CONFERENCE
WATERWORKS OFFICIALS

State Capitol
Hartford, Conn.

April 18, 1922

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MEMBERS PRESENT AT WATERWORKS CONFERENCE APRIL 18, 1922.

NAME	TITLE	WATER COMPANY OR TOWN REPRESENTED
Everett J. Lake	Governor	State of Connecticut
Frank J. Davis	Secretary	Ansonia Water Company
Samuel J. Kyle	Superintendent	Fountain Water Company Ansonia, Conn.
D. H. Hall	Superintendent	Bridgeport Hydraulic Company
F. C. Barrows	Chemist	
G. E. Lourie	Superintendent	Board of Water Commissioners Bristol, Conn.
Charles S. Wooding	Chairman	
George H. Scranton	Secretary	Birmingham Water Company Derby, Conn.
C. J. Redshaw		
O. B. Swain	Superintendent	Guilford-Chester Water Company Clinton, Conn.
E. C. Hopkins	Treasurer	Crystal Water Company Danielson, Conn.
John H. Walsh	Superintendent	East Hartford Water Department
C. H. Olmstead	Consulting Engineer	
John Maher	President	Greenwich Water Company
Caleb M. Saville	Manager and Chief Engineer	Hartford Water Works
James A. Newlands	President	Henry Souther Engineering Co. Hartford, Conn.
A. C. Roberts	General Manager	Lakeville Water Company
Walter E. Lydall	Director	Manchester Water Company
Arthur J. Straw	Secretary and Treasurer	
George H. Robinson	Superintendent	Mystic Valley Water Company Stonington, Conn.
Edward E. Minor	General Manager	New Haven Water Company
G. T. Gaillard	Secretary	
Walter Connor	Chemist	
A. B. Hill	Consulting Engineer	
W. B. Rossberg	Chairman	Board of Water Commissioners New Britain, Conn.
George C. Ham	General Manager	Naugatuck Water Company

NAME	TITLE	WATER COMPANY OR TOWN REPRESENTED
J. D. Milen	Commissioner, First Taxing District	Water Department Norwalk, Conn.
Wallace Daun	Commissioner, First Taxing District	
Harry Kenna	Superintendent, First Taxing District	
E. J. Finnegan	Clerk, First Taxing District	
J. E. Barlow	City Manager	New London, Conn.
G. E. Watters	Superintendent	Water and Sewer Department New London, Conn.
Sol Pincus	District Sanitary Engineer	U. S. Public Health Service New York City
Leo F. Rettger	Professor of Bacteriology	Yale University
G. H. Pratt		Wallace and Tiernan Co., Inc. Newark, New Jersey
Charles H. Edwards	Superintendent	Portland Water Company
Alfred Gildersleeve	President	
Joseph N. McKernan	Superintendent	Plainville Water Company
C. D. Sharpe	Superintendent	Putnam Water Company
Alberti T. Thompson	Superintendent	Rockville Water and Aqueduct Co.
Frederick W. Cotter	Superintendent	Shelton Water Company
Daniel E. Brinsmade	Secretary	
H. Belden	Treasurer	Simsbury Water Company
L. W. Howe	Secretary and Treasurer	South Glastonbury Water Co.
Charles A. Wheeler	College Engineer	Storrs, Conn.
Walter P. Schwabe	President and General Manager	Stafford Springs Aqueduct Company
	Vice-President and General Manager	The Northern Connecticut Light and Power Company Suffield, Conn.
	President and General Manager	Thompsonville Water Company
S. H. MacKenzie	Superintendent	Southington Water Department
	Superintendent	Terryville Water Company
William E. French	Superintendent	Torrington Water Company
Charles L. McNiel	Secretary and Treasurer	
William A. MacKenzie	Borough Engineer and Engineer and Superintendent Water Department	Wallingford, Conn.

Charles Nearing	Chairman	Board of Water Commissioners Wallingford, Conn.
A. W. Mitchell	Superintendent	Woodbury Water Company
John T. Black, M. D.	Commissioner	State Department of Health
J. Frederick Jackson	Director	Bureau of Sanitary Engineering State Department of Health
Joseph Doman	Assistant Engineer	
Edward B. Noonan	Inspector	
Doris A. Tryon	Secretary	
P. E. Bransfield	Chief Chemist	State Department of Health Laboratory

LIST OF SPEAKERS AT WATERWORKS CONFERENCE

APRIL 18, 1922.

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Everett J Lake	Governor	State of Connecticut
J. E. Barlow	City Manager	New London, Conn.
P. E. Bransfield	Chief Chemist	State Laboratory, New Haven, Conn.
Walter Connor	Chemist	New Haven Water Company New Haven, Conn.
G. T. Gaillard	Secretary	New Haven Water Company New Haven, Conn.
A. B. Hill	Consulting Engineer	New Haven Water Company New Haven, Conn
George C. Ham	General Manager	Naugatuck Water Company Naugatuck, Conn.
Edward E. Minor	General Manager	New Haven Water Company New Haven, Conn.
S. H. MacKenzie	Superintendent	Southington Water Department Southington, Conn.
S. H. MacKenzie	Superintendent	Terryville Water Company Southington, Conn.
W. A. MacKenzie	Borough Engineer and Engineer and Superintendent	Water Department Wallingford, Conn
Joseph N. McKernan	Superintendent	Plainville Water Department Plainville, Conn.
James A. Newlands	President	Henry Souther Engineering Co. Hartford, Conn.
Sol Pincus	District Sanitary Engineer	U. S. Public Health Service New York City
G. H. Pratt		Wallace and Tiernan Co., Inc. Newark, New Jersey
Leo F Rettger	Professor of Bacteriology	Yale University New Haven, Conn.
A. C. Roberts	General Manager	Lakeville Water Company Lakeville, Conn.
George H. Robinson	Superintendent	Mystic Valley Water Company Stonington, Conn.
W. B. Rossberg	Chairman	Board of Water Commissioners New Britain, Conn.
C. D. Sharpe	Superintendent	Putnam Water Department Putnam, Conn.
Alberti T. Thompson	Superintendent	Rockville Water and Aqueduct Co. Rockville, Conn.
Charles S. Wooding	Chairman	Board of Water Commissioners Bristol, Conn.
John T. Black, M. D.	Commissioner	State Department of Health Hartford, Conn.
J. Frederick Jackson	(Chairman at Meeting)	Bureau of Sanitary Engineering State Department of Health Hartford, Conn.
Joseph Doman	Assistant Engineer	Bureau of Sanitary Engineering State Department of Health Hartford, Conn.

PROGRAM

CONFERENCE WATERWORKS OFFICIALS

STATE CAPITOL, HARTFORD, APRIL 18, 1922.

CONFERENCE WILL CONVENE 11.00 A. M.

TOPICS FOR DISCUSSION.

1. Sanitation of watersheds.
2. Abatement of nuisances.
3. Fishing and boating on reservoirs.
4. Cutting ice from reservoirs.
5. The value of records of waterworks operation.

*1.00 P. M. ADJOURNMENT FOR LUNCH.

2.00 P. M. RECONVENE.

6. Collection of samples for analyses.
7. Interpretation of water analyses.
8. Dosage and operation of chlorinating machines.
9. Coppering reservoirs.
10. Certification of interstate carriers.

*If sufficient number of representatives make reservations, luncheon will be served at Hotel Bond, $1.25 per plate.

Opening Address by Chairman

MR. JACKSON: The State Department of Health is charged by statute with supervision of the water supplies of the State. The question is sometimes asked, how far should this supervision extend. The Department cannot be successful in the administration of its duties unless it has your fullest co-operation and it cannot expect your full and complete co-operation unless it is able to convince you that in any matter in question, it has the fullest and complete information available and that there is no desire on our part to impose any restriction which may be unreasonable or to hamper an official in the performance of his duties, duties which we ourselves know are exacting and onerous enough in themselves. To question the qualities and safety of a water supply is one of the easiest ways that I know of to stir up public opinion, and to restore confidence in one after it is once placed under suspicion calls for the exercise of patience and tact and means much time spent in explanations. We cannot hope to have as complete information in regard to any one water supply as you officials who are daily in touch with it. We have got to depend upon certain prescribed general tests which practice and experience have proven to be good indicators of the condition of a supply and to rely in a large measure on methods of prevention which experience has shown to be successful in protecting any supply from pollution. The source and remedy for deterioration in a water supply can often be much more quickly determined and applied by you than by us. It is essential, however that we have your complete and fullest confidence and that any information which we may seek is freely and willingly granted.

Our experience is that in obtaining and preserving a safe and wholesome water, the viewpoint of many is much better than one, and that without co-operation, successful administration by the State of water supplies is not possible. In our work there are certain questions which come up repeatedly. I have selected from these, those which recur oftenest and placed them upon the program for discussion today. They include questions pertaining to law, engineering, chemistry, bacteriology and administration, and we are most happy and it is particularly fitting that the head of the State of Connecticut should address us upon the last phase of the question.

I take pleasure in introducing to you, if indeed he needs any introduction, His Excellency, Everett J. Lake, Governor of Connecticut.

Fellow Engineers:

I have been asked to extend to you a word of greeting on behalf of the State on this, the opening meeting, of your Conference, and I am extremely glad to do so.

Were it possible, I should like to spend my entire time while you are here with you. As a graduate of the Worcester Polytechnic Institute in the department of Chemistry, and as a member of the American Society of Mechanical Engineers, I feel that I am slightly akin to you all and I am sure the problems you are to consider would be of the deepest personal interest to me.

But it is in a representative sense rather than a personal sense that I am here, and representing all of the people of the State I do bring to you a word of appreciation for the work which you are doing.

We have for our State and for its various political subdivisions, our Boards of Health and our health authorities, and we have the great medical profession throughout the State, all alert and fighting the ills and diseases of our million and more people both from the curative and preventative position.

In the entire field of these activities there is no more conspicuous or stronger force in furthering these modern preventative health measures than the public service of professional men of your training and standing.

I congratulate you Engineers who are really the keystones of your various organizations, upon your successes of the past, and these successes I am confident will continue in the future to your own personal satisfaction and for the betterment of conditions in your several communities.

And I congratulate you upon such a meeting as is the present Conference.

You and I are privileged to live in a day and time that will be bright on the pages of History. The great war seems now to have drawn a line between two distinct aims and methods of public acts, both governmental and individual. The Nations of the world seem to have reached a higher plane of symphathetic interdependence and open diplomacy. Our states seem to have less of the selfish and more of the national spirit, and our public servants, both office holders and the public service departments, seem to recognize that the public should be enlightened and served and not deceived and robbed. And in the individual himself, there seems to be a greater desire to give and to learn rather than to grasp and to withhold his knowledge and his abilities.

So, gentlemen, I again extend the thanks of Connecticut for your sacrifice of time and effort upon this Conference which will add to the health and comfort of the people of our State.

MR. JACKSON: Gentlemen, this is your meeting called by the State Department of Health but to be conducted as you desire. I have laid out a tentative program; perhaps you will think it is too ambitious, but I think we can get through it in the time alloted. I am going to ask each speaker to limit themselves to five minutes if he will. If there is any particular subject which seems to invite a more prolonged discussion than the time I have set permits, we can take it up again later if the other topics permit.

The first topic is "Sanitation of Watersheds". I am going to call upon Mr. Minor, General Manager of the New Haven Water Company, to give us a few short opening remarks on their methods of sanitation.

TOPIC I

Sanitation of Watersheds

MR. MINOR: I wonder if it would not be a good thing at this time for Mr. Jackson to go over the work which the State Department has done in inspecting watersheds and what your plans and aims are in this respect. I might talk on work which would be similar to that of most companies here present, but I think the greatest good that could come from this meeting would be to have a few remarks from the Department of Health on how you expect us to co-operate with you. This might be of much more benefit than going over our routine sanitary work on the watershed.

MR. JACKSON: Personally I do not agree with what Mr. Minor says. I thought it would be better for you to obtain first hand and not through a second party like the State Department of Health what other companies with similar problems like yours are doing. That was what I had in mind in asking Mr Minor to outline their procedure, because the Department knows that the New Haven Water Company is particularly qualified in this matter and have some pretty good stunts. He can tell them much better than I can.

MR. MINOR: We would like to know the purpose of the State Department of Health; how they are trying to get together in their office to control the sanitary situation on these different sheds; the information which you hope to obtain; what the aim of the Department of Health is, the sanitary part, particularly; where you can help us and whether we can help them; not what another company may do, but so that we may have a better understanding of what the State Department of Health may do.

MR. W. A. MACKENZIE: My methods of protection on the watershed are to plant Norway, Scotch and Red Pine trees around the reservoirs and waste pasture land to prevent refuse from getting into the auxiliary reservoir or the large storage reservoir which covers an extra large area. Beneficial results have also been accomplished at a small expense by draining as far as possible all stagnant pools and swamp areas on the watershed and also cleaning out the decayed leaves and refuse washed to the shores of the reservoir. I am positive this work has improved the color, reduced the algae and the necessity of treating the water with copper sulphate more than once or twice per season. It has also materially improved all the surrounding conditions of the reservoir.

The Water Department owns all the land with the exception of one tract which is growing more insanitary. The

owner of this property keeps a large herd of cows which have access to the water and they create a very insanitary condition and the commissioners are unable to come to any agreement with the owner as to a reasonable purchase price. If the present commissioners force the matter to a head and have to condemn the property, could the State Department of Health help out under the present State laws? The reservoir is over one mile in length and the capacity is over 1,158,000,000 gallons, and the upper end of the reservoir adjoins this property. Several samples of water that were taken a few feet from the shore where the pollution takes place shows the bacterial count from three to four thousand and the colon bacilli was found in 1-10 of 1 c. c. and at the intake the bacterial count is reduced to some three or four hundred but colon shows up positive, whereas at the extreme end of the reservoir where the auxiliary reservoir supply enters, the total count is very low and the colon is negative. This seems to prove conclusively that the pollution from a large herd of cows should be stopped.

Mr. Newlands knows about the tests and the conditions. Providing the people do not support the Board of Water Commissioners in purchasing this property on account of the high price for land and water rights, I would like to know how far a matter of this kind could be taken up by the State Department of Health in order to abate the nuisance.

MR. ROBINSON: It has always been the custom for the people living in this vicinity to use the grounds around our upper reservoir as a picnic ground long before we purchased it, and we have continued to allow them to do so, and we have built receptacles of stone in which they put the refuse, and we send a man several times a week to clean them out. We have been criticized for this but there are many good reasons for allowing it and many against it, but the people enjoy the privilege and most of them are our customers using the water in their own homes for domestic purposes and so look after things.

MR. JACKSON: The people appreciate it and do not abuse the privilege?

MR. ROBINSON: The people appreciate it very much, and as a rule take good care of the grounds, so that we have very few opportunities for complaint

MR. HAM: I don't know if I can add anything. However in a general way I can tell you what we do with ours. Our principal water supply is taken from two streams. There are perhaps eight or nine houses on the shed but on the outer edge of it and not near a stream, except the houses which the company owns. Our practice is to employ one man who has

charge of the reservoirs and who lives below and devotes his time to daily patrols. He, as a rule, makes one every day. He has an additional route he makes on the outskirts four times a month. That is the inspection system. We have run up against a little trouble. Some property owners on the shed own cows and there is some pretty good farming land within its limit. These cattle and the fertilizer used on the land adjoining some small tributary streams have sometimes given fairly large colon counts. We cannot trace it to anything else but the presence of cows and have taken precautions to clean up the barn yards, etc., on those streams where there are cattle, but yet we have the same condition that we had before. There are generally some coli in the upper end of the reservoir but usually not at the lower end.

Our high service system which is a small one having a little more population, is handled about the same way. There is a man living in a house there who patrols the shed twice a day.

MR. MINOR: Mr. Jackson, I don't want you to think we were not willing to discuss our methods. I only thought the time might be profitably spent otherwise.

We have a man on each watershed who is closely in touch with all the people living on the watershed. It is very wonderful the way news in the country will spread. If there is any sickness or danger comes up a good man on the shed will know of it before you do and in that way be able to forestall the situation which might otherwise prove serious. We have an arrangement with the doctors by which they use post cards for reporting contagious diseases and we pay them $1.00 for each card sent in. Sometimes they send in cards reporting only suspicious cases, but we are very glad to have them do this. We have had men taken to the hospital for typhoid and found out that it was not this; but we do not consider this a loss and we might as well be ahead of time.

One very good little stunt on brooks is to make loose stone dams and in the spring have men go up these streams and take the leaves out. There is an enormous amount of rubbish cleared out in this way which results in color and organic matter and is favorable for algae growths. There is always a possibility of something getting by you. A high board fence cannot be used as a means of defence against polluted water.

TOPIC II

Abatement of Nuisances

MR. JACKSON: I have asked the Commissioner to open the discussion on the abatement of nuisances because he has had experience as health officer in local and also as Commissioner in state matters which particularly fit him to give to us briefly effective methods of abating them. Dr. Black made a reputation for himself in New London, especially upon the way in which he handled this particular phase of the health problem and I am sure that he can give us some very valuable information on it.

DR. BLACK: Gentlemen, Mr. Jackson made a little mistake about my reputation in New London on the water supply. I did co-operate with the officials in New London and they, like everywhere else in the State, co-operated with the health officer.

First, I would like to speak on Topic I and connect it with Topic II. The State Department of Health has general supervision over water supplies. This does not mean that it should assume or acquire the sole or entire supervision of watersheds. We are, however, willing and anxious in all of our departments to assist and advise on the sanitary control of water supplies. A feature was brought out in the previous discussion which I would like to emphasize, that is the reporting of communicable diseases on watersheds, particularly typhoid fever. The law requires that the health officers of the town in which the watersheds lie, must report on request to the health officer or water officials within whose jurisdiction the water is consumed, and there is a statute to that effect. Most health officers do this willingly.

I am glad to know that the New Haven Water Company has established their own system. There is a feeling of relief, and anxiety is often avoided with the knowledge of what is going on in the way of sickness in your shed. We will be glad to furnish a list of typhoid carriers in the State to those who want it. There are seven or eight in the State of which we have record and I think you should know of these carriers if they go upon or are living in the vicinity of your water supply. These carriers, as you know, may go for months or a year without making trouble and then may cause considerable trouble. We would be very glad to see all watershed superintendents take these matters up with the health officers and have communicable diseases reported to them.

I want to take up the local phase of abating nuisances before discussing the general statutes. I think that the water company should lay a foundation by having an accurate sur-

vey made of the watershed and a map showing the location of every permanent habitation or possible nuisance. These should be indicated where they are likely to be dangerous in red and then should be systematically eliminated. What I mean is that if there should be seventy or eighty habitations on a watershed you cannot eliminate all those nuisances in a year, it is going to take time. The most menacing should be eliminated immediately, the others from time to time. By having a map and giving each a number, your inspectors and control men would be able to locate these places easily. This is very important. Every fixed nuisance should be considered as a time clock, regularly inspected and conditions noted. With this map before you, you are well prepared to eliminate the fixed nuisances.

Next there comes the method of removing all possible nuisances. As I said before, take the pronounced cases first, in this discussion I am not considering the nuisances which I consider non-fixed or accidental. All these are pretty well covered by the general laws. These nuisances, such as fishing, boating, bathing, throwing of carcasses on watersheds, and pollution in general, are all covered by special acts. I don't think any water company will have any great difficulty in settling these cases, but it is the fixed nuisance occasioned by the ordinary habits of living. How much or little it involves the property rights of the owners that we must consider. The greatest of these is the improper cesspool or privy vault. Every house must have some form of waste disposal. That right we cannot take away from them and it merely means that the installation must be such that it will not pollute the water supply. Whether the expense of making that safe for a water supply should be paid by the owner of the property or by the water company, is the question. In case of a water company desiring the abatement of a nuisance and expecting it to be abated permanently the abatement should be taken care of by the company. As an example of such a case, the Department issued an order under Section 2540 and spent five years in the courts. The final decision was that the State did not have the right to take the man's property without compensation. This was not our intention when we issued the order, because under the statutes 2532-2534, the State of Connecticut can issue orders. With proper presentation and with reference to the statute providing for appeal the order should have carried. There are, however, a number of acts or statutes which cover the abatement of nuisances which can be utilized.

The privy vault for example is the most common menace on the watershed. We generally advise the water officials to join with the local health officers of the community using the

water and of the territory in which the watershed lies. You know, I suppose, that the health officer in whose jurisdiction the water is used has control over the watershed for the purpose of preserving the purity of the water. So water officials should join with the local health officers and issue an order or a request to the owner of the premises with the assumption that the order will be obeyed. The order is issued for the convenience of the owner. He is given the opportunity to abate the nuisance to his own satisfaction and at his own expense. If he declines then the company has the authority to go in and erect such installations as it sees fit. The installation in this case must be paid for by the water company as I said before. The law provides that any unnecessary damage or loss occasioned the individual should be paid by the water company. I never knew any procedure like this to be opposed. When the installation is completed it may be used or not. I have seen one case where they refused to use it. Then comes a duty for the health officer. The old fixture should be ordered abated as a nuisance and if the order is not complied with, the health officer should prosecute for maintaining a nuisance. Still further, a privy vault constructed on the watershed may be of the best construction but it must be properly taken care of and that care should not be left to irresponsible owners who may not feel kindly toward the water company. The health officer again can issue an order that no privy vault or cesspool shall be emptied except by the water company, and if violated, can prosecute.

I do not think it is necessary to go into detail of other methods, only to quote the other statutes. Boating comes under 2544, fishing under 2547. There is another act which can be invoked but I do not think it as good as 2545 which fines anyone $100 for placing any poisonous substance on land occupied or controlled by them and which land is used as a watershed. I feel that the most satisfactory method is to act under 2540 in conjunction with the health officer and have the company put in its own installation and regulate it thereafter. This means it should be continually inspected.

One word about the abatement of nuisances when water is chlorinated. The same amount of care and attention should be given to a nuisance on the shed as before. Chlorination is an added precaution and breakdowns are liable to occur. The machine is liable to get out of order. One case in the State of this character was when the regulating valve did not work and a rubber band was put on with the result that the people drank practically raw water until an outbreak of diarrhea led to the discovery of the trouble. Every precaution should be taken. I think the great reduction of

typhoid in Connecticut which is a lower rate than in any other state in the Union, and our general death rate, the lowest ever recorded in eastern United States, is due to a large extent to the careful attention given to our water supplies.

You as waterworks officials, have not only a grave responsibility but a great opportunity to benefit mankind and I am glad to say that almost without exception, Connecticut waterworks officials are doing their duty and doing it conscientiously and well, and we as a department of health, feel it a great privilege to work with you.

MR. JACKSON: Will you discuss the abatement of nuisances further?

MR. MINOR: I think it was a very interesting talk. I would like to ask Dr. Black this question. The only help water companies can expect then from the State Department of Health is the necessary backing to eliminate any nuisance at their own expense. The State Department of Health offers us backing to go in and do for that man that which he will not do for himself.

DR. BLACK: I tried to draw a distinction between fixed and occasional or accidental nuisances. A fixed nuisance is the privy vault or old barn yard. In New London for example, there was a very bad barn yard. There were about two feet of water and manure around it most of the time. In times of rain it would wash over into the reservoir. You cannot order a man to abate such a nuisance. The barn yard was necessary. You can order him to drain his property, but he drains it on his land. You cannot require him to put in septic tanks or a drainage system. He was there before the water company. He cannot be put to unreasonable expense for the benefit of the public unless there be some intent to injure the water or other illegal act. But if the man put the barn yard in after it became a watershed, then he would suffer the cost of making it safe. But in this case the installation had been there for 200 years. Every effort was made to clean it up but it was found that it could not be done without an irrigation and subsoil drainage system and New London water officials put this in at their own expense. The State Department of Health and the water officials are both concerned. We are very glad to join you in anything but paying the bill, in advising, supervising, assisting or utilizing our legal authority, but decisions as rendered indicate very clearly that the individual's rights must be respected and the individual cannot be put to unnecessary expense unless it is shown that he has caused the nuisance with intent to injure or to profit.

MR. HILL: Suppose the water company should be there first?

DR. BLACK: If the water company were there first, the expense should be borne by the individual. He should know that it is a watershed and know that what he is constructing is a nuisance and injurious to the water supply and, therefore, under Section —— which I do not now recall, he is placing on the watershed something prejudicial to the water supply.

We have a case of that kind now. The county health officer says he can be prosecuted. The water company put in a dry concrete privy for this man outside but he now wants a water flushed toilet inside. He proposes to pipe into a brook running into the water supply. The health officer says the man is distinctly liable and will have to take care of the effluent from that house at his own expense. It is the old time nuisances that give the most trouble and that is why I emphasized this class.

MR. THOMPSON: Suppose the opening or end of the sewer was 100 feet from the brook.

DR. BLACK: It would be the same as if it was piped into the brook and it is up to the property owner to make it sanitary.

MR. NEWLANDS: Would it be feasible for the State Department of Health on request from water companies and water departments to establish rules and regulations governing the construction of outbuildings and the deposit of wastes on land bordering reservoirs and tributary streams?

DR. BLACK: It is the policy of the State Department of Health to assist by advising and inspecting, and also to establish standards and uniform methods of inspection of watersheds, taking of samples, interpretation of analyses and all matters pertaining to water supplies; and I think, after talking with Mr. Jackson, that his principal reason for calling this meeting was to get your ideas so that standard and uniform methods could be promulgated.

MR. NEWLANDS: Bridgeport has such standards which state in effect that no outbuilding shall be located within 50 feet of any stream or reservoir used by the city for drinking purposes and between a distance of 150 to 250 feet from the high water line. No outbuildings shall be constructed unless vaults for wastes are made water-tight. If people on the watersheds were acquainted with these regulations, it would help the water companies and departments in getting a prompt settlement when troublesome cases are brought into the courts.

DR. BLACK: I believe it would be a very good thing, if the water companies are agreeable, to incorporate in the Sanitary Code, special regulations for the water supplies and of

nuisances on watersheds. If this policy should be carried out, the Council would submit them to you for approval.

MR. MACKENZIE: Do you think it better to make an agreement with the property owner or have the health officer issue an order and let him decline?

DR. BLACK: It is better, of course, if the waterworks officials can handle the case without calling the health officer.

MR. WOODING: I agree with Dr. Black that the present legislation does supply sufficient means to abate all nuisances which now exist. But it is necessary to consider the time before the nuisance exists and the courts will not take notice of some impending action from which a nuisance may result. You have got to prove that there is a nuisance to get relief. There should be legislation that will provide that a new installation of sanitary equipment on the shed must be done with the approval of the State Department of Health or some other state authority. I have a case in mind where the land was purchased with the idea of making trouble for the water department and for the financial benefit of the purchasers. We ought not to be obliged to wait until they establish a nuisance and then pay for its elimination.

DR. BLACK: The health officer can cover that under his general powers where it is likely to be prejudicial to public health. Any condition likely to be prejudicial can be ordered abated by statute. I do not mean the unquestioned nuisances but what is likely to become prejudicial. The distinction I made was that the wide open nuisance should be attended to first and the probable ones later.

MR. WOODING: Would it not be well if we had a statute that provided that new equipment for sewage disposal on the watershed, where it is known that water is used for potable purposes, be inspected by some State authority?

DR. BLACK: That could be taken care of in the regulations as suggested by Mr. Newlands. The "Code" has the force and effect of the law. It did not occur to me to take that up in the "Code" but I think it is a very, very good suggestion.

MR. NEWLANDS: I don't think general regulations can be made to cover every case. In the case of Hartford, you cannot logically set the same limits, within which outbuildings must be controlled, as in the case of many other supplies, where less adequate facilities are available for purifying the water. The range within which we would have to establish regulations would be greater on a small unpurified supply than on a larger or purified supply.

DR. BLACK: I think that could be taken care of in the proposed regulations.

TOPICS III AND IV

Fishing and Boating on Reservoirs
Cutting Ice from Reservoirs

MR. JACKSON: We will now discuss fishing and boating and cutting of ice on reservoirs. I have combined these topics, because they are related. No one has been selected to open this subject. I have left it to your own initiative.

A MEMBER: Do you think that cutting of ice on the reservoir is a dangerous practice or something which should be allowed?

MR. JACKSON: The policy of the Department in relation to that is that the cutting of ice itself is not a dangerous practice, but may lead to others which are a direct menace and it is easier and better on bodies of water used for public supplies to prohibit or control the cutting of ice. New sources for ice supplies should be carefully investigated before permission is granted to utilize them.

A MEMBER: My point was whether it is the idea or the plan of the Department of Health to undertake to absolutely prohibit the cutting of ice on reservoirs.

MR. JACKSON: It is not. Every company that allows this should be especially interested to see that every precaution is taken. It has been my experience that some of them were not so.

MR.HAM: I would like some information in relation to giving of permits for fishing. I understand that there were some places where they gave permits and charged a fee. Where fishing is permitted, fishermen are not to be trusted, and I would like to know if anyone has any experience in giving permits where they charged for them or how they worked it. Our directors won't give permits but people do fish in the reservoirs. Our inspectors have orders to put them off if they see anyone at the outlet end. We have got them pretty well trained to keep away from the intakes, but to keep them from the upper end and tributary streams would take too many men. I think no very great damage has been done, but would we have better results if we did issue permits and charged a pretty fair price for them?

MR. GAILLARD: I will tell you the way we handle ours. We are not proud of the fact that we issue permits. The directors of our company feel that we must bow to public pleasure on this question. We have control of practically all of the ponds and lakes around New Haven. Lake Saltonstall is open to the public for fishing under certain restric-

tions and, while we disapprove of the practice, we must meet the situation. We had a season permit a number of years ago which gave people the right to fish on the reservoir during that season. These permits were considerably abused. People traded them back and forth. It was impossible for the company to keep track of them, so we have installed what is called a daily permit system. This is a permit which admits the bearer to fish with rod and line in Lake Saltonstall from 7.00 a. m. to 6.00 p. m. under rules and regulations prescribed by the water company. The applicant must go to the office personally, give his name at the desk, and the permit is made out in his name by the clerk. A carbon copy of this is kept in the office. All permits are taken up by the watchman in charge. At the end of the week permits are checked up against the carbon copies. The permits are made out for one day only as designated on the permit and are not good on Sundays or holidays. At times, someone will change the date, but upon comparing it with the copy, the change is detected and no more permits are issued to him that season. If he abuses the privileges allowed him, he is black listed, and he is asked to come to the office and is told why no more permits can be given him. It works out very well and the people in New Haven accustomed to fish on this reservoir understand that they have to live up to certain regulations if they are to continue to enjoy fishing there. There have been at various times, fishing clubs that go over there and report to us where they have seen abuses. We try to get the people to work with us and everyone understands that if the situation becomes unbearable, the lake will have to be closed for fishing. We have comparatively little trouble but we would like very much to get rid of it. I think it is more or less a menace to the health of the community and a source of constant worry and annoyance. We issued 3,900 permits last year during the three months' fishing season. We charge a small fee of twenty-five cents an hour for the boats. There is no charge for the permits.

MR. HAM: Does New Haven allow fishing through the ice?

MR. GAILLARD: No. The fishing is limited to the months of June, July and August.

MR. SHARPE: I have two questions I would like to ask. We take our water from Little River Dam which is about two miles from Woodstock on Roseland Lake. The fish and game warden says there can be no fishing on Roseland to-day unless the Water Department gives permits. We started in to give a few permits and I understand some influential people in Woodstock, one gentleman who is a trustee of Roseland Park, came up to Hartford and took up the question with the Fish and Game Commission, whether we had any rights to

issue orders. He met Mr. Gilpatric, who said afterwards, issue no more permits. They claim that we had no rights on any land at this place. We were not on Roseland Lake but were two miles away and owned no land around it. It was not a reservoir for us. That is one question I would like to ask, whether it is within our rights to give permits. I suppose your Department knows the conditions up there as to bathing, etc. It is a serious question and means a fight which must come up sometime. Does the Water Company have the right to issue permits, or if it doesn't, can they fish there?

MR. JACKSON: Has it been posted?

MR. SHARPE: Yes, for one year but it did no good.

MR. JACKSON: Was it signed by the local health officer or you?

MR. SHARPE: By the Water Department.

MR. JACKSON: You don't use this directly for your water supply?

MR. SHARPE: Our dam holds back nine inches of water on Roseland Lake. I suppose that certain property rights on Roseland Lake that the old company had passed to the municipality. There used to be a gristmill at Harrisville that had rights granted by the Town of Woodstock many years ago and we had to recognize the right and we did, but finally we bought the rights and abolished the gristmill. It is a very silent and still running stream from the lake to our dam.

MR. JACKSON: Mr. Sharpe's question is a mighty good illustration of just what questions come up before the Department of Health, complex questions. Frankly, I confess I don't know how to answer him. In a way it answers Mr. Minor's question. I think the State Department of Health can back up the water companies in their method of protecting the water supply. Here is one example where a difference of opinion between two departments of the State as to authority arises and I think that a meeting of this kind ought to be particularly beneficial in clearing up such disputed points.

TOPIC V

The Value of Waterworks Records

(Paper read by Mr. Doman)

MR. DOMAN: There is probably no better method of sustaining interest and producing efficiency in waterworks operation than the keeping of proper records. Such records may be grouped under three general headings, those pertaining to

1. Finances.
2. Quantity, consumption and distribution of the supply.
3. Quality of the supply.

Records kept pertaining to financial status are various segregations of receipts and expenditures, including among others, rates for service, costs of construction, alterations, repairs, depreciation and operation. Such records are, of course, of prime importance, and, stated briefly, they enable the waterworks manager to so adjust his rates that the Company can make a fair return on the investment. This applies to municipal as well as privately owned companies.

Records pertaining to quantity and distribution should first of all include complete maps and plans of the watershed, waterworks and distribution system. For supplies derived from surface sources the amount of water ordinarily available should be determined from rainfall records supplemented by records of reservoir stages, amount delivered to the mains and amount wasted over the spillway. The ideal way to measure consumption would be to meter all mains at or near the intake and meter all services, checking one against the other. Maps, plans and records, as above mentioned, enable the waterworks officials to intelligently plan extensions and alterations to existing works. One of the most important features in planning such extensions and alterations is an accurate knowledge of what is required for both present and future needs and this knowledge can be supplied only by proper records. Such records among other things, tell quite definitely whether the watershed area is sufficiently large, whether reservoir capacities need be increased, whether new watersheds and reservoirs are required, whether other sources of supply are required for fire protection, whether mains should be made of greater capacity, whether there is an undue waste of water through leakage or other sources, which is extremely important where conservation of the supply is necessary. No doubt many other uses of such records will occur to you, all of them vitally important in the proper operation of waterworks.

Records pertaining to the quality of the supply should include the results of inspections and patrols of watersheds, as well as the chemical and bacteriological examinations of the water from time to time. The importance of inspections and patrols can hardly be overestimated if a water of satisfactory quality is to be delivered to the consumer. With regard to sewage pollution of a supply, the chemical and bacteriological examinations can detect the presence of this contamination but it requires careful inspection of the watershed to locate the sources and determine to what degree they should be eliminated and, if necessary, how the water should be treated. It is, therefore, important that the map of the watershed should show all houses, barns, pasture land, cultivated land and the like, and should be supplemented by adequate descriptions as obtained from inspection and patrol. If the watershed is large enough to contain several villages or cities, the danger of contamination from their wastes should be determined. Swamp lands and other features affecting the quality of the supply should be noted and described.

It is often very helpful to have records of microscopic examination of the water from reservoirs, both large and small, as these are valuable in determining when copper sulphate should be used to eliminate organisms producing odor and taste in the water. Records of the sort just mentioned will give an accurate index of the quality of water delivered and determine whether treatment is necessary or not, and if it is, will indicate the type of treatment required. For example, a water habitually colored and high in organic matter from swamp lands, but unpolluted, may cause considerable objectional tastes and odors, particularly when used for cooking purposes. To render this water unobjectionable, filtration perhaps preceded by aeration is required. On the other hand, the problem may be entirely one of bacterial removal and chlorination may be the most effective solution. Or, the problem may be one of algae growths in the reservoir and the solution may be applying copper sulphate, sometimes followed by lime. Sometimes, as recently occurred in New York, the obnoxious tastes and odors produced by micro-organisms may be lessened or eliminated by increasing the dose of chlorine. In a word, records properly kept indicate the source of the trouble and once this becomes known, the proper remedy is usually not difficult to find.

Treatment plants, when not properly operated are often of little or no value. It is, therefore, important that records be kept of operating rates and periodical chemical and bacteriological examinations of the water before and after treatment. Where filtration plants are used, the type of filtration should be recorded as well as the rate of filtration in

gallons per acre per day and method of operation of the plant. Where chlorination of other chemical treatment is employed, the dosage rates should be computed either in pounds per million gallons or part per million. Records should also be kept of shut downs and causes for same, repairs, costs, etc., as well as efficiency of treatment.

Practically all of the large companies keep excellent records along the lines above mentioned and very often the information so obtained is extremely useful to other companies where no records are kept or where other data is desired for comparison. Requests for such information usually comes to the State Department of Health and in order to supply this information as fully as possible, it is very desirable that the Department have copies or summaries of such records as are kept and it is hoped that waterworks officials will make it a point to send such records and reports as become available to the State Department of Health. Where routine chemical, bacteriological or microscopic examinations of a supply are made by some laboratory other than that of the State Department of Health, it is particularly desirable that copies of these examinations be sent to the Department once a month. It is also hoped that companies not keeping records will be stimulated to do so at a very early date and if information is desired as to the form of records, the State Department of Health will be glad to co-operate in every way possible.

MR. JACKSON: Do you wish to discuss Topic V further?

MR. S. H. MACKENZIE: I might say that the New England Waterworks Association has appointed a committee on Records and Forms for Waterworks and that the committee is considering the advisability of putting on an exhibit at a convention of the association. We believe such an exhibit will be of great value to many waterworks, and trust that when the time comes we may have your full co-operation in getting such an exhibit together. Mr. Schwabe is also a member of the committee and, I believe, will second my request.

MR. JACKSON: You have all heard Mr. MacKenzie's announcement and will make note and govern yourselves accordingly.

ADJOURNMENT UNTIL 2.00 O'CLOCK

AFTERNOON MEETING OPENED

TOPIC V (CONTINUED)

The Value of Records of Waterworks Operation

MR. DOMAN: A number of water companies have their chemical and bacteriological work done at private laboratories. In the past it has not been the practice to furnish the State Department of Health with copies of these. It would assist the Bureau of Engineering very materially if copies were forwarded so that we might have a complete record in our files.*

MR. JACKSON: Have you anything further to offer on Topic V? If not, we will proceed to take up Topics VI and VII.

TOPICS VI AND VII

Collection of Samples for Analyses
Interpretation of Water Analyses

MR. JACKSON: I am going to ask Mr. Bransfield, our Chemist and Assistant Director of the Laboratory to open the discussion on Topics VI and VII.

MR. BRANSFIELD: Most of you gentlemen are familiar with the shipping case which the Laboratory sends out for collection of samples. It consists, as you know, of a two-liter bottle for the sample for chemical analysis and a four ounce bottle for the sample for bacteriological examination. The small bottle is sterilized but the large one is not sterilized but is cleaned with a cleaning solution and thoroughly rinsed. In taking a sample for chemical analysis, the large bottle should be completely filled and then completely emptied and then filled again, leaving about two inches at the top for possible expansion. In taking a sample for bacteriological examination, the small bottle should be filled and precautions should be taken in collecting the samples so that any contamination from the hands or fingers will not get into the bottle. The stopper should be removed with the cloth which covers it. The bottle is held in the right hand and the stopper

*NOTE—Sense of the meeting was favorable to such procedure.

covered by the cloth in the left. The sample should be taken as quickly as possible and the stopper inserted, leaving about one half inch at the top for possible expansion. In taking water from a tap, it should always be taken from a tap on a main in constant use, not from a tap located on a dead end because the bacteria are ordinarily higher in samples from dead ends than in samples from taps on mains in constant use, and the coli is also sometimes higher in samples from dead ends. You want to take special precautions when taking samples from taps. The water should be allowed to run for at least ten minutes before the sample is taken in order to get a representative sample and to draw off water standing in the local laterals. In taking samples of water from wells, at least five to ten pails of water should be drawn or pumped from them before the sample is taken. All samples should be taken directly, if possible, without the use of pail, dipper, or other similar apparatus. In ponds, reservoirs, lakes, and so forth, the samples should be taken in a sufficient depth of water to avoid disturbing the sediment on the bottom or near the edges, or otherwise disturbing the conditions usually present. In taking water from a running stream, the samples should be taken holding the mouth of the bottle in the opposite direction from which the stream is flowing, i. e., against the current, so that any bacterial contamination from the hands, etc., will not get into the bottle. When taking water from a quiet stream, the bottle should be held in the right hand and plunged under the water, mouth downward, then carried out of the water, all in one continuous motion.

Shipment of samples of water for analysis should be considered also. We recently tried having them sent by Parcel Post with ice. In winter it worked all right, but in the summer within 24 hours the bacterial content increased considerably, due to growth during the interval of time between collection of the samples and their arrival at the Laboratory. Previously, we tried sending them by express but as a general occurrence it took 48 hours for them to reach the Laboratory. Zinc compartments were used for holding the ice in these shipping cases and the ice was in most instances entirely melted when they arrived at the Laboratory and the bacterial counts were increased to a large extent. Especially was this true during the summer months. This covers the collection of samples. I shall be very glad to answer any questions you may wish to ask on the subject.

Regarding the interpretation of results of analysis, we do not use any standards, either chemical or bacteriological, but try to judge each sample on its own merits. We try to take into consideration the conditions on the drainage area and

the possibility of pollution of the supply and whether or not the supply is treated, i. e., filtered, chlorinated, or otherwise purified. We apply the Treasury standard to waters used on interstate carriers.

MR. JACKSON: Mr. Connor, I think you have had more experience than any one else here on this matter and think a statement of it will be very valuable to us.

MR. CONNOR: I agree exactly with what Mr. Bransfield has said about taking samples. I think bacteriological samples in general, are particularly necessary. We take them in small vials containing two liters and they are taken exactly as he suggested. There is nothing that I can add to his recommendations in taking samples. In regard to the question of shipment of samples, we don't do this because all our supplies are near the Laboratory.

PROFESSOR RETTGER: As far as sampling goes, one of the difficulties encountered is the understanding on the part of the person sampling the water that the bottle must be clean and sterile. Several years ago in Virginia, there was quite an agitation over a report of the local board of health regarding some spring water which was being bottled and sent over the country. The total bacterial count was not very high but B. Coli was present in large numbers and the water was condemned. They could find no cause for the occurrence of B. Coli. One young man suggested there might be something wrong with the bottle containers. They tested them and found the source of trouble. The bottles were clean, but they had not been sterilized. Persons sending samples to the laboratory should not send their own bottles. If you write and tell them to sterilize them, they will think that pouring luke warm water into bottles will accomplish this. We have sent bottles as far as Maryland. It is very important that the bottles be clean and sterile. Most people will dip the sampling bottle half way beneath the surface of the water and let the surface as well as the deeper water fill the bottle. The bottles should be opened under the water at least six or eight inches below the surface to avoid the surface film. Precautions must be taken also with samples drawn from a well or faucet in a laboratory. If these precautions are not taken the interpretation may be faulty.

You cannot easily protect a water supply against animal contamination. You cannot prevent a bird or stray dog from polluting a lake or open reservoir, but experience has shown as a rule, that as a result of human contamination alone, is there any appreciable increase in the number of B. Coli. There are often, enough bacteria in the water to cause high total counts. Decaying vegetation offers food for bacteria,

so the interpreter must be careful and study the conditions that enter into the situation. Total count does not mean much by itself. The mere presence of B. Coli must not be taken as being very significant either. You may sample some of the purest water and find some B. Coli, perhaps from birds flying over the water, or from stray dogs, etc. But you will not find B. Coli in as little as 0.1 or 1.0 of water, or even 5.0 c. c. as the result of such slight contamination. It is always well for the laboratory to run several duplicates for each dilution, so as to get a good average Coli count. In reporting results, I usually state that according to this standard it is below, and according to that standard perhaps it is within. You must study the requirements of each case well and make a sanitary survey or have someone else do so before definite conclusions are arrived at.

MR. NEWLANDS: In connection with finding the Colon Bacillus in tap water samples, I can safely state that the presence of this organism, though it comes from a harmless source, shows how far into the distributing system dangerous contamination might be carried from the same point on the watershed and indicates that it is desirable to have a sanitary survey examining closely into the source which produces the contamination.

MR. HAM: I think as Mr. Newlands expressed it, and the most important thing of the whole interpretation, is that if you get Coli, though the cause may be perfectly harmless or we may be able to trace it to something that has no relation to any human disease, yet it does show that your system is in such condition that the protection of long period storage in the reservoir is inadequate and pathogenic bacteria may get through in the same manner as the harmless bacteria, and should dangerous contamination occur at some point, you will have trouble.

That is the condition on many of our supplies and we must watch or eliminate the dangerous places.

MR. ROBERTS: I wondered if contamination in our water supply was not due to carelessness in taking samples. There is no chance for human contamination and there are no cattle unless they come through open bars.

MR. JACKSON: We find it advisable to scan total bacteria count carefully. While not conclusive in itself, it is a good indicator of the presence of undesirable conditions on the watershed or that the filtration or sterilization apparatus are not working efficiently. Of course a sudden jump in total bacteria count might be caused by lack of care taken in sampling, growth during transportation from poor icing, or laboratory technique. We recently had an analysis from a sup-

ply which usually had quite low counts where it jumped from 150 to 3,300. Upon investigation, a menacing condition was discovered which we were able to correct before it did any harm.

MR. ROSSBERG: We have been speaking of B. Coli. Are there any other pathogenic organisms than those of which you spoke?

MR. JACKSON: It has been suggested that there are other organisms found in water, such as B. Welchi which may affect the human system, but I would prefer to have this question answered by the chemists and bacteriologists.

PROFESSOR RETTGER: As a comparative test, the total count is of much value. This should always be included in the examination, but the chief emphasis must be put on the Colon count. If in the winter there is a sudden jump from say 100 to 10,000 bacteria per c. c. without any apparant explanation, the total count should have some significance. If in the summer the count runs from 2,000 to 10,000, no special importance need be given to the figures, as it may be due to decomposing vegetable matter, increased temperature, etc. Bacteria as such are not necessarily harmful. If B. Coli is found in the water or food, it must be there as the result of animal or human contamination. This is not in itself, proof that the water is harmful, but it is evidence that the water has been subjected to pollution, however slight. We would naturally think that when water has been subjected to serious pollution by human beings that typhoid bacilli may find their way into the water from cases of typhoid fever in the same way and with the same ease as B. Coli. B. Coli is an intestinal bacterium and finding it in appreciable numbers in a water is the most direct and as yet reliable test for sewage or fecal contamination.

MR. MINOR: Do you find any significance in the appearance of bacteria? Whether bacteria which are larger and more vigorous would be more dangerous? We usually have a bacterial count, but no statement as to any decided difference observed in their appearance. In two or three samples of water you might find an entirely different bacterial count, but that does not mean that any one sample is worse than the other. In taking water out of dead ends the bacterial count is very high and after water has been chlorinated, you may have a regrowth, yet in each of these cases the high count results from changes in the water which are commonly experienced.

A bacterial count of 1,000 per c. c. from causes above noted, where the bacteria are small and anaemic, should have a different significance than a like count from a reservoir with the bacteria large and vigorous. In other words, much

may be learned from bacterial investigations other than by knowing the number per cubic centimeter.

PROFESSOR RETTGER: No significance is attached to the appearance of bacteria as they reveal themselves under the microscope. Aside from the identification of B. Coli, search for different kinds of bacteria in water is of little or no value.

MR. BARLOW: I would like to ask what the usual practice is as to frequency of taking samples from city supplies?

MR. BRANSFIELD: We can analyze samples from only a relatively small number of supplies each month because of lack of appropriation and space to do the work. At the present time we analyze monthly samples from certain supplies only, but are planning to get samples from every city or town in the State having a public water supply. Our facilities are very inadequate but so far as we can, we are trying to get samples monthly. I think that, generally, full sanitary analyses in one, two, or three months would suffice, but bacteriological samples should be taken oftener. If the water company has a laboratory of its own, I think the supply should be sampled daily. Untreated supplies should be sampled more frequently than those which are chlorinated.

In relation to organisms other than B. Coli, Houston in England has laid considerable stress on the presence of B. Welchii in drinking water. A while ago the Engineering News-Record, I believe, sent out a questionnaire asking the opinion of sanitary engineers and chemists all over the country of the effect of B. Welchii in drinking water and the consensus of opinion was that proof is lacking that B. Welchii as found in water causes intestinal trouble. B. Welchii is a spore-bearing organism and in American waterworks practice the test for this organism is considered to be without value. B. Coli tests are considered standard for determining the quality of water supplies in America. The Colon Bacillus, however, is not a pathogenic bacterium. The reason we look for it is because the typhoid bacillus is a very illusive organism to find. B. Coli by itself has no significance from a pathogenic standpoint, but because both come from intestinal discharges, we do test for the Colon Bacillus, which is very easy to isolate and draw conclusions as to the probability of the supply being polluted by sewage because of the Colon Bacillus being present. It is the number of B. Coli and not their mere presence in a water which is significant as to its sanitary quality. The result of a water examination simply tells us the quality of the sample submitted and it has been observed that two different analysts may take a sample of water from the same source and one may find it good and the other bad. But, like all other bacteriological findings, a positive result means

considerably more than a negative one and if we find B. Coli present in large numbers we assume that the water is getting contamination from sewage. Some chemists think that Coli also comes from grains and other materials not excrementitious. Chemical results to a certain extent give us the past history of a water, bacteriological results tell of the condition of the water only at the time the sample was collected.

MR. ROSSBERG: Recently, we had an experience with our water in New Britain. We had the water examined but found nothing in it but a little Bacillus Coli. The water, however, had violent emetic and patebic qualities. We have never found out what really was the cause.

MR. BARLOW: Do you think that you could tell us, as a matter of information, how many water companies in the State are furnishing samples to the Laboratory at the present time?

MR. JACKSON: Last quarter there were 64 out of 90-odd water supplies which had been analyzed. Twenty to 25 water companies send regular monthly samples now. Some had not had an examination for two years. We are gradually adding to the number regularly analyzed and as a result, 64 of the 90 have been analyzed at least once in the past year.

MR. BARLOW: Do you want the cities to submit monthly analyses?

MR. BRANSFIELD: We do, but it would swamp us now, later on we wish to have them taken once a month. We have no additional equipment, but the matter has been taken up with the Board of Control for funds to equip the Laboratory and the matter is still pending.

MR. JACKSON: The Commissioner has authorized Dr. Bartlett to get additional equipment. I think we probably could not take care of the whole 90 supplies but we can take care of the larger companies.

MR. SHARPE: I would like to ask if when water passing through the pump is chlorinated, the B. Coli could be discovered in the system in other places after it had been through chlorination.

MR. JACKSON: Yes.

MR. SHARPE: What is the remedy?

MR. JACKSON: There is no remedy as yet. A more definite answer will be given you by the next speaker. Mr. Pratt, will you open the discussion on Topic VIII? Note, please, query of Mr. Sharpe, "Is there any remedy for B. Coli appearing in a supply after it has been chlorinated"?

MR. PRATT: Adequate dosage would remedy this.

MR. JACKSON: Will you give the quantities?

MR. PRATT: No specific quantities can be given.

MR. DOMAN: When chlorinated water is pumped into a system containing an equalizing reservoir, pollution is sometimes found in the water, even though after leaving the pump it has been efficiently sterilized. The explanation may lie in the fact that dust, leaves, sticks, excreta of birds, etc., containing sewage organisms have entered the reservoir through the open top. If an impounding surface reservoir is used, pollution may come from the drainage area. It is rather difficult to see how pollution can enter a standpipe, even though uncovered, but when such standpipes have been cleaned, a surprizing amount of mud and other foreign material is usually found. The entrance of extraneous material into such secondary reservoirs is probably the explanation of the recovery of B. Coli in water efficiently sterilized with chlorine before entering the reservoir.

MR. MACKENZIE: Single check valves sometimes fail to work on service connections and if the individual or manufacturing company supplied has auxiliary pump or well supplies that might back up into the city main, every precaution should be taken against this possible source of contamination, although the supply may be chlorinated at its source and sterile water delivered to the town or city.

As one instance of this possible source of contamination, about two years ago all the consumers on a dead end street with a small main called up and stated that they had hot water from the city supply. On investigation, we found that the Gas Company had been pumping from their well into their pipe system and the single check valve on the city supply did not work. As soon as a new check valve was installed, the trouble stopped.

TOPIC VIII

Dosage and Operation of Chlorinating Machines

MR. JACKSON: Mr. Pratt of the Wallace and Tiernan Company, will open the discussion on Topic VIII.

MR. PRATT: Chlorination of the public water supplies has been one of the largest contributing factors in the lowering of typhoid fever death rates in this country. It has been in-

strumental in eliminating some very bad spots; places where they had absolutely dangerous supplies and since have been able to show a record entirely satisfactory as far as typhoid is concerned. I don't mean that it was all due to chlorination, but in a large part it was.

In relation to watershed sanitation, I agree with Dr. Black where he said that chlorination was not a reason for letting up on watershed vigliance. Chlorination should only be used as insurance and as a line of defence against typhoid. As I view it, the point is this, own all the watersheds you can, patrol them as carefully as you can, develop every line of defense you can and chlorinate. The extent to which chlorination is now practiced may be of interest. To-day over half the population of North America is drinking chlorinated water. Connecticut is doing its share and is well abreast of the times in availing itself of this protection. There are three distinct classes requiring chlorination,—where it is absolutely a necessity, where really dangerous supplies are being made safe by it every day in the year. The intermediate class where occasionally the water analysis or the sanitary survey is recognized as not really satisfactory. Also the class where there is no record to show danger, where the sanitary inspection may show that it is probably safe but chlorination is used purely from the standpoint of "safety first".

As to dosage, that depends entirely upon the character of the water. No hard fixed rules can be set. Spring water and water free from organic matter and color do not require as much as an algae infected or polluted surface water would. A standard adopted by a number of states in the control of dosage, is to test for the presence of a minute amount of free chlorine in the water after about five minutes contact, using either what is known as the starch-iodide test or the ortho-tolidin test. This control of dosage does not mean that there would necessarily be an excess of free chlorine in the city at the tap, but this slight excess is used for the control at the dosing point. In connection with the dosing of chlorine, it should be noted that there is sometimes the necessity for automatic control, this being due to the varying flow of water in a main, and the necessity of varying the dose of chlorine with the flow of water; these machines are thrown into two classes, automatic and manual control: they are also thrown into two other classes, known as solution feed and dry feed machines, according to whether the gas is dissolved in the water after metering and before application to the water, or whether it is fed directly to the water as a dry gas.

Chlorinating machines require reasonable intelligence to

operate. They cannot be set up on a water supply or on the watershed and then forgotten. They require an inspection at least once a day and when they are at a pumping station, one should observe them occasionally to be sure that they are functioning properly. That brings us to the point that Dr. Black spoke about, when he said chlorination should not be used as an excuse for letting up on the vigilance of watershed patrol. There is a possibility that the machine may be out of order, and if it is, something may happen as a result of the pollution on the shed. The main point in connection with the operation is that the operator should avail himself of the instructions which are furnished and carry them out as nearly as possible; read about the functioning of the different parts so that he may have a knowledge of the operation of the equipment.

MR. BRANSFIELD: I would like to ask Mr. Pratt what his theories are about the aftergrowths from chlorination.

MR. PRATT: I would say that I haven't had much experience with aftergrowths. They may be due to the possible contamination of the equalizing or storage reservoirs. I believe that this also may have been Mr. Sharpe's question.

PROFESSOR RETTGER: Do they vary the dose materially in winter and summer? Do you take into account the effect of the temperature in dosing?

MR. PRATT: There would be a variation.

MR. ROSSBERG: The action of the chlorine being chemical, what becomes of the product? Where there is a chemical reaction, there must also be a product and is that product entirely harmless?

MR. PRATT: Absolutely.

MR. DOMAN: Chlorine, itself, when applied to the water in the minute doses necessary for sterilization, will not ordinarily give a very pronounced taste, but when combined with organic matter it will produce compounds which are capable of imparting distinct taste to the water when present in almost infinitesimally small amounts.

MR. PRATT: You get an R(CC), the organic radical combining with the chlorine and sometimes the result of this reaction is evidently a taste. It is not free chlorine, itself. They had a rather interesting experience recently in New York, where they had a growth of Synura. This particular algae has an oily secretion in it and gave a very pronounced taste of cucumbers. Copper sulphate treatment made it even stronger. The water was also being chlorinated. This made the taste even worse. However, it was found that when the dose of chlorine was just about doubled the objectionable taste was eliminated. This experiment has been car-

ried out completely, and this is the most definite work that has been done in this line. There are other places where chlorine was used with other algae forms and it only made matters worse.

MR. MINOR: How about reducing the color?

MR. PRATT: There is a slight reduction but chlorination is not advocated for a color proposition. It hangs its hat on its sanitary possibilities. It is applied in such minute quantities that the action is not very pronounced.

MR. MINOR: What were the dosage rates in reducing the Synura in New York?

MR. PRATT: They were using about .35 parts per million and increased the dose to about .75 parts per million.

MR. MINOR: We find a great difference in our waters. Some take more and some take less. There has been some doubt expressed as to chlorinators affording complete protection and I would like you to cover this more fully. Dr. Black gave the impression that they were not a means of making suspicious waters safe. We don't know of anything to take their place. We have eight chlorinators working and they do remarkable work year in and year out. It is one of the very best methods of making the water safe from B. Coli.

MR. PRATT: I did not gather from Dr. Black's remark that he was referring to the fact that it was not a wise and safe precaution but rather that he did not want a waterworks man to put in a chlorinator and then let up on the vigilance. A chlorinator is an absolute necessity and as far as functioning is concerned and considering the job they are doing, they operate well; but I also agree with Dr. Black that it will, being a machine, have to be looked after so that it will not stop operating. Chlorinators on a watershed are a safety measure which permits the water companies to feel, at least, that they have done everything they can to protect their water sanitarily and in eliminating water-borne diseases.

MR. MINOR: You can clean up everything on a shed and still cannot prevent someone from going on there and causing an epidemic, but you can have a chlorinating machine and have a man to look after it and make a pretty safe supply.

MR. PRATT: If I had been delivering a paper and not just opening a discussion, I would have driven just those points home. I thoroughly agree and appreciate just what chances there are for contamination of watersheds; and from my experience with chlorine, I know of the dire experiences of places where they thought they were covering everything on the shed and the chance contamination did come.

MR. JACKSON: The point brought out by Mr. Minor, which he fully answered himself, is this—Given a machine proper-

ly installed and properly operated, you have a safeguard against contamination. That is so in Mr. Minor's case and other large water companies that can afford and are fortunate enough to have men that are skilled in the operation of it. However, there are water companies which are not very prosperous who when they install machines have not been able to give them the attention they should receive. Those machines instead of proving a protection against diseases and epidemics, have at times created a sense of false security in the public mind, creating the impression that because a machine had been installed they had nothing further to fear. Investigations by the State Department have shown cases where the machine was operated perhaps only once or twice a week, others where it was operated continuously, but the dose was entirely insufficient or the valves were sticking. I think that is the point the Commissioner had in mind when he said the chlorinating machine was not an absolute protection. It is, provided the conditions stated in Mr. Minor's discussion obtain, i. e., that it is properly installed and efficiently operated. Recently, the Wallace and Tiernan Company, realizing the importance of this, have established a district engineer in this State.

MR. HILL: There is one thing that has been bothering me since Mr. Bransfield stated that the State Board of Health was only able to analyze samples once a month from some of the larger companies. That question is why, when the larger companies of the State all make daily chemical and bacteriological analyses very carefully, the State should need to more than once a year. If not able to take care of all the supplies in the State, why not take the smaller ones that do not get daily attention. I believe that the larger water companies can be safely trusted to maintain a pure and potable water. The question is why, when they make daily analyses, it should be necessary for the State to make them monthly. Why can they not give attention to the smaller companies.

MR. JACKSON: The State Department should have some knowledge of the conditions of all water supplies over which it is supposed to have supervision. If we make no analyses and the water companies are making daily analyses but do not furnish us with copies of them, we have no check on their condition. At present, Mr. Bransfield makes every week, ten to fifteen analyses of the New Haven Water Company at their own special request. Am I not correct Mr. Gaillard?

MR. GAILLARD: That is right. We are very glad indeed to have that co-operation.

MR. JACKSON: That is the only one case, other companies have their own laboratories, but we ought to have a check analyses on them if not once a month, then every two or three months because of its value to the companies themselves. Whether it is warranted or not, the public seems to place more reliance on an analysis by the State than by the company itself, and for that reason we have very often been able to be or great assistance to the company in backing up their own chemist when the analyses have been in doubt. It is unfortunate that because of lack of facilities at the Laboratory we are not able to make more analyses, but we are not making any extra ones for large companies except New Haven.

MR. BARLOW: How can we get the State to make a larger appropriation so that you can make whatever analyses are necessary?

MR. JACKSON: You probably can very materially assist us by impressing upon them the necessity for the supplies of the State being protected by more frequent analyses. For instance, in your vicinity we had occasion to go down and make a survey and a very intensive investigation of some watersheds, and as a result of that, we or the United States Public Health Service made the mistake of shooting a little bit too quick and putting up a sign prohibiting the use of the water, and things began to get warm immediately. Our records, however, showed that the supply had been showing the presence of B. Coli for about twenty previous examinations, and that the attention of the officials had been called to the significance of this. There were spots upon the watershed where contamination was very likely to occur and when these facts were presented to the officials, there was not much doubt left but that chlorination was necessary on that supply. After a chlorinator was finally installed, the analyses showed good and the supply was certified to as meeting the Treasury Department standards. About four months ago there was a very severe outbreak of typhoid fever in that community which threatened to assume very grave proportions. Immediately in our minds, the water supply was eliminated. Our tests showed that the chlorinator had been working satisfactorily and we could safely say that it was not the water supply. We started investigating other sources of infection and finally traced it to a spring used for washing milk utensils. If that supply had not been chlorinated, there would have been a pretty severe condemnation of those officials who permitted such conditions to exist, and it would have been difficult to convince the people that it was not due to that water supply. That is one instance of the desirability of having chlorination.

MR. HILL: I got the impression from Mr. Bransfield that the State was analyzing supplies from the larger companies and as they take such excellent care of their own supplies, why does not the State give more attention to the smaller companies?

MR. JACKSON: I will read the analyses made during the month of February. The larger ones are not included.

Ansonia (two sources of supply)	Naugatuck
Canaan	New Britain
Cromwell	Norwalk
Danbury	Norwich
Lakeville	Seymour
Madison	Southington
Meriden	Stafford Springs
New London	Terryville
New Haven (five sources of supply)	Thomaston
	Willimantic

MR. HILL: New Haven is included.

MR. JACKSON: As I said before we have a special arrangement with that company.

MR. BARLOW: Are there any water companies maintaining their own Laboratories?

MR. JACKSON: New Haven, Hartford and Bridgeport.

MR. BARLOW: The point is could we not get the State to arrange with other laboratories to do the analyses for the cities?

MR. JACKSON: Yes I think that could be done.

TOPIC IX

Coppering of Reservoirs

MR. BRANSFIELD: I would like to say a word about the method of coppering reservoirs. The usual method of proceedure is to first determine the type of organisms present and the number of them and then to determine the amount of chemical to be used for treatment. This depends upon a number of factors which need not be gone into here. Ordinary commercial crystals of blue vitriol are used. The required quantity is placed in loose cloth bags and pulled around reservoirs at the back of a boat. It is preferable to

carry out treatment on a day when the wind is blowing so that the circulation of the water may more readily disperse the chemical in the water. Make trips across about 20 feet apart and then criss crossing and it is best to do this in the morning if the algae are near the surface but if deeper it is best to do it in the evening. The copper unites with the organisms and being heavier than the water is precipitated to the bottom. The copper that remains in the water is so small in amount that it is said not to have any deleterious effects on the consumers. The boat should not be rowed too slowly because you will get too great a concentration of the solution near the bags which might kill fish. Copper sulphate does kill fish. I have seen reservoirs which have been coppered where bagfulls of fish have been picked up after the treatment. It is said that fish are not poisoned but that the copper in killing the organisms uses up the oxygen and that the fish die because of deoxygenation of the water. Coppering of reservoirs has been a great success in some cases while in others it has been a failure. A certain amount of copper will remove one kind of organism but will not remove others and after one kind has been removed, another kind may grow and produce a worse odor than the one killed. Speaking of algae in reservoirs, one notices that one gets a stronger odor from a tap sample at times than from the reservoir itself. When passing through the mains under pressure, the algae are broken up and the volatile oil which is produced in the organism during its growth is set free and gives a very pronounced odor in the tap water rather than in the reservoir. I have seen a reservoir with algae growing in it which looked like a pond of milk. A man once said to me that he feared someone had dumped a barrel of soap in his reservoir. I examined the water and found that it was full of algae. Then he coppered the reservoir and the milky appearance disappeared because the treatment killed off the organisms and he had no more trouble.

MR. JACKSON: I gather that successful application of copper sulphate is largely dependent upon the time element, that there is a feasible indication of the growth or the beginning of a growth of the algae which may or may not be peculiar to each reservoir. For example, I have had men tell me that they could determine by the appearance of small specks in the water near the gate house within a day of the appearance of the algae, and if at the time of the appearance of these small specks they immediately got out their boat and traversed the reservoir, they were able to control it successfully, and if they let it go two or three days it would mean that it would take a great deal more copper sulphate

and time to successfully combat it. I have had no actual experience, but wonder if some of you men had not had something similar to it in your reservoirs.

MR. MINOR: The reservoirs should be inspected every day early and there will be no trouble.

MR. S. A. MACKENZIE: We find at Southington that if we watch the water closely and treat it as soon as indications of algae appear, that we can control it. If we should delay, the algae increases very fast and trouble starts.

MR. BRANSFIELD: If you use a microscope, very small specks can be seen.

MR. JACKSON: Is that your experience Mr. Minor?

MR. MINOR: We look at them in a bottle. You have to hold the sample to the light.

MR. S. A. MACKENZIE: You can also see the small white globules in the pond if the light is right. The caretaker at our reservoir is also instructed to test and observe a sample of water in a clean glass two or three times a week.

TOPIC X

Certification of Interstate Carriers

MR. JACKSON: Mr. Pincus will open the discussion on Topic X, The Certification of Water Supplies Used by Interstate Carriers and will also refer back to Topics I and II which are somewhat related to Topic X.

MR. PINCUS: I will try to explain to you first what the aims and procedure are of the U. S. Public Health Service in the certification of water supplies used by common carriers for drinking and culinary purposes. By Congressional Act of 1893, the U. S. Public Health Service had the general responsibility for the prevention of the spread of disease from state to state, but only in 1913 were specific quarantine regulations promulgated covering the use of water for drinking and culinary purposes on interstate carriers. The sole aim at first was to have the carriers use only a safe and pure water, but in recent years a second aim, by no means the less important one, has been to stimulate the protection of local water supplies so that disease will not be spread interstate by persons drinking water from these supplies either at the towns or on the trains.

The procedure for the certification of these water supplies is as follows:

Each carrier must obtain a certificate twice a year for every source of water supply from which water is taken and furnished for drinking and culinary purposes. The carrier must furnish semi-annually a complete list of the water supplies which are to be used. Copies of these lists are furnished the State Department of Health. In order not to have a duplicate and possibly conflicting organization routinely investigating water supplies over the whole country, and in order not to weaken state supervision over local water supplies, the actual determination of local conditions about the water supplies are accomplished through the State Departments of Health. These departments furnish the basic data upon which the U. S. Public Health Service issues the certificates to the carriers. There are more than 3,000 water supplies for which certification for use by interstate carriers is requested each year.

It was found soon after commencing this supervision over water supplies used by interstate carriers, that a minimum standard of quality for approved water supplies would be necessary. Therefore, in 1914, the Secretary of the Treasury promulgated the bacteriological standard recommended by the advisory committee of scientists and experts, and which is today known as the Treasury Department Standard. Under the provisions of this standard, the limits of permissable bacterial impurities are a total bacteria count of not over 100 per cubic centimeter plated on agar at 37°C for 24 hours, and the presence of Bacillus Coli in not more than one out of five ten cubic centimeter quantities as determined by planting on lactose broth and confirmed on Endo's medium or litmus lactose agar. This standard was soon extended voluntarily by waterworks and health officials to water supplies not used by interstate carriers, and is today the most widely used water supply standard in this country.

Besides basing the fitness for approval of a water supply on the bacteriological standard, the conditions surrounding the source and treatment of the supply are given an important even more controlling part in the determination of whether a favorable or unfavorable certificate will be issued. In this part, consideration is given to the initial pollution, actual and potential, of the water supply, the natural purification through storage, the treatment of the water by filtration and chlorination, the possibilities for subsequent and unforeseen pollution, the local control and operation of the waterworks and the state supervision provided. Much more can generally be determined as to the probable safety of a supply from the physical inspection and observation of the handling of the supply than from analytical data alone.

Mr. Jackson has suggested that I also make a few re-

marks on the subject of State supervision over water supplies. Let me give what I consider to be the proper aims for the supervision over water supplies by the state department of health. It should seek to insure for each community the benefits of a safe, wholesome water supply of adequate quantity and to this end, should see (1) that the water resources of a state are kept available for the proper water supply needs of the communities, and that judicious utilization is made of such resources when used for public water supplies. (2) that the method of development of water supplies and the treatment works and waterworks system are so planned as to give a safe water for domestic consumption, and (3) that the proper and reasonable protective measures including supervision over operation and analytical control are provided so as to minimize the possibilities of infection being spread by the water supply.

The State Department of Health should seek to secure these aims by the following methods:

(1) Requirement of the submission for approval of plans for use of the public water resources of the state for the disposal of sewage.

(2) Requirement of the submission for approval of the plans for any new and additional water supplies, or changes or extensions to existing systems.

(3) Authority to issue rules and regulations for the protection of watersheds from which domestic water supplies are derived, limiting and governing the permissable practices which may have influence on the sanitary quality and safety of the water supply.

(4) Supervision over the operation of waterworks systems.

Here in New England the principal emphasis has been placed on watershed sanitation for the protection of the public water supplies, and as several speakers have shown, especially Mr. Minor, watershed sanitation at the best cannot be wholly reliable. If you move every habitation off the drainage area, there remains still the chance of pollution from trespassers, hunters, automobile parties and often highways and railroads crossing the shed. One must realize that a lot more can be done than simply try to clean up the watershed, that storage, filtration or chlorination at times provides the more effective and economic defensive measure for additional protection. Then as to local supervision over water supplies, I think a great deal more can be done in this region than is now being done. By local supervision, I mean the regular complete sanitary investigation of the water supply made once in every one, two or three years, with routine

laboratory control and field inspections. This complete sanitary investigation of the water supply should be considered as necessary as the regular balancing of the financial records, a sort of sanitary audit, which would show whether the quality and safety of the supply was being maintained, lessened or improved as the years go on. Obviously, for insuring an important check, such investigations should be made by experts outside of the local water board or company—preferably by the State Department of Health. The routine supervision of the water supply should be local, for the best results. It is far better that the full time responsibility for the safety and purity of the supply should be with an official who is daily in contact with the supply rather than that one state organization should try to take care of and be responsible for the scores of supplies in the state. You cannot expect men here in Hartford to be watching and thinking of your supply all the time. Each community water supply, just as it has a bookkeeping or accounts division in its organization, should have a laboratory division or arrangements for routine analyses. This should certainly hold for water supplies taken from surface sources serving a population of 15,000 or more. A great many more towns in Connecticut ought to have their own laboratories making routine analyses. The State Health Department should provide a check over the results of the local laboratories by collecting and analyzing samples themselves. The State Department should receive a copy of the monthly record of the results of the local analyses, with data on the operation of any purification processes and changes in the water supply, to be in position to interpret the analytical results. In this way the State Department of Health would be able to give better service to the communities, would find difficulties and dangers before they became actually acute and thus prevent a good deal of harm.

I sometimes wonder whether or not here in the East, where we have so very little typhoid fever, if we are beginning to get lax and complacent. I have heard, as a reply to recommendations for improvements, the local waterworks superintendent or councilman say that there is no need for that, we have not had any typhoid outbreaks for ten or twenty or thirty years. Let me recall to you what happened in a town in Ohio in the fall of 1920. The city of Salem, O., with a population of 10,000 had not made a thorough investigation of their water supply system for many years. They were having an occasional sample analyzed, once in four or five months or so. No typhoid outbreaks nor any pollution of the water supply had been recorded for about twenty years. Then suddenly in October, 1920, gastro-enteritis sweeps the

town affecting approximately 80% of the population, and soon followed by 850 cases of typhoid fever with over 30 deaths. Upon investigation of the water system, it was found that a gravity, tile section of the water distribution system had permitted infection of the supply when a nearby sewer became choked. Routine analyses of samples if previously carried out, would undoubtedly have shown similar infection, though possibly non-specific, in times of heavy rains, and certainly a thorough investigation of the waterworks system would have shown the danger that existed. In the same way here in Connecticut, there are many towns, some knowingly and some unknowingly, that have cross connections of their public supplies with other polluted supplies, which will if uncontrolled in the passing of time spell sure danger and disaster.

There is one way in which you can all help to improve the protection and quality of the water supplies of this state, that is to support the State Department of Health in its efforts to help protect your supplies. Consider carefully the advice and recommendations which are submitted to you, and do your best to put them into practice. Then too, help acquaint the public with what the State Department of Health is doing and trying to do in assisting you in giving your community a safe and wholesome water supply. Help the State Department to secure the authority, the funds and the men that are needed to give this state the best supervision over its public water supplies. Some of you here, when you get back home will say we ought to be getting more help and better service from the State Department, little realizing how handicapped Mr. Jackson and the Department are in laboratory facilities and field inspection personnel.

MR. BARLOW: Has there been any instance in New England where the government has refused to certify the water supply?

MR. JACKSON: We have refused to certify to only four supplies in this State. Two have been since abandoned. They were small insignificant supplies. One has been remedied and the fourth apparently became rehabilitated so that the analyses are now so that we can certify to it.

PROFESSOR RETTGER: It seems to me that the Treasury Department standard is somewhat rigid. I would like to know what percentage of water supplies have passed that test.

MR. PINCUS: One way to estimate the number of supplies meeting the United States Treasury Department bacteriological standard is to refer to the total number of supplies favorably certified for use on interstate carriers, which was 73% of all those for which certificates were issued during

the fiscal year 1921. A great number of states used this standard for judging the bacteriological results of their public water supplies. However, keep in mind that supplies for which the analyses meet this standard cannot be considered safe until the field conditions surrounding the supply are entirely satisfactory.

MR. MINOR: I should like to ask you to explain the care which is taken in looking out for the sanitary aspect of ice water on trains. A man goes along and dumps ice into the can taken from any old river and it is carried to the station in an open pail where the dust gets into it and we drink it and what is the result? Do we drink big bacteria or little ones?

MR. PINCUS: The Interstate Quarantine Regulations provide that water cooled for drinking purposes shall be cooled in such a manner that ice cannot come into contact with such water. This provision has been in the regulations for several years, but obviously, it could not be strictly or rigorously enforced all at once. The railroads were given until July 1, 1922, to fully comply with this requirement, but a little over a year ago, the railroads, while in rather difficult financial and operating conditions, pleaded strongly for an extension of the time limit. Accordingly, this time limit has now been set for July 1, 1924, by which time all equipment must meet this requirement. However, in the meantime, all new equipment and all cars for which major repairs are necessary are to be equipped with coolers with no contact between the ice and the water. A number of railroads have already complied with this provision practically 100%, while some railroads in the west have gone so far as not to place cracked ice in the glasses on the table in the dining cars, preferring to use thermos bottles for keeping the water cool. There is after all, very little evidence of connection between ice and the spread of disease, so we need not be alarmed of having general outbreaks of disease during the next year or two due to ice in railroad coolers. But continued efforts will be made to have the separation of the ice and water completed, as the placing of the ice together with the water is at least, highly objectionable and a possible cause of the spread of disease.

MR. MINOR: I think it is interesting to note that while the Government continues to increase the sanitary requirements, we talk about improving our supplies and improving the safety of them. Yet no attention is paid to the cost of this improved supply and the necessity of getting a return adequate to furnish not only sufficient water but water of a purity satisfactory to all supervising agencies. What is needed is

attention to water rates so that everything may be done to give the best and safest supply possible.

(Close of meeting)

MR. JACKSON: The meeting is now open for a general review.

MR. MCKERNAN: I think it would be a very good thing if waterworks men of the State were to get together for a conference such as this one, say twice a year, subject to the call of the Chairman, and I will make a motion to that effect.

MR. JACKSON: You have heard the motion of Mr. McKernan.

MR. BARLOW: I would like to second that motion and amend it, extending a vote of thanks to the chairman for calling this meeting.

(Vote on amendment was called for by Barlow and it was carried unanimously.)

MR. JACKSON: The original motion as amended was that the conference be held twice a year. Those in favor say aye.

(Motion carried.)

MR. JACKSON: The Chair would like a little more information in regard to what time of the year you think would be desirable.

MR. HAM: I think a little later would be a very good time. You can't have it much earlier as most of the water companies are busy finishing Public Utility Reports.

MR. JACKSON: Perhaps around April or October at about six months intervals.

The Chair on behalf of the State Department of Health, wishes to express its appreciation and extend its thanks to you gentlemen for coming to this conference in such good numbers as you have and express its pleasure in the interest which you displayed and the close attention which you have given to the discussion. I think that we have all learned something today and I know that for myself, personally, it has been a great pleasure and I am sure it will be of benefit to me to be able to visualize the men, with whom I necessarily have had a great deal of correspondence, when any matters come up in the future for discussion.

I cannot promise you that the results of the proceedings of the conference will be in such shape as to be distributed to you. The facilities of the Department are exceeded as it is and I do not think we could take on any extra work.

MR. BARLOW: How much would it cost the companies represented here to pay for their share of it.

MR. JACKSON: Not much, there would be the cost of the paper and the typing and mimeographing.

MR. BARLOW: I move that the minutes of the conference be typed and a copy furnished each company represented here, the cost to be shared equally amongst them.

MR. JACKSON: It has been moved and seconded that the minutes of this conference be put in form for distribution to the members and that the cost of doing this work be distributed pro rata amongst the companies represented at the conference. Will you discuss the motion? Those in favor will say Aye, those opposed, No.

It is a vote and so ordered.

If there is no further business or questions, the Chair will entertain a motion to adjourn to meet again within six months.

(Meeting adjourned 4.20 p. m.)