOTOGRAPHS FROM LIFE OF TWO KINDS OF DOMESTIC MOSQUITOES.

ABOUT THREE TIMES LIFE SIZE.

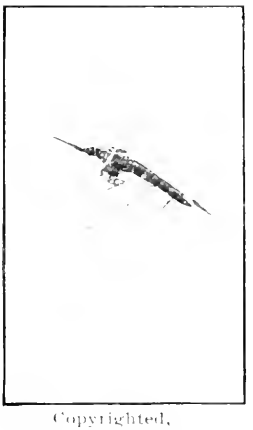
Copyrighted,
By WM. L. UNDERWOOD.

THE COMMON HOUSE MOSQUITO

(*Culex pipiens.*)

Showing characteristic resting position on side wall. Wrigglers seen in rain barrels produce these.

These mosquitoes may be found hibernating cellars in Winter and may be breeding there if water is allowed to remain standing.



Copyrighted,
By WM. L. UNDERWOOD.

THE DANGEROUS MALARIAL MOSQUITO.

(*Anopheles punctipennis.*)

Note that this mosquito rests with body at angle to the side wall, body and beak in a straight line.

If such be found anywhere in the village report the fact at once to the Board of Health or to the Committee.

THE DRAINAGE COMMITTEE OF THE

VILLAGE IMPROVEMENT SOCIETY OF SOUTH ORANGE

SPENCER MILLER, *Chairman.*
E. S. ALLEN, *Secretary and Treas.*
E. V. CONNELL.
R. S. SINCLAIR.

# Appendix C.

### *National Organization, Etc.*

Pursuant to the Resolutions of the Convention of December 16, 1903, Mr. Robert W. de Forest, Chairman, appointed the following-named ten persons as a Provisional Committee to consider the question of a National Organization and of publishing the Proceedings of the Convention: (See p. 39)

PROVISIONAL COMMITTEE.

| | |
|---|---|
| William J. Matheson | William H. Baldwin, Jr. |
| John Claflin | Charles W. Wetmore |
| Walter C. Kerr | George C. Rand |
| Paul D. Cravath | Frederick C. Beach |
| Spencer Miller | Henry Clay Weeks |

At the first meeting of the Committee, held January 28, 1904,

William J. Matheson was elected Chairman;

Walter C. Kerr, Vice-Chairman;

Henry Clay Weeks, Secretary, Bayside, L. I.; New York City;

Frederick C. Beach, Treasurer (Editor "Scientific American," New York.)

An Executive Committee of five, besides the Chairman, *ex officio*, was appointed, as follows: Messrs. Kerr, Cravath, Baldwin, Miller and Weeks.

It was unanimously resolved, after due consideration, that a central organization be formed, and the name adopted by the committee was the

NATIONAL MOSQUITO EXTERMINATION SOCIETY.

The purposes of the Society were stated generally as education, co-operation, legislation, and the interchange of ideas through conventions and otherwise.

It was decided to establish an Advisory Board, composed largely of those selected as Vice-Presidents of the Convention, with the addition of several names. The following were elected as an

ADVISORY BOARD.

Robert W. de Forest, New York.
Judge Howard J. Curtis, Connecticut.
Dr. Alvah H. Doty, Port of New York.
Prof. Nath. S. Shaler, Massachusetts.
General George W. Sternberg, U. S. A.
Surgeon-General Walter Wyman, District of Columbia.
Hon. J. Wilson, Secretary Agriculture, United States.
U. S. Senator John Kean, New Jersey.
Prof. Milton Whitney, District of Columbia.
Col. W. C. Gorgas, Assistant Surgeon General, U. S. A.
Louis C. Tiffany, New York.
Otto H. Kahn, New York and New Jersey.
G. Waldo Smith, New York.
Colgate Hoyt, New York and Ohio.
Prof. Franklin W. Hooper, New York.

Prof. C. B. Davenport, Carnegie Institution.
Ex-Mayor R. T. Barton, Virginia.
Prof. L. H. Bailey, Cornell University.
L. C. Weir, President Adams Express Company.
T. T. Pitman, Newport, Rhode Island.
A. J. Cassatt, President Pennsylvania Railroad.
Cornelius Fellowes, New York.
Dr. Walter B. James, New York.
O. E. Cromwell, New York and New Mexico.
Mrs. John Nicholas Brown, Rhode Island.
Horatio N. Parker, New Jersey.
Ernst J. Lederle, Ph.D., New York.
Dr. Daniel Lewis, President, N. Y. Dept. of Health.

An Advisory Board of Entomologists, of which Dr. L. O. Howard, Washington, was named as Chairman, was decided upon, to be composed of the official entomologists of those States interested in the subject and others who have made mosquitoes a special study, as follows:

ADVISORY BOARD OF ENTOMOLOGISTS.

Leland O. Howard, Ph.D., Washington.
Dr. E. Porter Felt, Albany, N. Y.
Dr. John B. Smith, New Brunswick, N. J.
Prof. J. M. Aldrich, Moscow, Idaho.
Prof. R. H. Pettit, Agricultural College, Mich.
Prof. F. L. Washburn, St. Anthony Park, Minn.
Prof. W. E. Britton, New Haven, Conn.
Prof. C. E. Chambliss, Clemson College, S. C.
William Lyman Underwood, Boston, Mass.
Prof. S. A. Forbes, Urbana Ill.
Prof H. Garman, Lexington, Ky.
Prof. C. P. Gillette, Fort Collins, Colo.
Prof. H. A. Gossard, Lake City, Fla.
Prof. V. L. Kellogg, Stanford University, Cal.
Prof. Trevor Kincaid Seattle, Wash.
Prof. H. A. Morgan, Baton Rouge, La.
Prof. Herbert Osborn, Columbus, Ohio.
Prof. G. H. Perkins, Burlington, Vt.
Prof. E. D. Sanderson, College Station, Texas.
Dr. Henry Skinner, Philadelphia, Pa.
Prof. C. F. Hodge, Worcester, Mass.
Dr. W. N. Berkeley, New York City.
D. W. Coquillett, Washington, D. C.
Dr. H. C. Dyar, Washington, D. C.
Prof. Glenn W. Herrick, Mississippi.

A convention for final organization and adoption of Constitution and By-Laws, to be proposed, and for the presentation of invited papers, and discussion of same, all proceedings possibly to be published, was proposed for the spring, but nothing definite was determined.

The publication of the Proceedings of the late Convention was authorized. A number of unsolicited subscriptions were received towards the expenses of the Convention and publishing the Proceedings. An appeal for moneys by the Treasurer was reported.

### MEMBERSHIP.

It was resolved to have as large an Active Membership as possible, dues $2 a year, and an Associate Membership at $5 per year, and that any one contributing $25 shall be constituted a Benefactor, $100 a Life Member, $500 a Patron, and $1,000 a Founder; further, that a general invitation to join be extended throughout the country.