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The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC HEALTH

FOR THE

YEAR ENDED NOVEMBER 30, 1921



BOSTON

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The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC HEALTH,
BOSTON, Jan. 18, 1922.

To the General Court of Massachusetts.

In accordance with the provisions of section 32 of chapter 30 of the General Laws I have the honor to submit herewith the annual report of the Department of Public Health for the year ended Nov. 30, 1921.

Respectfully,

EUGENE R. KELLEY, M.D.,
Commissioner of Public Health.

SEVENTH ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC HEALTH OF MASSACHUSETTS.

For the fiscal year ending Nov. 30, 1921, the Department of Public Health was constituted as follows: —

Commissioner of Public Health EUGENE R. KELLEY, M.D.

PUBLIC HEALTH COUNCIL.

EUGENE R. KELLEY, M.D., *Chairman.*

J. E. LAMOUREUX, M.D., 1924.

RICHARD P. STRONG, M.D., 1923.²

ROGER I. LEE, M.D., 1924.

WARREN C. JEWETT, 1922.

GEORGE C. WHIPPLE, S.B., 1923.

SYLVESTER E. RYAN, 1922.

WILLIAM T. SEDGWICK, Ph.D.¹

During the year 14 formal meetings of the Council were held, as well as many meetings of the standing and special committees of the Department. The standing committees for the year were as follows: —

SANITARY ENGINEERING (INCLUDING HOUSING AND RURAL HYGIENE).

Professor Whipple, Dr. Kelley and Mr. Jewett.

PREVENTIVE MEDICINE AND HYGIENE.

Drs. Lamoureux, Lee, Ryan and Strong.

FOOD AND DRUGS.

Drs. Lamoureux and Ryan and Mr. Jewett.

LABORATORY WORK AND RESEARCH.

Drs. Strong and Kelley and Professor Whipple.

PUBLICATIONS.

Drs. Ryan and Lamoureux and Professor Whipple.

Following the sad death of Prof. William T. Sedgwick, on Jan. 25, 1921, the following memorial was written by Dr. Lamoureux and spread upon the records of the Public Health Council: —

¹ Died Jan. 25, 1921.

² Appointed Feb. 23, 1921.

To the Memory
of
William T. Sedgwick

Pioneer in modern public health science.

Teacher: nationally loved.

Author: internationally appreciated.

Councillor: universally sought for,
this page is dedicated by the Public
Health Council, of which he was
an original member, in sweet
remembrance of his charming
personality, as a man; his wisdom,
as an adviser; his boundless activity
and good will as a co-worker.

The Council also records with regret the death, on July 13, 1921, of Dr. William J. Gallivan, Director of the Division of Tuberculosis (sanatoria), and formerly a member of the Public Health Council. Dr. Lamoureux wrote the following memorial on Dr. Gallivan's death, which has been spread upon the records of the Public Health Council.

In Memoriam

When Life

has endowed one with:

A quick mind to grasp the special science of his profession,
A clear eye to detect the approved recent advancement,
A gifted tongue that carries conviction,
A profound knowledge of human nature,
A magnetic personality,
Enthusiasm, born of sincerity,
Tact, coupled with optimism,
Firmness, associated with justice,

those around him find such an existence so indispensable as to believe it perpetual.

William J. Gallivan

was the apostle of prevention, the prism through which the spectrum of sanitary sciences would reach the masses in the form of principles and practices of healthful living.

When Death

snatches, in a moment, such a powerful force, the shock, in the Department of Public Health, is all the more severe; the vacuum, the more bewildering; the regret, the more lasting. That others may not forget, the Public Health Council dedicates this page of its records to the loving memory of a loyal, genial and devoted companion.

At a meeting of the Public Health Council held on Jan. 10, 1922, it was voted that the report of the Department's activities for the fiscal year 1921 as submitted by the Commissioner be approved and adopted as the report of the Department of Public Health for the fiscal year 1921.

SEVENTH ANNUAL REPORT OF THE COMMISSIONER OF PUBLIC HEALTH.

To the Public Health Council.

GENTLEMEN: — Since my last annual report this Department has sustained serious losses through death.

Prof. William T. Sedgwick, a member of the Public Health Council from the organization of the present Department in 1914, died on Jan. 25, 1921.

His work and influence have been widely commemorated and reviewed both by the Department and elsewhere. The deep and continuing sense of loss of his wise counsel and of the stimulus of his enthusiasm for the progress of health endeavor everywhere is shared by us all.

Dr. William J. Gallivan, Director of the Division of Tuberculosis, died on July 13, 1921.

Like Professor Sedgwick, Dr. Gallivan had been a member of the Public Health Council from its organization in 1914, only resigning from it to accept appointment as Director of the sanatoria and other tuberculosis activities of the Department after the reorganization of the State government in 1919. Dr. Gallivan brought to his new duties wide experience, vast enthusiasm, sound judgment and a personality which positively radiated human sympathy and fellowship. These qualities, added to his years of interest in the anti-tuberculosis cause, made him an ideal administrator for the intricate and far-reaching tuberculosis program of this Commonwealth. He had really just reached the point where he himself felt that he had all the details of his new field thoroughly in hand when his sudden and untimely death deprived us of a beloved colleague and the Commonwealth of one of its most useful and devoted public servants.

It is a sad and peculiar coincidence to be obliged to report in a single year a third death of a former officer of this Department, — Mr. James C. Coffey, for many years chairman of the Board of Examiners of Plumbers of this Department and the executive officer of the Worcester Board of Health. Because of failing health Mr. Coffey resigned from his position on the Board of Examiners of Plumbers early in the year. Just as this report is being drafted we have to record his sud-

den death on December 2. Mr. Coffey had always been most faithful in attendance upon the meetings of his Board and otherwise concerned in the proper carrying out of the duties of his position. He also had for years been an honored unofficial adviser of the Commissioner and District Health Officers of his district on all matters on health administration touching upon the relations of this Department with city and town boards of health.

It is perhaps suggestive of the magnitude of cardiac disease as a health problem to-day that all three of these men should have died in the same manner, suddenly and while "carrying on" actively in the battle of life.

Dr. Sumner H. Remick, superintendent of the Sassequin Sanatorium of New Bedford, was appointed Director of the Division of Tuberculosis, to fill the vacancy caused by the death of Dr. Gallivan, and Mr. Charles J. O'Brien of Chicopee, chairman of the Board of Examiners of Plumbers, to fill the vacancy due to the resignation of Mr. Coffey.

As now constituted the executive organization of the Department is as follows:—

DIVISION OF —	DIRECTOR.
Administration.	
Sanitary Engineering	X. H. Goodnough, C.E.
Water and Sewage Laboratories	H. W. Clark.
Communicable Diseases	Bernard W. Carey, M.D.
Food and Drugs	Hermann C. Lythgoe, S.B.
Biologic Laboratories	G. Benjamin White, Ph.D.
Hygiene	Merrill E. Champion, M.D.
Tuberculosis (sanatoria)	Sumner H. Remick, M.D.

All the divisions are now in charge of expert full-time officials, and I feel that I can conscientiously report to you that they are without exception doing most efficient work at the lowest possible cost in their individual spheres of activity. Furthermore, with the able assistance of our District Health Officers and sanatoria superintendents, these gentlemen have this year achieved a degree of teamwork and spirit of co-operation among their various staffs and the multitude of official and non-official health agencies throughout the State which I feel has perhaps never before been equalled and from which I confidently anticipate great returns in public benefit in the immediate future.

Prior to discussing briefly the individual work of these divisions of the Department, I wish to call to your attention certain occurrences, problems and features of the past year's work or possible future developments suggested by our year's experience which I consider worthy of special notice.

RETAINING OF EFFICIENT PERSONNEL.

It is a distinct pleasure to be able to report that the problem of retaining tried and efficient personnel in the face of the competition of the superior rates of compensation offered by other organizations for skilled health workers in all lines has lightened materially during the past year.

While our rates of compensation in certain lines, particularly nursing and bacteriology, are still markedly below prevalent rates paid for persons of equivalent training and experience in other places, the marked depression in engineering and chemical lines in industry and the general condition of economic uncertainty have enabled us to retain the services of experienced personnel to a very much greater degree than for any year since the beginning of the war, with a very advantageous reaction upon the work of the Department.

DISEASE PREVALENCE.

So far as our records go, and they are very complete from the date of the establishment of the State Board of Health fifty-two years ago, I believe we are justified in making the unqualified assertion that the year 1921 has no parallel in the history of the Commonwealth in its freedom from epidemics.

Neither poliomyelitis nor influenza recurred in epidemic form, although there was grave apprehension concerning both at the beginning of the year, and a new record has been established of freedom from serious outbreaks of our more commonly prevalent diseases.

One typhoid epidemic, due to infection of a single *unpasteurized* milk supply, practically covers the entire story of serious epidemics for the year. There were in all 114 cases in this outbreak. A small institutional outbreak of septic sore throat and a small group of small-pox cases might be added from the standpoint of completeness, although the number of individuals involved in each were relatively insignificant.

One has to go back over a series of previous reports to grasp the full significance of this remarkable immunity from serious epidemics. It is, however, necessary to make a careful distinction between epidemic conditions and those of unusual average prevalence. Thus, while diphtheria has been checked sufficiently so that no epidemic has occurred at any given time or locality during the year, yet the average diffused prevalence of this disease has been higher than usual. This is a matter of grave concern, although the number of fatalities may now be estimated with high degree of certainty not to exceed those of recent previous years.

The degree with which our sporadic typhoid is now averted and serious epidemics prevented or controlled at their inception is beautifully illustrated by the fact that the single epidemic of this disease already referred to, which would have contributed so small a relative percentage to the total deaths to have been scarcely noticeable a few years back, was a large factor this year in preventing the repetition of our phenomenal low total of typhoid fatalities of a year ago.

A few words of special emphasis may not be amiss in reference to the experience of this Commonwealth with three communicable diseases during the past year.

The first of these is poliomyelitis.

In 1920 the Commonwealth experienced a much more severe visitation from this justly dreaded malady than has ever been popularly appreciated, amounting to one-third of the fatalities of the great epidemic of 1916. Many careful students of this disease felt that this recrudescence after three years of relative freedom from it would prove to be merely the forerunner of a much more serious outbreak during the present year. Fortunately this prophecy proved erroneous. There was a considerable increase in the number of cases for July of this year over July, 1920, and for a few weeks it looked extremely probable that the situation would become grave. However, instead of increasing in frequency as the summer progressed, as has been the case in all previous years, before the end of August it was very clear that the disease was on the wane, and the three autumn months simply record a fairly rapid return to usual endemic prevalence. Why the disease should so suddenly and spontaneously disappear as an epidemic problem after all the preliminary indications of a very serious outbreak we have at present no adequate knowledge or even satisfactory hypothesis.

The second of our communicable diseases whose behavior is worthy of special note during this year is diphtheria.

Diphtheria and sanitary science have fought to a draw for several years past.

Following the sensational reduction in diphtheria deaths as a result of the general utilization of diphtheria antitoxin in the late nineties, and the effective demonstration of the fact that antitoxin could be depended on to save practically 100 per cent of cases *if administered in the early stages* of the attack, it was not unnaturally assumed by the medical profession, sanitarians and general public alike that this method could be more and more effectively extended with each year's passing until deaths would become negligible. Time and practical experience showed that this roseate forecast was destined never to be fulfilled.

A careful painstaking study of 1,000 consecutive diphtheria deaths conducted by the staff of this Department a few years ago is probably the clearest proof on record of the futility of ever expecting that all cases would be reached in the *early stage*. For a time it seemed almost as if we were beaten and a permanent death toll from this most controllable of all epidemic diseases of from 600 to 800 young children yearly in this Commonwealth must be anticipated indefinitely, this condition being due to the impossibility of parents and, to a lesser degree, of physicians discriminating sufficiently early between the numerous milder inflammatory involvements of the throat and the malignant diphtheritic inflammation.

Due to the researches of Dr. Schick of Vienna, a few years ago an extremely simple, painless and harmless procedure was discovered by which in the hands of an experienced observer the susceptibility of any individual to diphtheria can be determined with great precision. Along with this came the introduction of a safe and simple method for the active artificial immunization against diphtheria of those found to be susceptible. This immunity is certainly of several years' duration and in many, perhaps most, instances is probably retained for life.

This year under the stimulation of the staff of this Department many cities and towns are putting into effect active campaigns for popularizing this method of diphtheria prevention. The task of determining the susceptibility of each child whose parents can be persuaded to see the advantage of this procedure and, if found susceptible, of carrying out immunization, is a huge undertaking. Nevertheless with the certainty that its universal application would mean the practical elimination of diphtheria as a cause of sickness and death, local health officials and the medical and nursing professions generally are all over the State urging the adoption of the plan. I confidently predict that within the next five years we will witness a spectacular reduction in our diphtheria problems as the result of increasing utilization of the Schick test and toxin-antitoxin immunization of susceptibles.

The third disease I wish to present for your special consideration is tuberculosis.

Tuberculosis of the lungs, or consumption, is at present exhibiting an unprecedented and highly gratifying decline in fatality. In the annual report for last year this phenomenon was discussed, therefore I will not go into the matter extensively again. It is important, however, to call to your attention that whereas a year ago I estimated that our 1920 death rate per 100,000 of population would not exceed 100, that as a matter of fact when the figures for the year were available it fell substantially below that figure, the rate being 96.7.

The really amazing feature of this year has been the steady progression of this decline at substantially the same curve of recession as last year. It now seems very safe to estimate that the total number of deaths from this cause for the entire State in 1921 will not exceed 3,300, which is at the rate of approximately 85 deaths per 100,000, a reduction of 38 per cent since 1918. The reasons for this remarkable decline are complex and not all due to direct anti-tuberculosis activity. We must expect years when the rate will be stationary, other years when it will increase, but, on the whole, the conclusion seems most justifiable that the battle against consumption is entering upon a phase of great and permanent gains.

VENEREAL DISEASES.

The experience of the past year in venereal disease work has been peculiarly trying but at the same time most illuminating. It has been trying because the cessation of the Federal funds for the furtherance of venereal disease work in the several States necessitated the cutting down of our program and the reducing of essential personnel in a field where there existed every reason from a public health standpoint to desire expansion of program and additions to personnel. It has also been illuminating because it has demonstrated how deep and genuine the interest is in this campaign, and that our method of attack upon the problem was along sound lines.

The attendance at clinics is increasing in a sound, substantial fashion at nearly all the newer clinic centers; the demand for arsphenamine for syphilitic treatment has increased steadily, although still only a fraction of the total possible utilization; the medical staffs of the various clinics have continued to manifest the same enthusiastic interest in their work as formerly; and there have begun to come to the notice of health departments opinions from specialists, general practitioners, institutional workers and others to the effect that the venereal disease campaign of education and early treatment has already begun to take effect; that infections are apparently less frequent and infected persons are seeking proper advice and treatment much earlier and following treatment more thoroughly. All of these reports are encouraging, but should not blind us for a moment to the fact that the problem is still a tremendous one and that we have no more than made a fair beginning.

In offset to these optimistic reports, the workers of the Massachusetts Charitable Eye and Ear Infirmary report that children with eye manifestations of congenital syphilis are coming to the notice of their clinic in larger numbers than ever before.

The temptation is strong at this point to cite and discuss briefly

the statistics on venereal disease work, but to do so would lead to too great amplification of this report.

Suffice to say that the crying need above all others in the furtherance of the venereal disease campaign is for more follow-up workers to discover fresh foci of infection from the evidence readily available in the routine reports of clinics and physicians, to get these persons under treatment for their own benefit and the protection of the public health, and to see that those individuals once seeking treatment persist until permanent benefit is assured. This last is the most pressing and most difficult of all the many problems involved in the venereal disease and sex hygiene campaign.

INSTITUTIONS.

Here the most outstanding feature of the year has been the permanent closure of the leprosarium on Penikese Island, following the transference of the inmates to the new Federal leprosarium at Carville, La. The inmates will receive the definite advantages of residence in a warmer climate, of being members of a much larger leprous community, with all the advantages of greater social opportunities that this means, and of being placed where they can receive the advantage of every advance in the treatment of the disease to an even greater extent than could possibly be done for them with the relatively small personnel at Penikese. By legislative resolve the Commissioner of Public Health and the State Supervisor of Administration were designated a special board for disposing of the property. The island has been advertised for sale and bids received for its purchase, but all such bids up to the present have been so far below the actual investment by the Commonwealth in the institution that it did not seem wise to accept; therefore, for the present, the island is left in the charge of a caretaker, awaiting some permanent disposal by sale or otherwise that will seem to give some appreciable return either financially or in usefulness to the Commonwealth.

The work of the four tuberculosis sanatoria under the direction of this Department has gone along usual lines during the past year. One gratifying feature has been the noticeable increase in efficiency of these institutions as the year progressed, due to the greater willingness of institutional employees to remain and do faithful work. This result has been of course due principally to the industrial depression, which in turn resulted in a cessation of the constant drawing away from institutional positions of employees through the higher wage standard prevailing in industry. In a similar manner there is no doubt that the filling of our institutions and re-establishment of

waiting lists for both sexes (except for males in one sanatorium), following the experience of empty beds in all of them for the past few years, is due to financial depression plus more energetic community tuberculosis work than ever before. This has occurred in spite of substantial addition to total tuberculosis bed capacity in the State as a whole by the completion and opening of new county and municipal institutions or additions to existing institutions.

At first glance this condition might be presumed to indicate an increase in prevalence of consumption. Practically all evidence points to the contrary. Aside from the impressive evidence of the lowered death rate, all the testimony of case workers on tuberculosis, tuberculosis specialists and others indicates a decrease in morbidity rather than the contrary. There have always been many more persons suffering from pulmonary tuberculosis who would be personally benefited and whose families would be greatly protected by their residence in a sanatorium or tuberculosis hospital than there are patients in sanatoria. But in time of great industrial activity with workers at a premium, hundreds of tuberculous persons will refuse to give up work, whereas in times of financial depression it is relatively easy to persuade such sufferers to take advantage of sanatorium treatment.

Too high praise cannot be given to the spirit of enthusiasm with which the superintendents and the members of their staff have suggested methods of increasing the medical influence of these institutions. The consultation service, which was referred to in my last report, has worked out on the whole exceedingly well. It has meant long hours, exposure and hard work for our institutional staffs without any additional pecuniary reward. But it has also meant that in a steadily increasing number of instances they have been able to diagnose and to personally assist in the prompt admission to a sanatorium of individuals whose lung process is still relatively early and hence with a much greater chance for good recovery, and in the satisfaction of this service for fellow humanity they have had their highest reward.

Reference has already been made to the sudden death during this past year of the well-beloved Director of our Tuberculosis Division, Dr. William J. Gallivan. Dr. Sumner H. Remick, for the past eight years superintendent of the Sassequin Sanatorium of New Bedford, succeeded Dr. Gallivan, commencing his duties with the Department on Dec. 1, 1921. He is taking up the arduous duties of his new position with tact and enthusiasm that speak well for the future progress of this great field of the Department's activities.

PLAGUE PROBLEMS.

This subject was dealt with in some detail in the previous annual report and reasons given why it was deemed advisable to recommend special action by the Legislature to carry out, in co-operation with the several municipalities, a rodent survey of the various ports of the State. The Legislature appropriated a sum of money at the special session of 1920 to enable a preliminary survey and report based thereon to be submitted at the regular session of the 1921 Legislature.

The matter was presented carefully, and this Department, backed strongly by the Boston Chamber of Commerce and other civic organizations, and city departments of health, recommended that an additional sum of money be appropriated for this purpose, pointing out that such work was purely preventive and not based upon any existing evidence that the rats of our ports were already infected. This project was reported favorably by the ways and means committee of the House and passed that body, but on being referred to the Senate was rejected apparently on the grounds that the danger was no more imminent than for several previous years, and that in the last analysis it was a responsibility resting primarily upon the Federal and municipal governments. In view of this attitude there do not seem to be any new grounds for urging passage of this appropriation beyond those already presented to the same Legislature in its last session, and therefore no legislative recommendation for this coming year will be made.

OIL-REFINING INDUSTRY PROBLEMS.

During the past year a new public health and nuisance problem of the first magnitude has come to the front in this State. This situation has arisen from the putting into operation of three new large oil-refining plants.

These refineries use Mexican crude oil exclusively, which is brought directly to the refineries in tank vessels. These Mexican oils contain considerable quantities of sulphur and sulphur compounds, and the nuisance features have arisen from odors which are due principally to the escape into the atmosphere of sulphur in various forms. There have also been shore and beach nuisances due to the accidental escape of crude oil or partially refined oil products directly into the water, or reaching it by leakage from underground oil conduits. In numerous instances, however, it has been clearly demonstrated that oil on the water of harbors or deposited on beaches has come in large part not from the oil works but from deliberate or accidental discharge of such oil by oil-carrying or oil-burning vessels. At all events the situation

created has been one of peculiar difficulty. On the one hand is the undeniable benefit to all New England from the establishment of these plants. This is due to the fact that these companies could for the first time lay down gasoline, fuel oil, lubricating oil and other oil products and by-products in the New England market at prices which allowed this section to compete upon more equal terms with those sections nearer to this country's sources of crude oil. Furthermore, the availability of fuel oil for purposes of heat and power alike means much to a region which has passed through the recurring coal famine crises of the past few years.

To offset these great advantages, however, it is intolerable and not to be thought of that any industry, however important and desirable, should operate in such a fashion as to seriously jeopardize the health, comfort or even æsthetic enjoyment of hundreds of our citizens. There seemed to be relatively little expert knowledge or previous experience to guide either sanitarians or oil-refining managements as to the chemical nature of these obnoxious odors, the points in the various refining processes which are most responsible for the dissemination of these odors, the best means of eliminating or overcoming these odors, and the mechanical engineering devices necessary to accomplish this result. Added to this is the fact that in the case of the plant concerning which there has been the most serious complaint, complete changes in the financial and operating organizations took place during the year, all of which has made progress difficult.

The Department, upon a petition properly presented in accordance with statute by citizens affected, held public hearings, made careful investigations through its own engineering staff, coupled with personal inspections by the members of the Council of the Department, and made a finding sustaining the allegations of the petitioners. It was found that the plant as then conducted constituted an offensive trade so operated as to produce a serious public nuisance, and the Department therefore ordered the closing of the plant. The new management referred to petitioned for a suspension of this order pending the installation and a test of new devices, changes in methods of operation and structural repairs and improvements which they believed would overcome the obnoxious features of their operations. This was granted, but owing to the apparent grave lack of definite engineering knowledge as to how to eliminate and overcome those odors, and uncertainty as to the points in the processes that were chiefly responsible for the obnoxious conditions complained of, very slow and unsatisfactory progress was made.

Public sentiment in the communities adjacent to the works, which in the beginning was very much in favor of retaining the industry and

inclined to put up with disagreeable odors in the hope of their early elimination, became definitely out of patience as the summer progressed, and new hearings were demanded and held in which the majority of the protestants seemed to insist upon complete and immediate closure of the plant. While sympathizing deeply with the citizens affected thereby it did not appear to the Department that the situation was so hopeless of correction as to justify ordering the complete, and probably permanent, shut down of a plant representing the investment of several millions of dollars and the beginning of an industry of incalculable benefit to all New England, the source of livelihood for several hundreds in a time of financial depression, and by that time in the hands of a management who gave evidence of a sincere intent to co-operate by putting into effect every improvement from which it seemed probable that any benefit might be obtained.

Nevertheless, as the season wore on into autumn and complaints of the most vigorous character relative to odors emanating from the plant persisted, this Department became convinced that more radical changes were necessary, and in this view the management of the plant finally concurred.

By this time it was quite generally agreed by all concerned that defects in the original construction of a very essential part of the equipment known as the "coking stills" accounted for escape of some of the most serious odors, and accordingly the Department on Oct. 11, 1921, ordered this part of the works to be shut down until reconstructed and completely equipped with a system for carrying all odors generated in this process into furnaces maintained at high enough temperature to insure the complete breaking up of these odors. This work has just been completed, and the company has petitioned for revocation of the order of closure. Revocation did not seem warranted to the Department until a further trial of these devices over a sufficient period of time with the plant in full operation demonstrates to how great a degree this serious problem has been solved.

All the staff and members of this Department concerned with these problems are convinced that these questions are still far from being completely and satisfactorily solved even though great improvement is demonstrated in this plant. Although the operations of only one of the three oil-refining plants in the State have been brought to the official cognizance of this Department by formal petition, complaints have been numerous concerning the other two plants; and in the case of one other at least, preliminary steps have been taken by aggrieved citizens living adjacent thereto to bring the question of possible nuisance through the operation of the plant before the Department for adjudication and action. Numerous complaints have come to our

attention from citizens of this Commonwealth relative to the noxious odors emanating from a refinery of similar character operating in another State closely adjacent to the State line. I have already with your advice and approval incorporated in the estimates of the Division of Sanitary Engineering for the ensuing year requests for additional funds to enable this Department to carry on further studies and investigations of this subject.

Furthermore analyses of the "flue gases" from furnaces using fuel oil from Mexican sources show a percentage of sulphur compounds thrown off which with the increasing use of fuel oil may and in fact very probably will unfavorably affect in time the chemical content of the atmosphere of large cities and centers of industry generally.

It is important that thorough-going chemical research on this problem be undertaken by this Department at once and carried through a series of years; and as soon as it appears that the question of atmospheric pollution is one which will lead to serious economic and public health considerations, to also begin to carry out in collaboration with industry and our technical schools researches for the most efficient and economical methods of preventing or overcoming such detrimental results of modern industrial progress.

PLUMBING REPORT.

At the beginning of this year legislation was submitted for the purpose of rendering more uniform and more simple the regulations, restrictions and specifications governing plumbing installation in the various cities and towns now operating under plumbing regulations. It was also hoped that this legislation would, by providing for certain simple *minimum* requirements applicable throughout the State, greatly improve the standards of plumbing efficiency in the numerous small towns which at present have no system whatever of plumbing regulation or plumbing inspection.

This legislation was opposed by some on the basis of its being an invasion of local rights and by others on grounds which were not clear or easily to be understood. The Legislature postponed consideration of the measure until the present session. I then requested the Special Plumbing Board appointed by this Department to continue its studies, with a view to further perfecting proposed legislation looking towards a simplified and improved plumbing code for introduction at this session.

In the meantime the Federal Department of Commerce, under the leadership of Mr. Hoover, has taken up and is making a thorough study of this problem, and the Plumbing Board of this Department

feels that great and far-reaching improvements in American plumbing procedure are likely to result from this investigation. Therefore the Board has recommended that the plumbing regulations now in use in this Commonwealth be left undisturbed until the conclusion of the Federal studies. In this recommendation I strongly concur.

WATER SUPPLY PROBLEMS.

There seems to be no occasion for any detailed reference to these questions in this report, inasmuch as the special report on this subject of the Joint Board composed of this Department and the Metropolitan District Commission will soon be filed with the Legislature.

PROBLEMS OF HYGIENE.

In contrast to lines of health work wherein control of infection by combined police power and group restriction methods, or control of environment by sanitation of public necessities and utilities, or assurance of safe and pure food supply take a prominent place, the newer aspects of health work centering upon the individual, wherein the building up of stronger and more vigorous physique from prenatal existence to old age is the great aim sought, loom larger each year.

Everywhere the conviction that "health pays" is growing. With the growth of this sentiment there is an increased interest in the mechanisms by which the doctrines of hygiene are to be spread. Increasing appreciation of the fact that all these measures are essentially educational and that childhood is the period of life in which the individual can best learn and put into practical application the principles of personal hygiene is resulting inevitably in a closer and closer *rapprochement* between health and educational authorities which is greatly to be desired.

MATERNITY BENEFITS.

For the past three years in this State one aspect of hygiene has been prominently brought to the front by the legislative discussions and debates over so-called "maternity benefit" proposals.

There has always been very wide divergence of view as to what was meant by this term in the minds of various groups and individuals. So far as this Department is concerned, I think there has never been any material change of viewpoint. The great objective sought by the Department always has been more effective and intelligent training in the duties of motherhood and child care.

The chief means advocated have been always educational methods reaching directly to the mothers of the Commonwealth.

The agency, aside from printers' ink, which has seemed to this Department always most promising for accomplishing these results is the public health nurse.

We have advocated such degree of direct bedside and household nursing service by these public health nurses as would be a necessary incidental to such training of housewives in the principle of infant and maternal hygiene, or as might be necessary to supply imperatively needed nursing assistance for which no other nursing agency was available. But we have never stood for the principle of the State replacing by either cash or trained personnel the bedside nursing services of our local communities, or for the principle of the State taking over the moral responsibility of each community to care for its own needs in these directions.

The fact that two successive Legislatures debated these proposals, with the second one having before it the specific and unanimous recommendations of a special recess commission, with no definite legislative action resulting, shows that there is as yet no clearly defined public opinion on the subject. A committee of this Council has recently reported on this subject in substance as follows:—

1. The discussion has brought out clearly that certain groups of our citizens are opposed to the fundamental principle of Federal or State "benefits," whether these take the form of cash payments to mothers or free medical or nursing service.

2. It does not appear that there is any considerable group opposing the proposal to more extensively carry out a campaign of hygienic education designed to meet the needs of mothers and prospective mothers.

3. There has been far from general acceptance among the medical profession in regard to the interpretation of the findings of the Commission, and to a lesser extent the validity of the statistics accepted and reported by the Commission has been questioned. It may be added that the Special Recess Commission on Maternity Benefits itself very strongly emphasized the difficulty of getting at all the facts bearing on the question, and regretted that the time and funds at their disposal made the series of cases directly investigated and reported all too brief.

In view of these facts and inasmuch as the passage of the so-called Sheppard-Towner act by Congress has made available, if the contingent financial requirements are met by the State, a sufficient sum of money to enable very extensive educational investigation and research work to be carried out in the fields of maternal and infant hygiene for the five-year period which the act covers, this Department has definitely recommended that the Massachusetts General Court accept the provisions of this Federal legislation rather than press for

an immediate enactment of the much farther reaching recommendations of the Massachusetts Special Commission on Maternity Benefits.

This so-called Federal Sheppard-Towner act appropriates for a period limited to five years certain sums of money — \$1,480,000 for the first and \$1,240,000 for the four following years — to be distributed among the several States for the purposes of this act, subject to certain conditions. Most important of these conditions are: (1) that each State must by legislative action accept the act, and (2) must appropriate equal amounts to the amounts due the State by Federal allotment, after certain initial outright grants for organization purposes have been deducted for which no matching is required. The conditions of allotment have been very ingeniously fixed in such fashion as to guarantee to each State a substantial sum regardless of population, and beyond this point allotments are upon a basis of the ratio which the population of the State bears to the total population of continental United States. For Massachusetts the amounts due from the Federal funds will be approximately \$41,000 for the first year and \$36,000 thereafter.

It must be clearly recognized that the amounts of money made available from the Federal and State sources together will be entirely insufficient to carry out any State-wide assistance by furnishing bedside care to mothers and infants by an extension of our present voluntary privately financed district nursing systems, which was the essence of the Special Commission's plan. Obviously, these sums of money from Federal sources would be so minute a fraction of the total necessary for carrying out the plans proposed for cash payments to needy mothers that it does not seem likely that any one will argue that such type of legislation is made easier financially for Massachusetts on account of this Federal legislation.

OTHER PROBLEMS OF HYGIENE.

Aside from the special field of maternal and infant hygiene this Department has been keenly awake to its opportunities and duties in other phases of hygiene during the past year.

1. In the matter of general health education by the exhibit method, the Department has consistently followed out the policy of taking its exhibit only to communities where a concrete demand existed for an advance step in community service in some aspect of hygiene. Our funds and personnel for this type of work are exceedingly limited in comparison to the total expenditures of this Department, but nevertheless the exhibit has been shown in over a score of communities with definite tangible results following in nearly all instances.

2. *Nutrition Work.* — Here the Department's work has been, I be-

lieve, of particular value. Unfortunately, with only one expert worker available, we cannot begin to meet the demands for instruction. There is no phase of our work which I feel needs expansion so much as our nutrition work. Numerous special projects of great possible significance cannot be carried out because of the inability of one worker to cover the field.

How deep the relationship is between faulty nutrition in early life and the multitude of ailments and infirmities of the flesh that man is heir to in later life we are just beginning to comprehend dimly.

The problem in such a portion of the world as the United States is still further complicated by the fact that so many very intelligent, well-informed people have but one conception of malnutrition, that it means quantitative insufficiency of food or partial starvation, and hence resent the idea that malnutrition is a problem of American families generally, not realizing it is not a question of "how much" but a question of "what kind" and "how balanced" that determines whether child or adult is obtaining proper nutrition.

The implications of the possible degree of relationship between faulty childhood nutrition and subsequent tuberculous development are so great that I for one do not feel justified in accepting in its entirety this relationship as definitely proved, but certainly the responsibility for correcting faulty nutrition in children as a possible, even a probable, means of preventing adult tuberculosis is now so great that from this angle alone I feel we ought to have much greater personnel at work on the nutrition problem.

3. *Dental Hygiene.* — Closely pressing nutrition for first place among the problems of personal hygiene, and most intimately associated with nutrition, comes dental or mouth hygiene. The extent of the problems of faulty teeth is almost staggering. Such facts as surveys of typical Massachusetts towns showing an average of seven cavities per mouth for all the school children are needed to make us comprehend it. The fact that our high sugar content and otherwise wrongly balanced, predominantly soft food dietaries are rapidly increasing susceptibility to dental decay among our children, and that proper dental habits plus intelligent nutrition habits can in many cases prevent any dental decay occurring in the average child, shows the direct relationship of the hygiene of nutrition to mouth hygiene.

The entire dental profession is wide awake as to the significance of and tremendous increase in interest in this question. Their co-operation with this Department has been most hearty and inspiring. They show us the facts in unmistakable language. It is up to the American public to take action. If dental decay meant at the worst simply gradual loss of teeth and substitution of false teeth, the prob-

lem would be serious enough. But we know that the local effects of toothache, tooth decay and tooth loss are of minor significance compared to the far-reaching, irreparable bad results in relation to the development of the entire body that follow from tooth decay in childhood, and the frequent general disease complications of serious nature associated with focal infections in the teeth and teeth pockets of the jaw in adult life.

To touch upon the brighter side of the picture, however, I wish to call to your special attention that part of the report of the Division of Hygiene which tells how great is the expansion of community effort throughout the State to meet the demands of the mouth hygiene problem.

4. School hygiene, the cancer problem, the midwife question, expansion of public health nursing service and many other problems of hygiene are being carefully studied by our Division of Hygiene, but to do justice to them all would lead us too far afield for a report of this character.

5. I wish to call to your attention the remarkable interest shown in the series of round table conferences on health work which this Department has recently held. In this series of meetings originally planned for six afternoons, an attempt was made to bring out some of the most salient features of modern public health problems. The list was not exhaustive. Great subjects such as sanitary engineering and pure food, which occupy much of the Department's attention and resources, were not even touched upon.

The attendance was largely of a representative nature. Many women's organizations sent representatives whose instructions were to attend in order to more intelligently explain to their fellow members what the aims and objectives of health workers in general and of this Department in particular really were. By request, two supplemental conferences were held devoted particularly to nutrition, dental hygiene and methods of public health education. The question arises whether meetings of similar character ought not to become an annual feature of the Department's work.

6. *Mental Hygiene.* — Finally, I wish to present for your consideration the question of whether the time is not nearly at hand when we should seriously address ourselves to the problem of mental hygiene, although I am not prepared at present to make any definite recommendations in reference to this subject.

As to the pressing need of more attention being paid to it there can be no debate. The bald statement that at present one out of every twenty odd deaths occurring in this Commonwealth is among inmates of our mental hospitals tells the whole story. Nor is there any

reason to doubt that preventive principles applied to the problems of mental life will bear fruit as certainly as they do in the field of physical hygiene. The problem of mental hygiene is unquestionably closely bound up with the problem of school hygiene. The uncertain factors are such matters as methods of approach and the working technique to be employed.

There is already a most vigorous voluntary organization, the Massachusetts Mental Hygiene Association, actively attacking the problem of insanity prevention and mental hygiene in general. It needs and greatly deserves much stronger financial and moral support from our citizens.

The State Department of Mental Diseases has been established principally for the management of the mental hospitals. Its principal job hitherto has consisted in taking care, as it were, of the wasted mental by-products of a civilization of high-nerve tension which has never worked out any adequate provision for mental hygiene.

Nevertheless, that Department by its admirably conceived mental clinics held throughout the State has already taken an important step in the direction of prevention, although naturally patients seeking these clinics are in large measure interested in the subject from the pathological side rather than from the purely mental hygiene aspect.

Like all other forms of hygiene, mental hygiene must be an aggressive beneficent force if it is to reach its full possibilities. Its principles must be brought to bear upon the mental life of every person and early in life, rather than to be reserved for that group in whom symptoms of mental stress or instability are already observable.

It is my understanding that at present the Massachusetts Department of Mental Diseases is in much the same situation with reference to mental hygiene as we find ourselves in this Department. They are earnestly advocating greater attention to this question as a challenging problem to our body politic, but are by no means certain just how the Commonwealth can best attack the question.

It therefore looks as if both departments must seriously consider the matter and endeavor to determine, by joint consideration, if it seems desirable, which department seems most logically the official agency of the Commonwealth that ought to develop the possibilities of the subject.

It is by no means certain that further study may not lead to other conclusions. It may be that the whole matter might be best developed by the voluntary society already referred to, or by the Department of Mental Diseases, but surely some body ought to be getting at the problem and that without undue longer delay.

LEGISLATIVE RECOMMENDATIONS.

The following recommendations for legislation have been submitted to the General Court: —

1. An act accepting the provisions of an act of Congress relative to the promotion of the welfare and hygiene of maternity and infancy and for other purposes and providing for co-operation with the Federal government.
2. An act relative to the analysis of liquor by the Department of Public Health.
3. An act relative to the publication of certain information by the Department of Public Health.
4. An act relative to the examination of vinegar.
5. An act relative to the purchase of land in Westfield.
6. A resolve relative to the reappropriation of certain funds to be used in connection with the work of the sanitary improvement of the Neponset River.

DIVISION OF ADMINISTRATION.

The work of this Division has followed much the same lines as previous years.

In the matter of personnel, it is necessary to record the deeply regretted retirement, due to ill health, of one of the best known and most universally respected employees of the Department, Miss Sarah E. LeMaster, for many years bookkeeper to the Department.

Miss Helen G. Condon, who had been for several years assistant bookkeeper, was promoted to the position thus made vacant.

It was decided to make no changes in the matter of institutional accounting following the transfer of the tuberculosis sanatoria and the Leper Hospital to this Department in December, 1919. But, nevertheless, the increased administrative routine in such matters as applications for appointment, civil service requirements, discharge notices, etc., has added very materially to the pressure of work always too great for the amount of personnel employed in this Division. The time is rapidly approaching when, in spite of all efforts at economy in administration and in spite of the policy of decentralizing routine administrative matters to the respective divisions of the Department, it will not be possible for the present system to keep up with the ever-increasing load of administrative obligations falling upon this Division.

At present, as for all previous years since the Department was organized, the secretary to the Commissioner, who is also secretary to the Public Health Council, to a large degree performs the duties of a

director of the Division of Administration as well; but with the constantly expanding duties and organization of the Department, the triple load is rapidly becoming entirely too heavy for one individual to carry.

DIVISION OF SANITARY ENGINEERING.

The total number of applications for advice with reference to water supply, drainage and sewerage received by this Division during the year was 216, an increase of 40 per cent over the highest year since 1915. For a number of years during and since the war water works and sewerage construction has been extremely limited because of the high cost of labor and materials, but the past year has shown an increased activity in this line of work.

The rainfall for the year was about the average throughout the State as a whole, but an excessive rainfall in the summer aided in preventing a shortage of water in many places where difficulty in obtaining an adequate water supply would no doubt have been experienced during the year. As it was, the short period of low rainfall extending from August to October, inclusive, depleted some of the sources which are being used in excess of their capacity. A high summer rainfall has also had a good effect in aiding the maintenance of satisfactory sanitary conditions in the streams, though the amount of waste discharged into the inland waters of the State during the year has been less than usual on account of the business depression. In consequence of these conditions, little complaint has been made of the pollution of streams during the year.

The Department through this Division has made return to the Treasurer of the Commonwealth and to the Board of Assessors of each of the municipalities mentioned in chapter 655 of the Acts of the year 1911, entitled "An Act relative to the Protection of the Public Health in the Valley of the Neponset River," and acts in addition thereto, of schedules and plans showing the parcels of land which it finds to have been benefited by the work done or changes made under that legislation. The Department has also made application to the Supreme Judicial Court, in accordance with the law requesting the court to appoint three commissioners to determine what proportion of one-half of the total expense incurred under the acts above referred to shall be paid by the various municipalities mentioned in said chapter 655, and the commissioners have been appointed by the court.

A large amount of work has been required of the Division during the year in the investigation of complaints of offensive odors from oil refineries and of the pollution of adjacent waters by oil escaping therefrom. These complaints have been widespread, and thorough investi-

gations have been made so far as practicable to determine the sources of the odors and the means of prevention. Changes have been made and appliances provided to prevent the escape of odor and oil at each of the refineries, and a material improvement has been effected in the control of the more objectionable odors; but much remains to be done, and a further study of the problem is needed in order to devise adequate means of preventing objectionable conditions complained of about these refineries and of preventing the escape of oil which pollutes adjacent waters.

The special investigation of water supply needs and resources has been prosecuted during the year, and the results will be presented in a separate report jointly with the Metropolitan District Commission.

DIVISION OF WATER AND SEWAGE LABORATORIES.

During the year 1921 the Division of Water and Sewage Laboratories made 7,600 chemical, 2,750 bacterial and 2,270 microscopical analyses of water, sewage, filter effluents, etc.

A large part of the work was done to determine the quality of the public water supplies and of the effluents of filters treating or purifying public water supplies, the condition of the rivers, the character of the sewage entering rivers or passing to filtration areas, the degree of purification obtained at these areas, the character of factory wastes, and the quality of the effluents from filters receiving factory wastes, etc.

Other work was done calling for special determinations of lead, manganese, carbonic acid, etc., in connection with corrosion, ground water supplies and similar subjects, and a large number of analyses made of spring waters, water from domestic wells, ice supplies, etc.

Considerable analytical and bacterial work was carried on to determine the quality of shellfish from different areas of the State and also the condition of the waters over these areas.

Many investigations were made along the lines usually covered by this Division in regard to methods for the disposal of wastes and sewage, and an especially interesting and important investigation was made in regard to the wastes from twenty-four tanneries, leather works, glue works, gelatin works, etc. These wastes, after some preliminary treatment in settling tanks, etc., enter and badly clog the Salem-Peabody sewers.

Wastes and odors from rubber factories and from the large oil distilleries now in operation in the State, the odors and wastes from which appear to be a serious cause of trouble, were investigated.

Special studies were made of methods for the treatment and dis-

posal of sewage, of the condition and efficiency of certain municipal sewage disposal areas, of the efficiency of small septic tanks for houses, factories, etc., and of many general questions in regard to the disposal of sewage by trickling filters, by aeration and activated sludge and similar tanks, etc.

Purification of water by means of chemical coagulants and rapid sand filtration has, because of new questions arising during the past two years concerning this method and the results obtained by it, acquired new importance, and hence more complete studies are being carried on by us at Lawrence than ever before and with better equipment than before available. As the question of utilizing the waters of the more or less polluted rivers of the eastern portion of the State for the domestic water supply of this portion after filtration has been agitated and urged by certain people in connection with the investigation of the water supply needs and resources of the State, a study of the results that can be obtained by various treatments of such waters is being made in order to accumulate new and reliable data.

Besides those studies already enumerated, many special chemical and bacterial studies were made during the year, both upon laboratory methods and technique and upon questions submitted to this Division for explanation.

DIVISION OF COMMUNICABLE DISEASES.

There have been no outbreaks of any great magnitude during the year save one of typhoid fever, with 129 cases and 7 deaths, which occurred in Waltham, and which, although not definitely proved, appears to have been transmitted by milk. The continued high incidence of typhoid fever in Adams (23 cases from July 27 to November 14) called for an intensive investigation. It was discovered that the drinking water had become contaminated by a faulty system which utilizes the river water for washing and mill purposes and the town supply for drinking. Since correction, no further cases have been reported save a few resulting from contact. Milford had a small outbreak of 14 cases, all of which occurred upon one milk route. No carrier was found, and the conclusions of our investigation appear to point to the possibility of transmission through the return of infected milk bottles.

The sudden increase in the reported incidence of anterior poliomyelitis in July and August caused a great deal of apprehension lest we were to experience an outbreak similar to that of 1916. The peak of this increased prevalence was quickly reached and reporting quickly subsided. In no community did it appear to be epidemic save at a boys' camp in Becket. Here 75 boys became suddenly ill with acute

gastrointestinal symptoms, but within a few days all recovered. Within the next fourteen days 6 cases developed in the camp, all of which proved to be true cases of anterior poliomyelitis. Careful investigation failed to bring to light any new facts as to the transmission or etiology.

The high incidence of diphtheria has also caused much concern. It has appeared in unusual amounts in every large city of the State. We are not certain whether this increase is an actual one or whether the increased interest in diphtheria prompts more laboratory examinations to be made of suspicious throats, and the subsequent better reporting of the condition accounts for the unusual amount of diphtheria officially recorded. One favorable comment, however, may be made, and it is that for the first time in our history our fatality rate is below 7. This is of course indicative of the results that are to be obtained by the increasing use of the diagnostic laboratory and of the earlier treatment that will of necessity be instituted. Much of our effort of the past few years among physicians and the laity has been to introduce and to popularize the use of the Schick test for the detection of those susceptible to infection from exposure to diphtheria, with subsequent immunization with the toxin-antitoxin mixture where it may be indicated. Results of this educational work are now apparent. Here and there in all sections of the State are springing up clinics where school children may have this test applied if their parents so desire. The school department of the city of Boston, the Evans Memorial Out-Patient Department in Boston, Lynn, Newton, Hingham, Clinton, Waltham, Brockton and Cambridge are actually maintaining free Schick clinics or performing the Schick test at school clinics. Several of our State and municipal hospitals have adopted this procedure as a routine measure. Special lectures to medical societies and hospital groups with demonstration of procedure, together with interpretation of the test, have been given with increasing interest shown.

Cases of dog bite have increased markedly during the past year, and while the number of cases may be considered insignificant, even this small number is entirely unnecessary if proper restraint might be exercised for a period of time.

The total number of smallpox cases reported this year is 37. These may be divided into three groups: one in Methuen, due to an unrecognized case in a Canadian who came to Methuen, with a total of 12 cases; the second group in Salem and Gloucester, with 9 cases occurring in workmen who had returned from Jamaica, and their families; the third group in Worcester of 6 cases were infected by a man who broke quarantine in Utica, N. Y., where he was being held

as a suspected case. He left Worcester and was finally apprehended in Peoria, Ill.

On March 1, 1921, encephalitis lethargica was declared a disease dangerous to the public health. The difficulties of diagnosis were fully appreciated as well as the fact that a certain percentage of our diagnoses would be incorrect and our statistics of little value. However, with encephalitis lethargica a reportable disease, we may investigate into its etiology, mode of transmission, communicability, etc. There have been 117 cases reported, with 73 deaths for this year. All of these cases have been investigated, yet our findings have been practically negative. However, clinicians are spending much time and study upon this condition which will in time shed much light on this disease.

The reported incidence for all communicable diseases will show a marked decrease for the year. For the twelve months past there have been 77,367 cases reported and for a period of eleven months 6,962 deaths. This compared with the statistics of last year (135,242 cases and 11,277 deaths) is most favorable. It is interesting to note that the percentage of deaths of six of the more common communicable diseases to the death rate from all causes for the last forty years is decreasing.

	1880.	1890.	1900.	1910.	1920.
Diphtheria	2,394	1,626	1,475	679	591
Measles	236	114	330	240	352
Scarlet fever	574	196	391	254	214
Pulmonary tuberculosis	5,494	5,791	5,199	4,503	3,645
Typhoid fever	882	835	632	411	95
Whooping cough	230	363	337	183	546
	9,810	8,925	8,364	6,270	5,443
Total deaths from all causes	36,589	43,528	51,156	54,407	53,632
Per cent due to above communicable diseases.	26	20	16	11	10

The following table gives the total number of cases and deaths reported for the year, *i.e.*, calendar year, 1921:—

	Cases.	Deaths.		Cases.	Deaths.
Actinomycosis	2	1	Pellagra	14	14
Anterior poliomyelitis	233	47	Pneumonia, lobar	4,080	1,818
Anthrax	6	-	Scarlet fever	8,331	189
Chicken pox	8,324	8	Septic sore throat	140	42
Diphtheria	9,100	603	Smallpox	37	-
Dog bite	118	-	Syphilis	2,497	198
Dysentery	25	23	Tetanus	39	25
Encephalitis lethargica	117 ¹	74	Trachoma	97	-
Epidemic cerebrospinal meningitis.	164	58	Trichinosis,	10	1
German measles	649	-	Tuberculosis, pulmonary	6,168	3,304
Gonorrhoea	5,563	5	Tuberculosis, other forms	827	551
Influenza	735	155	Typhoid fever	917	121
Leprosy	1	1	Whooping cough	5,703	197
Malaria	49	2	Rabies	1	3
Measles	17,827	174	Hookworm	1	-
Mumps	3,952	6	Typhus fever	2	1
Ophthalmia neonatorum	1,573	-	Total	77,302	7,621

¹ Made reportable March 1.

For the work of the Subdivision of Venereal Diseases the following table, showing the figures for 1919, 1920 and 1921, indicates at a glance the continued progress in this field:—

	1919.	1920.	1921.
Ampoules of arsphenamine distributed	21,667	26,782	38,473
Cases reported by number:			
Gonorrhoea	9,435	7,225	5,563
Syphilis	4,127	2,986	2,497
Pamphlets distributed	21,762	59,280	37,802
Smear examinations	4,035	2,815	2,478
Wassermann examinations	32,390	37,207	42,957
Figures for all State-approved clinics:			
New patients	4,492	7,314	4,197
Total treatments	49,005	142,367	98,473
Lapsed cases:			
Reported	1,421 ¹	1,344	1,147
Returned to treatment	616	365	327

¹ Cases reported by name from State institutions are included with the lapsed cases up to April, 1919.

A brief survey of the past three years shows upon the whole satisfactory progress. The interest of both physicians and laity gives evidence of the soundness of our program. This before long should be reflected in a decrease in the admissions to our institutions, particularly in those where untreated or unrecognized syphilis has been such a large predisposing factor.

The Bacteriological Laboratory continues to show an increase in its activities, the number of examinations made for the past year being 33,729, as compared with 28,637 for twelve months of the last fiscal year.

Total Number of Examinations made, 1921.

Diphtheria	22,778
Tuberculosis	4,541
Typhoid fever:	
Widal test	1,646
Culture test	724
Malaria	93
Gonorrhoea	2,489
Pneumonia	483
Miscellaneous	975
	33,729
Total	33,729

The routine inspection of hospitals, jails and houses of correction, and dispensaries has been done as in past years.

The Leper Hospital at Penikese Island closed its doors to patients on March 10, 1921, the patients being removed to Carville, La. The island and buildings are now under the care of a caretaker and have been offered for sale.

Under date of Dec. 22, 1920, the Legislature directed the Department to conduct a survey of the seaport cities and towns of the Commonwealth to see what steps, if any, were necessary for the prevention and control of bubonic plague, and appropriated the sum of \$5,000 for this purpose. Because of the limitation of the appropriation it was not deemed advisable to establish a laboratory for this work, and therefore arrangements were made with the Boston Department of Health for the examination of rats which might be caught along the water front. A force of four rat trappers was employed and the water front of the city of Boston systematically trapped. Approximately 6,200 rats were obtained, and although none showed evidence of plague infection there were several suspicious rats obtained. On further study by the Boston Health Department, Professor Rosenau of Harvard Medical School, and the Hygienic Laboratory at Wash-

ington, these were found to be not true cases of bubonic plague. All other cities and towns of the seacoast were surveyed and a report made to the Legislature under date of Feb. 21, 1921. Owing to the limited appropriation and because of the fact that it was made for the specific purpose of making a survey, we were obliged to discontinue our labors on or about the 1st of May. This work has been continued by the city of Boston, and is about to be undertaken by the cities of New Bedford and Fall River.

The health organization in Barnstable County has been established, and is apparently serving its purpose well. Reports submitted by the executive officer show that much time is being spent in school inspection and in obtaining a better milk supply for this area.

There have been a few changes in personnel in the Division during the past year. Dr. Jonathan E. Henry, epidemiologist, resigned to enter the United States Naval Service, and Dr. Leland M. French was appointed to fill this position. Dr. Howard A. Streeter, chief of the Subdivision of Venereal Diseases, resigned to become health officer of the city of Manchester, N. H., and Dr. Albert Pfeiffer has been promoted from epidemiologist to chief of the subdivision.

The work of the District Health Officers and nursing assistants has continued along the same lines as in the past years. More demand has been made upon the field force for lectures and for assistance in diagnosing the obscure or atypical communicable disease. Lectures to nurses in training, nursing groups, parent-teacher's associations and medical societies have become a very large item in the field activity.

The investigation of disease is more and more taken over by the local authorities, who have profited and are profiting by the advice and demonstration given by the District Health Officer and his nursing assistant.

Much time has been spent in demonstrating the use of the Schick test and toxin-antitoxin immunization in institutions and with local boards of health. Assistance has been given to Brockton, Quincy, Clinton and Lancaster in making tuberculosis surveys.

All together the year's work has been devoted toward building up programs with the local authorities and the voluntary organizations throughout the State rather than initiating new programs or carrying out special investigations.

DIVISION OF TUBERCULOSIS.

The activities of the Division of Tuberculosis for the year 1921 may be briefly summed under the following heads: —

1. Supervision of sanatoria and dispensaries.
2. Consultation clinics.
3. Examination clinics.
4. Nurses' associations.
5. Follow-up work.

The four State institutions have had a very successful year. The labor situation, so acute during 1920, which laid many additional burdens on the superintendents, has been alleviated, and at present each sanatorium has a full quota of workers. Not as many patients have been treated during the year as formerly, due to three facts, — fewer cases have been reported, the sharp decline in the death rate, and the filling of county hospitals.

This Division desires in the future to reserve the beds in the sanatoria at Rutland, North Reading and Lakeville for typical sanatorium cases only, and to send more children to Westfield as fast as opportunity will permit.

Residence for patients at sanatoria should be limited to a period of eighteen months to two years. Every favorable case is given fair trial in this period, and no unfavorable case can be benefited by a longer stay.

The consultation clinics, although not as yet utilized by the physicians as anticipated, have been of distinct value and well worth the time and money expended. During the year 623 persons have been examined; 260 showed definite signs of active tuberculosis, 289 were negative, and 74 still under observation. Greater effort should be made to popularize this service and extend it to other centers.

The examination clinics, which have become very popular, ought to be increased in number and held in centers not provided with a dispensary. Clinics have been held in Ludlow, West Springfield, Palmer, East Longmeadow, Chester, Agawam, Southwick and Williamstown, and will soon be held in Brimfield, West Springfield and Lee. Three hundred and seventy-two cases have been examined since May, 1920.

By the enthusiasm and attendance at the meetings of the Public Health Nurses' Associations, we feel that the inspiration gained by the individual nurse at such times enables her to give better service to the community, and fills a great need in her life and work. In getting together and discussing difficulties and problems, many knotty questions are easily solved, and they carry to their work that warm feeling of co-operation which makes for more efficient work in any department.

On May 23 the Public Health Nurses' Association of the first four districts united in an all-day conference at the Lakeville State Sana-

torium. The work of the nurses is invaluable in public health work, and we hope to develop this feature by holding frequent conferences in our State, county and local institutions.

The importance of following up the discharged patient has been realized, and steps have been taken by the Department to carry it out. Ten thousand follow-up cards have been issued to the District Health Officers' nursing assistants, and already between 5,000 and 6,000 have been filled out and returned to our files. In this way the nurses keep in touch with all discharged cases either by personal visits or visits made by public health nurses under the supervision of the District Health Officer's nurse. With the 23,000 record cards now on file, and the follow-up cards being filed, very valuable information will be in our hands, and these statistics must be of great value to the Department during the coming year.

DIVISION OF HYGIENE.

No activities along radically new lines have been started by the Division of Hygiene during the past year, but existing activities have been strengthened and broadened.

The chief object of the Division has been to come into as close touch as possible with the diverse agencies of the State which are interested to a greater or less degree with child health. Much time has been spent, for example, in trying to bring about close co-operation between the Parent-Teacher Association and the Department of Public Health. In the belief that no true interest in a subject can be fostered without a real knowledge gained by first-hand investigation, an attempt has been made to get the various Parent-Teacher Associations to study their own local problems after gathering themselves all possible facts bearing upon these problems. Help has been offered by this Department in analyzing the facts and suggesting lines of endeavor.

Lectures to the training schools for nurses throughout the State were continued last year under the general management of the Division, the lectures on child hygiene, in particular, being given by members of this Division.

The principle of advisory committees to the Department was extended during the year in the establishment of an Advisory Committee on Health Weeks. This committee includes representatives of health committees and departments of thirteen State-wide organizations. Its purpose is to bring to bear upon any community desiring to conduct a health week all the assistance which can be afforded by these State-wide organizations and their local branches.

During the past year the Division co-operated with the Division of

Vocational Education of the State Department of Education in a summer course to continuation school teachers on methods of teaching hygiene. The Division also participated in a very important series of public health conferences conducted by members of the whole Department and others. These conferences were designed to present in outline form some of the essentials of modern public health.

Much new information has been assembled during the year respecting the nutrition activities of the different cities and towns of the Commonwealth. We are more and more in a position to offer advice and assistance to those wishing to start new lines of work. The same is true of mouth hygiene. A State-wide survey of mouth conditions among typical groups of school children is now in progress. Studies of general health conditions among rural children were continued by the pediatrician of the Division.

A considerable volume of new educational material on the preservation of health was produced to meet what seemed to be a real need. This material falls into two classes, — that designed for general use by the public and that intended for those who in turn will employ the facts contained therein for the instruction of larger groups. The latter method seems one peculiarly suited to a State advisory body, and is likely to produce the maximum results at a minimum expense.

The policy has been continued of trying to make our bimonthly bulletin, "The Commonwealth," a source of inspiration to health workers throughout the State, as well as the vehicle of authoritative information on all phases of constructive health activity. Certain issues of this magazine during the past year have been devoted mainly to special articles on nutrition, on aspects of communicable disease control, and on cancer; also to a discussion of certain investigations made by the staff of the Division into the problems of the open-air school and the midwife.

DIVISION OF BIOLOGIC LABORATORIES.

I. *Antitoxin and Vaccine Laboratory.*

The outstanding features of the work of this laboratory may be classified as follows: —

1. Increase in production of biologic products.
2. Improvements in the methods of testing biologic products.
3. Improvements in the physical condition of the laboratory and its equipment.
4. Extension of the educational activities of the laboratory.
5. Authorization of sale of surplus products.

Marked increase is shown in the production of products distributed by this laboratory, notably in the case of—

(a) Diphtheria antitoxin: The amount of this product distributed during the past year exceeds the amounts distributed in any previous year in the history of this laboratory. This increase may be accounted for by the activities of the Department directed toward the prevention of diphtheria and the increased number of cases of diphtheria occurring during the autumn of 1921.

(b) Schick outfits: The great increase in the number of Schick outfits distributed may be considered as a response to the educational activities of the Department in popularizing the Schick test.

(c) Diphtheria toxin-antitoxin mixture: The increased amount of this product distributed during the past year may be taken as the result of the educational activities in popularizing active immunization against diphtheria. The demand for this product is steadily increasing.

Improvements in Method. — (a) Diphtheria antitoxin: Through the appointment of a qualified chemist, the Division has greatly increased the amount of concentrated antitoxin distributed, — much to the satisfaction of the medical profession, — and a still further increase in the future has been made possible.

(b) The methods for testing the sterility of all products have been entirely revised and amplified. The expense of instituting and continuing this work constitutes a large item of increased cost, but it is entirely justified by the greater security given to physicians in the use of biologic products. Every lot of every product now issued from this laboratory is tested in full conformity with the requirements of the United States Hygienic Laboratory.

(c) The method of testing antimeningococcic serum has been revised, resulting in greater accuracy in the determination of the potency of this serum.

(d) Not only has the actual amount of vaccine virus been increased, but additional purity tests — some in addition to Federal requirements — have been instituted, still further insuring the purity of this product.

(e) Diphtheria toxin-antitoxin mixture: As a result of conferences with members of the Hygienic Laboratory, with Dr. Park of the New York City Health Department, and others, the method for preparing this product has been standardized in this as in other laboratories of the country, thereby insuring its proper potency, purity and harmlessness.

The physical condition of the laboratory has been improved and the work has been facilitated by the addition of new apparatus and

the installation of an incubator room, which is operating most satisfactorily, enabling us to produce all the diphtheria toxin required and to carry out the elaborate sterility tests on products required by the Federal government.

Educational Activities. — During the past year a large number of physicians as well as boards of health, both individually and in society groups, have visited the laboratory and have been given demonstrations in all the processes involved in the preparation and testing of biologic products. Classes from the Harvard Medical School, Boston University Medical School, Massachusetts Institute of Technology, Simmons College and other educational institutions have been given similar demonstrations.

The total demonstrations in the laboratory and the number of persons in attendance follow: demonstrations, 12; attendance, 526.

Addresses and demonstrations on the Schick test have been given as follows: number, 27; attendance, 1,915.

The tabulation of products distributed during the past two years follows: —

PRODUCT.	1919-20. ¹	1920-21.
Diphtheria antitoxin (1,000 unit doses)	202,755	261,664
Antimeningococcic serum (15 c.c. bottles)	4,030	3,474
Antipneumococcic serum (100 c.c. bottles)	482	625
Schick outfits	120	919
Toxin-antitoxin mixture (1 c.c. ampoules)	2,474	6,974
Bacterial vaccine (1 c.c. ampoules)	44,913	58,433
Vaccine virus (capillary tubes)	185,862	198,849

¹ Twelve months from November 1 to October 30.

The Legislature of 1921 authorized the sale of surplus products of this laboratory. It is not intended to actively compete with commercial biologic laboratories, but merely to dispose of excess stock from time to time before it becomes inert by lapse of time. The demands for all types of our products within the Commonwealth have been so heavy during the year past that practically no sales have yet been made under this authorization, but it is anticipated that in the future considerable income may accrue to the Commonwealth from this source.

II. *Wassermann Laboratory.*

The work of this laboratory has been confined to the execution of its routine duties. The actual number of tests has increased by between 15 and 25 per cent, while the number of positive rabies examinations has so greatly increased that it would appear that a mild epidemic of this disease has been prevalent among dogs.

An important statistical investigation on the incidence of syphilis in pregnant women has been concluded and will shortly come to publication. This investigation also bears on the incidence of syphilis in the population of the Commonwealth as a whole and on the prevalence of the disease in the different race groups of the State.

DIVISION OF FOOD AND DRUGS.

The Food and Drug Division carries out certain provisions of the laws relating to slaughtering, cold storage, bakeries, soft drink factories, the adulteration of milk, food and drugs, the examination of liquors and drugs, chemicals and poisons for police authorities, as well as the manufacture of arsphenamine. In addition to this work, the Division has made analyses of coal, soap, alleged poisonous food, Famo, an alleged gasoline intensifier, and linseed oil for the Departments of Correction, Public Welfare, Mental Diseases, Attorney-General and Public Safety.

There has been an unusual amount of co-operative work. Analyses of various sorts have been made for the local health officers or inspectors of twelve cities and towns. Investigations not requiring an analysis have been made for four cities and towns. In return, the local boards of health of five cities and towns have permitted the chemists of this Department to utilize their laboratories on field investigation of milk, etc. The inspectors in five cities and towns have assisted this Department in cases involving prosecutions, and in addition a number of instances of co-operation arose between this Division and the United States Department of Agriculture. Several boards of health have called upon the Division for assistance in making their preliminary inspections of the bakeries required by the regulations promulgated to carry out the provisions of the bakery law of 1920.

The outstanding feature of the year's work has been the enormous increase in liquor samples, which, formerly amounting to about 50 or 100 samples per year, increased to about 1,500 during 1919 and 1920, and to about 4,000 in 1921, with indication of a probable increase to about 5,000 before the close of the next fiscal year.

Bakery inspections were made in thirty-six cities and towns, and

In accordance with the provisions of section 23 of chapter 111 of the General Laws, a statement of the prosecutions by the Department under chapter 94 of the General Laws follows:—

	Conviction.	Discharged.	Filed without Plea.
Milk:			
Low standard	16	-	-
Cream removed	4	-	-
Watered	26	2	-
Misuse of milk bottles	5	-	-
False advertising:			
Cocoa	1	-	-
Olive oil	1	-	-
Eggs	7	1	-
Misbranded:			
Compound oil	1	-	-
Grape juice	1	-	-
Olive oil	6	-	-
Eggs	3	-	-
Adulterated:			
Vanilla extract	1	-	-
Grape juice	1	-	-
Maple sugar	1	-	-
Olive oil	15	4	-
Sausage (starch)	16	-	-
Sausage (colored)	3	1	-
Soft drinks	18	1	9
Vinegar (low in acid)	6	1	-
Drugs	9	-	-
Decomposed food:			
Eggs	1	-	-
Butter	1	-	-
Canned corn	1	-	-
Kream Krist (cooking fat)	1	-	-
Shrimp	2	-	-
Cold storage:			
Eggs not marked	76	3	-
Absence of sign "Cold Storage Eggs"	2	-	-
Holding goods in storage exceeding twelve months	2	-	-
Absence of sign "Cold Storage Goods"	11	-	-
Representing cold storage goods as fresh	1	-	-
Operating a warehouse without a license	1	-	-
Slaughtering:			
Illegal use of stamp	2	1	-
Slaughtering in absence of inspector	7	-	2
Selling unstamped meat	4	-	-
Selling diseased meat	1	1	-
Failure to condemn diseased meat	-	1	-
Slaughtering without license	-	1	-
Totals	254	17	11

Number of prosecutions, 282.

APPROPRIATIONS AND EXPENDITURES FOR THE YEAR ENDED NOV. 30,
1921.

DIVISION OF ADMINISTRATION.

Appropriation for personal services	\$21,100 00
Expended for personal services	20,553 61
	<hr/>
Balance	\$546 39
Appropriation for expenses	\$10,100 00
Brought forward from 1920 to cover sundry charges	14 33
	<hr/>
	\$10,114 33
Travel	\$608 69
Express	48 75
Printing and binding	1,733 30
Books and subscriptions	82 54
Advertising	44 33
Stationery, maps and blue prints	827 39
Postage	1,481 60
Telephone and telegraph messages	714 36
Typewriting supplies and repairs	53 11
Sundry office supplies	247 98
Multigraph supplies and repairs	40 74
Furniture	138 55
Messenger service	226 30
Miscellaneous	117 30
	<hr/>
Total	\$6,364 94
Unexpended balance	3,749 39
	<hr/>
	\$10,114 33

DIVISION OF HYGIENE.

Appropriation for personal services	\$22,000 00
Expended for personal services	20,118 44
	<hr/>
Balance	\$1,881 56
Appropriation for expenses	\$22,000 00
Brought forward from 1920	280 35
	<hr/>
	\$22,280 35

Travel	\$3,457 37
Express	485 84
Postage	1,728 00
Printing and binding	8,619 35
Telephone and telegraph	43 70
Books and subscriptions	423 62
Stationery, maps and blue prints	244 95
Typewriting supplies and repairs	306 66
Furniture and office supplies	443 70
Laboratory supplies	90 95
Special investigation	2,500 00
Educational work	2,335 63
Extra services	119 85
Auto maintenance	643 55
Miscellaneous	239 18
	<hr/>
Total	\$21,682 35
Unexpended balance	598 00
	<hr/>
	\$22,280 35

DIVISION OF COMMUNICABLE DISEASES.

Appropriation for personal services	\$56,740 00
Expended for personal services	55,666 19
	<hr/>
Balance	\$1,073 81
Appropriation for expenses	\$22,350 00
Brought forward from 1920	6 47
Credit account of refunds	15 78
	<hr/>
	\$22,372 25
Travel	\$12,870 61
Express	40 35
Printing and binding	1,096 04
Postage	609 03
Telephone and telegraph	576 80
Books and maps	521 39
Office supplies and stationery	570 74
Typewriting supplies	79 65
Furniture	143 85
Office rent and light	1,265 76
Extra services	242 08
Laboratory and experimental work	3,636 50
Animals	118 70

Food for animals	\$28 22
Labor	26 75
Miscellaneous	50 65
Total	<u>\$21,877 12</u>
Unexpended balance	495 13
	<u>\$22,372 25</u>

Subdivision of Venereal Diseases.

Appropriation for personal services	\$6,670 00
Credit by cash received from United States government	5,109 46
	<u>\$11,779 46</u>
Expended for personal services	9,676 26
Balance	<u>\$2,103 20</u>
Appropriation for expenses	\$15,000 00
Credit by cash received from United States government during 1921	9,623 98
	<u>\$24,623 98</u>
Credit by refund account of damages to shipment	12 54
	<u>\$24,636 52</u>

Travel	\$1,895 70
Express	54 19
Printing and binding	318 48
Postage	15 53
Telephone and telegraph	12 95
Office supplies and stationery	9 94
Typewriting supplies	50 09
Furniture	45 30
Books, reprints and educational material	1,360 71
Clinic subsidies	17,104 14
Miscellaneous	3 35
Total	<u>\$20,870 38</u>
Unexpended balance	3,766 14
	<u>\$24,636 52</u>

DIVISION OF BIOLOGIC LABORATORIES.

Antitoxin and Vaccine Laboratory.

Appropriation for personal services	\$28,760 00
Expended for personal services	28,610 41
Balance	<u>\$149 59</u>

Appropriation for expenses	\$24,700 00
Travel	\$134 83
Express	190 42
Printing	482 98
Telephone and postage	209 22
Stationery, office supplies and furniture	968 96
Rent	2,058 32
Water, gas, electric lighting and heating	1,463 89
Ice	738 68
Apparatus, chemicals and laboratory supplies	10,631 44
Shipping materials	94 59
Purchase of animals	2,003 61
Food for animals	3,915 35
Stable supplies	64 85
Labor and materials	977 48
Miscellaneous	565 84

Total	\$24,500 46
Unexpended balance	199 54

\$24,700 00

Wassermann Laboratory.

Appropriation for personal services	\$6,100 00
Credit by cash received from United States government during 1921	4,743 45
	<hr/>
	\$10,843 45
Expended for personal services	8,920 28

Balance	\$1,923 17
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Appropriation for expenses	\$3,600 00
Credit by cash received from United States government during 1921	2,797 75
	<hr/>
	\$6,397 75

Travel	\$2 20
Express	33 88
Printing	455 18
Telephone and postage	650 81
Books and stationery	214 57
Apparatus, chemicals and laboratory supplies	890 18
Shipping materials	180 39
Purchase of animals	1,570 94
Food for animals	681 70

Labor and materials	\$430 47
Ice	148 80
Miscellaneous	103 61
	<hr/>
Total	\$5,362 73
Unexpended balance	1,035 02
	<hr/>
	\$6,397 75

DIVISION OF FOOD AND DRUGS.

Appropriation for personal services	\$29,930 00
Expended for personal services	29,825 51
	<hr/>
Balance	\$104 49
Appropriation for expenses	\$11,000 00
Brought forward from 1920	13 98
Credit account of refund	39 00
	<hr/>
	\$11,052 98
Travel	\$6,119 12
Express	35 43
Printing	573 21
Telephone and postage	462 89
Books, maps and stationery	266 03
Typewriting supplies and repairs	99 01
Mimeograph and office supplies	376 86
Apparatus and chemicals	2,042 68
Sundry laboratory supplies	106 26
Branding outfits	73 08
Samples	623 69
Extra services	19 05
Miscellaneous	249 88
	<hr/>
Total	\$11,047 19
Unexpended balance	5 79
	<hr/>
	\$11,052 98

MANUFACTURE AND DISTRIBUTION OF ARSPHENAMINE.

Appropriation for personal services	\$6,500 00
Credit by cash received from United States government during 1921	4,774 35
	<hr/>
	\$11,274 35
Expended for personal services	9,523 06
	<hr/>
Balance	\$1,751 29

Appropriation for expenses	\$4,666 00
Credit by cash received from United States government during 1921	4,321 29
	<hr/>
	\$8,987 29
Credit by refunds	69 84
	<hr/>
	\$9,057 13
Travel	\$89 71
Express	161 49
Printing	23 09
Telephone and postage	48 78
Rent	1,440 00
Water, heat and light	606 15
Ice	63 27
Apparatus, chemicals and laboratory supplies	4,717 58
Services testing arsphenamine	833 33
Animals	481 00
Royalty on arsphenamine distributed	287 73
Shipping	85 49
Labor	66 01
Miscellaneous	20
	<hr/>
Total	\$8,903 83
Unexpended balance	153 30
	<hr/>
	\$9,057 13

WATER SUPPLY AND SEWAGE DISPOSAL.

Division of Sanitary Engineering.

Appropriation for personal services	\$33,000 00
Expended for personal services	32,970 21
	<hr/>
Balance	\$29 79
Appropriation for expenses	\$6,850 00
Brought forward from 1920	310 00
	<hr/>
	\$7,160 00
Travel	\$4,369 09
Express	10 42
Printing and binding	321 35
Telephone and postage	251 94
Maps, blue prints and books	286 19
Stationery, drawing materials and typewriting supplies	961 80
Apparatus and materials	414 18

Special investigation	\$44 12
Services, collecting samples and reading gauges	381 90
Labor	54 70
Miscellaneous	61 34
	<hr/>
Total	\$7,157 03
Unexpended balance	2 97
	<hr/>
	\$7,160 00

Division of Water and Sewage Laboratories.

Appropriation for personal services	\$28,000 00
Expended for personal services	27,805 51
	<hr/>
Balance	\$194 49
Appropriation for expenses	\$6,825 00
Credit by refunds	156 45
	<hr/>
	\$6,981 45

Travel	\$391 02
Express	1,760 17
Printing and binding	209 54
Telephone and postage	53 72
Maps, blue prints and books	10 00
Stationery, typewriting supplies and office equipment	176 67
Apparatus and materials	3,228 19
Labor	658 10
Rent	150 00
Miscellaneous	18 50
	<hr/>
Total	\$6,655 91
Unexpended balance	325 54
	<hr/>
	\$6,981 45

DIVISION OF TUBERCULOSIS (SANATORIA).

Appropriation for personal services	\$15,860 00
Expended for personal services	13,486 90
	<hr/>
Balance	\$2,373 10
Appropriation for expenses	\$3,000 00
Brought forward from 1920	274 60
	<hr/>
	\$3,274 60

Travel	\$1,263 77
Postage	360 00
Printing	903 78
Telephone	74 10
Books and subscriptions	22 30
Stationery	128 34
Office equipment	195 67
Typewriter supplies	94 17
Miscellaneous	42 00
	<hr/>
Total	\$3,084 13
Unexpended balance	190 47
	<hr/>
	\$3,274 60

Appropriation to cover payment of subsidies to which certain cities and towns are entitled under the provisions of chapter 597, Acts of 1911, as amended by chapter 290, General Acts of 1917	\$138,000 00
Expended	136,444 34
	<hr/>
Balance	\$1,555 66

STATE EXAMINERS OF PLUMBERS.

Appropriation for the year ended Nov. 30, 1921	\$4,700 00
Appropriation for 1920 deficiency	57 78
Brought forward from 1920	57 99
	<hr/>
	\$4,815 77

Salaries	\$3,500 00
Travel	741 79
Express	48 61
Printing	152 40
Postage	50 88
Books and stationery	99 19
Telephone and lighting	106 83
Plumbers' materials	6 00
Extra services	58 90
Cleaning	28 75
Miscellaneous	22 42
	<hr/>
Total	\$4,815 77

BUBONIC PLAGUE INVESTIGATION.

Appropriation	\$5,000 00
Salaries	\$3,611 40
Travel	64 54

Express	\$18 58
Books and maps	7 25
Field supplies	371 48
Educational material	95 71
Miscellaneous	4 05
	<hr/>
Total	\$4,173 01
Balance returned to treasury	826 99
	<hr/>
	\$5,000 00

NEPONSET RIVER.

Appropriation for the apportionment and assessment of betterments upon certain real estate in the Neponset Valley	\$4,500 00
Expended for services	1,441 90
	<hr/>
Balance	\$3,058 10

PENIKESE HOSPITAL.

Appropriations for the maintenance of Penikese Hospital, including necessary expense for preparation and transportation of the inmates to the United States Hospital, and any other expenses incidental to the closing of Penikese Hospital, and subsequent care of State's property	\$17,162 00
Transfer from Governor's fund	1,770 70
	<hr/>
	\$18,932 70

Personal services	\$7,515 18
Travel, transportation and office expenses	1,251 45
Food	1,907 88
Clothing and materials	385 26
Furnishings and household supplies	520 63
Medical and general care	1,433 36
Heat, light and power	4,160 57
Farm and stable	1,490 75
Repairs, ordinary	267 61
	<hr/>
Total	\$18,932 69

Appropriation to cover expenses connected with advertising and sale of Penikese Island ¹	\$140 00
Expended	110 86
	<hr/>
Balance	\$29 14

¹ Transferred by the Governor and Council from their appropriation for extraordinary expenses.

RECAPITULATION.

	Appropriation plus Credits.	Total Appropriation.	Expended.
For the Division of Administration	{ \$31,200 00 14 33 }	\$31,214 33	\$26,918 55
For the Division of Hygiene	{ 44,000 00 280 35 }	44,280 35	41,800 79
For the Division of Communicable Diseases	{ 79,090 00 22 25 }	79,112 25	77,543 31
For the Subdivision of Venereal Diseases	{ 21,670 00 14,745 98 ¹ }	36,415 98	30,546 64
For the Division of Biologic Laboratories:			
Antitoxin and Vaccine Laboratory	53,460 00	53,460 00	53,110 87
Wassermann Laboratory	{ 9,700 00 7,541 20 ¹ }	17,241 20	14,283 01
For the Division of Food and Drugs	{ 40,930 00 52 98 }	40,982 98	40,872 70
For the manufacture and distribution of arsphenamine	{ 11,166 00 9,165 48 ¹ }	20,331 48	18,426 89
For the Division of Sanitary Engineering	{ 39,850 00 310 00 }	40,160 00	40,127 24
For the Division of Water and Sewage Laboratories	{ 34,825 00 156 45 }	34,981 45	34,461 42
For the Division of Tuberculosis (Sanatoria)	{ 18,860 00 274 60 }	19,134 60	16,571 03
For subsidies to cities and towns . . . . .	.	138,000 00	136,444 34
For the State Examiners of Plumbers	{ 4,700 00 115 77 }	4,815 77	4,815 77
For Penikese Hospital . . . . .	.	18,932 70	18,932 69
For advertising and sale of Penikese Hospital . . . . .	.	140 00	110 86
For bubonic plague investigation . . . . .	.	5,000 00	4,173 01
For the apportionment and assessment of betterments upon real estate in Neponset Valley.	.	4,500 00	1,441 90
Totals . . . . .	.	\$588,703 09	\$560,581 02

¹ Received from United States government.

WATER SUPPLY AND SEWERAGE.

DEPARTMENT OF PUBLIC HEALTH,
BOSTON, Jan. 18, 1922.

To the General Court of Massachusetts.

The Department of Public Health presents herewith a report of its doings for the year which ended Nov. 30, 1921, under the provisions of laws relative to the oversight and care of inland waters, including advice to cities, towns and others in regard to water supply, drainage and sewerage and questions relating thereto.

CARE OF INLAND WATERS.

WATER SUPPLY AND SEWERAGE.

The Department received during the year 216 applications, an increase of 40 per cent over the highest year since 1915. Of these, 153 were in relation to water supplies, 10 to sources of ice supply, 16 to sewerage, drainage and sewage disposal, 10 to pollution of streams, and 27 to miscellaneous matters.

Water Supplies.

As has been stated in the reports of the Department of recent years, water works construction has been extremely limited during and since the war because of high cost of labor and materials; but the past year has shown a somewhat increased activity in this form of construction, and although no new works have been installed several municipalities and fire districts have found it necessary to make extensions to existing systems in order to carry them through a short period of low rainfall in the latter part of the year. The town of Norwood has installed additional wells in order to increase the capacity of its ground water supply in the valley of Purgatory Brook, and the city of North Adams found it necessary again to take water from certain deep wells located in a thickly populated part of the city, while the town of Methuen has taken steps toward securing an additional supply of water from the ground near the Merrimack River. The total number of cities and towns in the State supplied with water

wholly or in part from public works at the end of the year 1921 was 216, the aggregate population of which in 1920 was 3,702,549. The remaining towns, 138 in number, have no general system of water supply, though in many of them there are cases in which either several houses are supplied through a common pipe, or a small district or public institution is served, usually from a spring on a neighboring hillside, under the control of an association or company formed for the purpose. The aggregate population of the towns not provided with public water supplies in 1921 was 149,807, according to the census of 1920, and there are now only 13 towns, having in 1920 a population in excess of 2,500, which are not provided with public water supplies. They are the following:—

TOWN.	Population (Census of 1920).
Tewksbury	4,450
Templeton	4,019
Somerset	3,520
Warren	3,467
Westport	3,115
Seekonk	2,898
Wilbraham	2,780
Wilmington	2,581
Sutton	2,578
Hanover	2,575
Dighton	2,574
Harvard	2,546
Bourne	2,530
Total	39,633

In many of these towns public water supplies are very badly needed, not only for public comfort, convenience and fire protection, but principally for the protection of the public health, since well waters, which are the usual sources of supply in these towns, are usually more or less polluted and in many cases unfit for use. In many such villages the sewage for a great many years has been disposed of by discharge into vaults and cesspools, and the seepage from such places, which tends to flow to a lower level, often finds its way into a well in the neighborhood where the ground water is lowered on account of the draft for domestic use.

Difficulties of Providing Water and Sewerage Facilities in Certain Districts.

Attention was called in the last two reports to the problem in water supply and sewerage brought about by the development of lands for occupation by summer cottages and camps, which have been increasing very rapidly, not only on the seashore, but also along the banks of rivers and the shores of lakes and ponds. A similar important problem is that of water supply and sewerage in connection with real estate developments adjacent to or in the neighborhood of cities and larger towns. In some places lands are built upon which are so located or are of such a character that it is impracticable to provide a public water supply or an effective system of sewerage or drainage, unless at excessive cost.

The attention of the Department has again been called to a number of such districts where houses, sometimes in considerable numbers, have been constructed on rocky soil where the ledge has little or no earth covering and where it is impracticable or exceedingly difficult and expensive to lay pipes for water supply and sewerage. The agency developing such lands and the purchaser often fail to realize or give little heed to the difficulties likely to be met with in maintaining satisfactory sanitary conditions in and about such premises, and the municipality usually refuses to extend proper water supply and sewerage service to such districts, at least until the streets are built to an established grade and accepted by the city or town. In other cases, areas of low, wet land have been built upon where proper drainage is impracticable except at an expense which may be far in excess of the value of the property involved.

Many of the difficulties arising from objectionable real estate developments could be prevented if cities and towns generally would accept and put in force the Board of Survey laws already provided by the Legislature.

Rainfall and Flow of Streams.

The rainfall for the year 1921 was slightly below normal as deduced from observations at a number of rainfall stations in the State having continuous records of forty-seven years or more. Excessive rains occurred during the latter part of June and early part of July, several stations reporting over 10 inches between June 28 and July 16.

In the Wachusett watershed, located near the middle of the State, the total rainfall for 1921 was 45.66 inches or 0.33 inches in excess of the normal for this watershed. The rainfall exceeded the normal in the months of February, April, July and November. The greatest

deficiency occurred in August, amounting to 2.06 inches, followed by a deficiency of 1.43 inches in September and 1.18 inches in October, a total of 4.67 inches for the three months.

The flow of the Nashua River during 1921 was also slightly in excess of the normal. Owing to the excessive precipitation in November and December of 1920 and the very mild winter of 1920-21, the flow of the Nashua River in the month of January was in excess of the normal, though the rainfall was below it. The flow in the months of May and July was greatly in excess of the normal, while the greatest deficiency occurred in June, the flow being only slightly over half the normal. Deficiencies also occurred in the months of February, March, April, August, September and October.

The deficiency in rainfall from the middle of July to November threatened a shortage of water in some places; but the excessive rains of November removed the danger, and the use of emergency supplies, except in the case of one city, became for the time being unnecessary.

Examination of Water Supplies.

Most of the sources of public water supply have been inspected as usual during the past year, and samples of water from nearly all of the supplies have been analyzed at intervals as in previous years.

Sanitary Protection of Public Water Supplies.

Rules and regulations were established by the Department during the year for the sanitary protection of the water supply of the Adams Fire District and of the water supply of Newburyport taken from the reservoirs on the Artichoke River, and the rules and regulations were re-established for the water supply of Haverhill, a question having arisen as to whether they had been properly adopted at an earlier date. The water supplies of the following cities and towns are now covered by rules and regulations: —

Abington and Rockland.

Adams.

Amherst.

Andover.

Attleboro.

Braintree.

Brockton and Whitman.

Cambridge.

Chester.

Chicopee.

Concord.

Dalton.

Danvers and Middleton.

Easthampton.

Fall River.

Falmouth.

Fitchburg.

Gardner.

Great Barrington (Housatonic).

Greenfield.

Haverhill.

Hingham and Hull.

Holden.

Holyoke.

Hudson.	Plymouth.
Lee.	Randolph and Holbrook.
Leicester (Cherry Valley and Rochdale).	Rockport.
Leominster.	Russell.
Lincoln and Concord.	Rutland.
Lynn.	Salem and Beverly.
Marlborough.	Springfield.
Maynard.	Springfield and Ludlow.
Montague.	Stockbridge.
Newburyport.	Taunton.
Northampton.	Wakefield.
North Andover.	Westfield.
Northborough.	West Springfield.
Norwood.	Weymouth.
Peabody.	Williamsburg.
Pittsfield.	Winchester.
	Worcester.

Examination of Sewer Outlets discharging into the Sea.

In connection with the improvements in and about Plymouth a plan was presented to the Department early in the summer for the extension of the main sewer outlet of the Plymouth sewerage system. This work has been completed, and has effected an improvement in the disposal of sewage from this town. Very little change has been made in the conditions surrounding the various other main sewer outlets discharging into the sea or into tidal estuaries. Some of these are highly objectionable, and their improvement is greatly needed, as noted in previous reports, but the outlets discharging into deep water continue to be satisfactory.

In 1914 the Department approved plans for a sewerage system for the town of Hull, including a proposed outlet into the sea. The system has not been constructed, and offensive conditions are caused in some of the thickly settled sections of the town in the summer season by the lack of proper means of sewage disposal. An adequate sewerage system is an immediate necessity in these areas.

Sewage Disposal Systems.

At Andover the sewerage system has been extended to include Shawsheen Village. The quantity of sewage has exceeded the capacity of the sewage disposal works for a number of years, and with additional sewage from the newer districts of the town now requiring disposal only a portion of the sewage can be treated upon the present filters. A large mill and a large number of dwelling houses have been

constructed very near the filter beds, and near the end of the year a plan was presented providing for the abandonment of this sewage disposal works and the disposal of the sewage elsewhere.

At Brockton the new additional sewage disposal works, comprising a series of large settling tanks and $1\frac{1}{2}$ acres of trickling filters, have been practically completed during the year, and will soon be placed in operation.

Several of the sewage disposal works in the State, particularly those at Clinton, Framingham, Milford, Natick and Norwood, have been heavily overloaded during the year, and at some of these places, namely, at Clinton and Milford, considerable quantities of sewage have been allowed to overflow without treatment. At Framingham the load on the sewage filters is greater in comparison to the area than at any other plant in the State, but it has been possible by careful management to prevent the overflow of any considerable quantity of sewage, though sewage stands on the surface of the filters sometimes for long periods.

At Gardner and Northbridge additional sewerage facilities have been provided. At Milford the underdrainage system was thoroughly reconstructed during the past year, but a considerable addition to the filtration area is necessary in order to treat all the sewage and prevent the serious pollution of the Charles River. Considerable quantities of sewage have been allowed to overflow without treatment from the sewerage systems at Andover, Easthampton, Leicester, Pittsfield, Southbridge and Spencer, but no material difficulty has been encountered in the treatment of the sewage at Attleboro, Concord, Hopedale, Hudson, Marlborough, North Attleborough and Northbridge.

At Worcester the work of improving the sewage disposal works as required by chapter 171, Special Acts of the year 1919, has been carried on during the year, and the amount of work done and the expenditures made to date comply fully with the requirements of the act.

Objectionable Conditions due to Lack of Sewerage.

Attention has previously been called in the annual reports of this Department to the objectionable conditions due to the lack of adequate sewerage facilities in many of the larger towns. In many towns which have been provided with public water supplies for long periods and where the sewage is disposed of largely by means of cesspools, the ground is becoming saturated with sewage and local waters are becoming more and more seriously polluted. With the improvement now rapidly taking place in the conditions affecting the construction of

works, it is to be expected that adequate provision for sewage disposal in such towns will not be much longer delayed. Among the towns referred to are the following: —

Braintree.	Rockland.
Danvers.	Stoughton.
Hull.	Webster.
Mansfield.	Weymouth.
Marblehead.	Whitman.
Maynard.	Winchendon.

Plans for sewerage systems in most of these towns have already been prepared.

EXAMINATION OF RIVERS.

The distribution of the rainfall in the year 1921 has been on the whole favorable for the maintenance of satisfactory sanitary conditions in the rivers of the State, for the reason that the flow was exceptionally large during the spring and the greater part of the summer and was not extraordinarily low at any other period of the year. Manufacturing also was considerably decreased by the business depression, and the quantity of manufacturing wastes discharged into the rivers was less than normal.

Aberjona River.

The results of the analyses of samples of water from the Aberjona River show no material change from the last two or three years. Complaint was made during the year relative to the pollution of this stream, however, and the conditions complained of have not been wholly removed. It is probably impracticable to remedy satisfactorily the remaining sources of pollution of the main stream until a sewer is constructed in general accordance with the plan accompanying the report of this Department authorized by chapter 34 of the Resolves of 1918 and chapter 14 of the Resolves of 1919 (see House Document No. 1216, dated Jan. 14, 1920).

Assabet River.

The results of the analyses of samples of water from the Assabet River show that from a point above Westborough a slight increase in pollution has taken place as far down as the town of Hudson, while below Hudson the pollution is more marked. Below Maynard, also, the pollution is greater than in 1920, though not as great as in certain earlier years.

Blackstone River.

The results of analyses of samples of water from the Blackstone River above the Worcester sewage disposal works indicate a less objectionable condition than has been the case in several years in the past, but below the sewage disposal works the river has shown more evidence of pollution than during the past two years. The same is true below Millbury, though farther down the valley its condition has shown little change in the last few years.

Charles River.

The Charles River immediately below Milford has been more polluted than at any time since 1910, a condition due largely to the overflow of sewage during the reconstruction of the underdrainage system of the Milford sewage disposal works. At Medway and Medfield, also, the river shows signs of greater pollution, but farther down the stream there has been little change as compared with the conditions in former years. The factories along this stream and its tributaries have not been operated to capacity during the year, and there has been less pollution by factory waste than in previous years.

Chicopee River.

The condition of the Chicopee River and its tributaries has in general been about the same as last year. The Ware River, one of the main tributaries, has on the whole been less objectionable during the year than in recent years, due to the high rainfall of the summer and a reduction in the amount of manufacturing. The Seven Mile River, the main feeder of the Quaboag River, one of the three main tributaries of the Chicopee, has been badly polluted for a number of years by the overflow of sewage from the sewerage system of the town of Spencer. This sewage is causing very objectionable conditions in the water of Quaboag Pond, farther down the river. It will be necessary to prevent the overflow of sewage from the Spencer sewerage system into the Seven Mile River in order to protect the public health in the valley of this river below Spencer.

Concord and Sudbury Rivers.

The condition of the Sudbury River has not been objectionable during the year, and the same is true of the Concord River to a point near its entrance into the city of Lowell where it has been polluted at times as in previous years.

Connecticut River.

The condition of the Connecticut River, which is polluted by sewage in large quantities from the cities and towns along its banks, has shown little change as compared with previous years, and there is very little evidence of increasing pollution of the main stream excepting in the immediate neighborhood of some of the main sewer outlets. These conditions have been remedied in several instances by the extension of the sewer outlets to a proper distance from the shore. Mill River below Northampton has shown evidence of greater pollution than during the last two years, and the same is true of the Manhan River at the mouth.

Deerfield River.

The condition of the Deerfield River has not been objectionable during the year.

French River.

The French River below Webster has shown more evidence of pollution than in 1919 or 1920. This condition is likely to continue until the sewage of the town of Webster is purified before discharge into the stream. Plans for disposal works were approved by this Department some years ago, but the works have not yet been constructed.

Hoosick River.

There has been a marked increase in the pollution of the Hoosick River below North Adams as compared to 1920, and during the year the Department has again recommended that the sewage of the city of North Adams be removed from the river and properly purified.

Housatonic River.

The branches of the Housatonic River above Pittsfield have shown a slight increase in the amount of pollution in the past year, and the condition of the West Branch below Pittsfield was objectionable during the period of low flow in the late summer and fall. The main stream immediately below Pittsfield has shown more evidence of pollution than in 1920, but at Stockbridge and Great Barrington conditions have not changed materially in the last two or three years.

Merrimack River.

The Merrimack River below Lawrence has shown a greater degree of pollution than in 1920, though the conditions have not been as objectionable as during the three years previous to 1920. Above

Haverhill a slight increase in pollution has been noted, but below Haverhill the condition of the river has not changed materially as compared with its condition last year.

Millers River.

The Millers River has shown less evidence of pollution below Gardner than at any time for several years, and lower down its course its condition has not been materially different from that of previous years.

Nashua River.

The North Branch of the Nashua River below Fitchburg has shown greater evidence of pollution than in 1920. A large quantity of manufacturing waste, together with sewage from public sewers which overflows at times of storm, is discharged into the river in this city.

The sewage of the city of Leominster, excepting that from a very small section of the city which is still being diverted to an experimental filter, is discharged untreated into Monoosnock Brook, and flows thence into the North Branch of the river below the city.

The North Branch of the Nashua River at its mouth has shown more evidence of pollution than in 1920, and this is also true of the South Branch below Clinton. The main stream below the confluence of the two branches has been on the whole in a slightly better condition than during the last few years.

Neponset River.

The results of the analyses of samples of water from the Neponset River show a slight increase in pollution just above and just below Hawes Brook, and the same is true of Hawes Brook at the mouth. At points farther downstream an improvement has taken place, and in Hyde Park and at the mouth the river has been in better condition than for many years.

North River in Peabody and Salem.

The North River in Peabody and Salem has been the cause of very serious complaint during the year, and the condition of this stream was the subject of a hearing before the Department in response to a petition from the city of Salem. The following recommendation was made relative to this stream:—

The Department of Public Health has considered the petition of the city of Salem requesting a hearing upon the condition of North River and such action by this Department as it may deem necessary to abate an alleged nuisance

therein, and in response to this petition has examined the locality and has given a hearing as requested in the petition.

The Department finds that a nuisance exists in the North River caused by the discharge of foul organic matters of various kinds into the river or upon its banks, whence it is washed into the stream at times of rain. One of the chief causes of complaint appears to be the surcharging of the trunk sewer, the carrying capacity of which has been found to be greatly reduced at times by deposits therein. These deposits result from a variety of causes. The manufacturing wastes before being discharged into the sewers are generally passed through settling tanks or other form of treatment, but there are indications that wastes from different processes after entering the sewers cause a precipitation of solid matters which collects on the bottom and sides of the trunk sewer. Furthermore, examinations have shown that in the operation of the pumps the sewage is at times ponded in the trunk sewer, reducing the velocity of flow and thus tending to cause deposits therein. It is evident that the capacity of the force main is but little in excess of the usual flow of sewage, making proper operation of the system increasingly difficult as time goes on.

In order to prevent the discharge of waste matters into the North River and remove the nuisance therein, it is important first to investigate fully the causes of the present nuisance, the means necessary for its prevention, and to devise a suitable plan for relief. Such an investigation will involve an expenditure of a considerable sum of money for which no provision has been made in the appropriations available to this Department. The Department recommends that the city of Salem, either alone or in conjunction with the city of Peabody, petition the Legislature for an order directing a thorough investigation of the whole question of the condition of North River and of the trunk sewer and its appurtenances and the preparation of a practicable plan for the removal of the nuisance now existing in North River. The investigation should be committed to such agency as the Legislature may direct, and a suitable sum of money provided to defray the necessary expenses of the work.

Taunton River.

The condition of the Salisbury Plain River below Brockton and that of the Coweaset River below the Brockton sewage filters has varied considerably from year to year of late. The results of analyses indicate in general a slight improvement in the condition of the former stream during the past year, while the reverse is true of the latter. The condition of the Coweaset River should show improvement when the new Brockton sewage disposal works now just completed are put into operation. The Town River, into which the Coweaset River discharges, has been slightly more polluted than during 1920 both above and below Bridgewater. Above Taunton the main river has been more noticeably polluted than in 1920, but less than in earlier years, while below Taunton at Berkeley bridge the condition of the river has been more objectionable than in 1920.

Other Rivers.

The examinations of other rivers have shown no change in their condition worthy of note.

PROTECTION OF THE PUBLIC HEALTH IN THE VALLEY OF THE NEPONSET RIVER.

Under the provisions of chapter 655 of the Acts of the year 1911, and legislation in amendment thereof and in addition thereto, the Department of Public Health has made returns to the Treasurer of the Commonwealth and to the board of assessors of each of the municipalities mentioned in said legislation of schedules and plans, showing the parcels of lands which it finds have been benefited by the work done or by changes made under said legislation. Returns have also been made of the areas of said parcels and the names of the owners or occupants thereof, so far as they can be ascertained, together with the amount of the benefits which the Department finds accruing to each of said parcels.

Under further provisions of said legislation, the Department of Public Health has made application to the Supreme Judicial Court, requesting the court to appoint three commissioners to determine what proportions of one-half of the total expense incurred under the acts above referred to shall be paid by the various municipalities mentioned in the acts, and the commissioners have been appointed by the court.

OIL REFINERIES.

Several petitions have been received during the year relative to odors from offensive trades, particularly from oil refineries. Three refineries have been established in this Commonwealth since the war, — one at East Braintree, one at Fall River and one at Everett, — where the crude oil treated contains considerable quantities of sulphur, and the gases given off, if not properly controlled, are extremely offensive. Furthermore, the pollution of waters near the refineries by oil has been a serious matter and a difficult one to control satisfactorily.

The complaints relative to the pollution of the air and water by these refineries, particularly the odors therefrom, have been widespread, and a large amount of work has been necessary in the investigation of complaints and of methods of relief.

Changes have been made and appliances provided to prevent the escape of odor and oil at each of the refineries, and a great improve-

ment has been effected in the control of the more objectionable odors. Much more remains to be done, and more study of this problem is necessary in devising adequate means of preventing the escape of these odors and also in preventing the escape of oil which pollutes neighboring waters.

The refineries are located near thickly settled communities and at points unsuited for any purpose where danger of the escape of objectionable odor is involved, while suitable locations might probably have been found in the beginning and the danger of nuisance largely avoided. It is most important that locations proposed for offensive trades or processes that are likely to result in offensive odors or the pollution of inland waters shall be selected under expert advice before the works are constructed for such purposes.

WATER SUPPLY NEEDS AND RESOURCES.

The work of investigating the water supply needs and resources of the State, under the provisions of chapter 49 of the Resolves of 1919, has been carried on as rapidly as possible during the year jointly with the Metropolitan District Commission, and a report thereon will be presented in a separate document.

EUGENE R. KELLEY, M.D.,

Commissioner of Public Health.

SUPPLEMENT

DIVISION OF SANITARY ENGINEERING

X. H. GOODNOUGH, *Director*

REPORT OF DIVISION OF SANITARY ENGINEERING.

In carrying out the duties of this Division which relate in general to the oversight and care of inland waters, including advice to cities, towns and persons relative to water supply, drainage and sewerage and questions relating thereto, the Department during the year 1921 has acted upon 216 applications, an increase of 40 per cent over the highest number received in any year since 1915. Of these applications, 153 related to water supply, 10 to sources of ice supply, 16 to sewerage, drainage and sewage disposal, 10 to pollution of streams, and 27 to miscellaneous matters.

Very few additions or enlargements of the water supply and sewerage systems in the cities and towns have been made during the past few years chiefly because of the high cost of materials and labor. For several years, also, the rainfall has exceeded the average and has been evenly distributed, so that the yield of sources of water supply has greatly exceeded their dependable capacities. The most noteworthy addition to any of the sources of water supply in the State is that of Norwood, where a new group of tubular wells was completed in the latter part of the year.

The total number of cities and towns in the State is 355, an increase of one over the year 1920 caused by the establishment of East Brookfield as a separate town on Jan. 3, 1921. The former city of Methuen reassumed the town form of government on April 16, 1921, and the town of Westfield became a city on Jan. 1, 1921. Of the 38 cities and 317 towns in the State, 217 were supplied with water wholly or in part from public works at the end of the year 1921. No new works, however, were installed during the year, but a portion of the works formerly classified under the town of Brookfield have been taken over by the town of East Brookfield, thereby adding one to the number of municipalities supplied with water for the year 1921. According to the census of 1920, the aggregate population of those cities and towns which are provided with public water supplies was 3,702,549, while that of the 138 towns which have no general system of water supply was 149,807. There are now 13 towns, having in 1920 a population in excess of 2,500, which are not provided with public water supplies. They are the following: —

TOWN.	Population (Census of 1920).	TOWN.	Population (Census of 1920).
Tewksbury	4,450	Wilmington	2,581
Templeton	4,019	Sutton	2,578
Somerset	3,520	Hanover	2,575
Warren	3,467	Dighton	2,574
Westport	3,115	Harvard	2,546
Seekonk	2,898	Bourne	2,530
Wilbraham	2,780	Total (13 towns)	39,633

A public water supply is greatly needed in the thickly populated parts of many of these towns not only for public comfort, convenience and fire protection but especially for the protection of the public health. As a rule, the water supplies commonly used in these municipalities are taken from wells in thickly settled areas, and such sources are usually polluted by sewage from neighboring vaults and cesspools, continuous seepage from which through a long period of years has gradually saturated the ground in their vicinity and has a tendency to flow toward the wells which are usually the low points in the water table in such localities. A public supply is the only satisfactory solution of this health problem in such towns.

DIFFICULTIES OF PROVIDING WATER AND SEWERAGE FACILITIES IN CERTAIN DISTRICTS.

Attention was called in the last two reports to the problem in water supply and sewerage brought about by the development of lands for occupation for summer cottages and camps, which have been increasing very rapidly not only on the seashore but also along the banks of rivers and the shores of lakes and ponds. A similar important problem is that of water supply and sewerage in connection with real estate developments adjacent to or in the neighborhood of cities and larger towns. In some places lands are built upon which are so located or are of such a character that it is impracticable to provide them with a public water supply or an effective system of sewerage or drainage, unless at excessive cost.

The attention of the Department has again been called to a number of such districts where houses, sometimes in considerable numbers, have been constructed on rocky soil where the ledge has little or no earth covering, so that it is impracticable or exceedingly difficult and expensive to lay pipes for water supply and sewerage. Both the agency

developing such lands and the purchaser often fail to realize or give little heed to the difficulties likely to be met with in maintaining satisfactory sanitary conditions in and about such premises, and the municipality usually refuses to extend proper water supply and sewerage service to such districts, at least until the streets are built to an established grade and accepted by the city or town. In other cases, areas of low, wet land have been built upon where proper drainage is impracticable except at an expense which may be far in excess of the value of the property involved.

Many of the difficulties arising from objectionable real estate developments could be prevented if cities and towns generally would accept and put in force the board of survey laws already provided by the Legislature.

THE SANITARY PROTECTION OF PUBLIC WATER SUPPLIES.

Under the provisions of chapter 111 of the General Laws, rules and regulations were established by the Department during the past year for the sanitary protection of the water supply of the Adams Fire District and of the city of Newburyport, and rules and regulations were re-established for the water supply of Haverhill, a question having arisen as to whether the rules had been properly adopted at an earlier date. Rules and regulations have been made by the Department for the protection of the water supplies of the following cities, towns and districts: —

Abington and Rockland.
 Adams.
 Amherst.
 Andover.
 Attleboro.
 Braintree.
 Brockton and Whitman.
 Cambridge.
 Chester.
 Chicopee.
 Concord.
 Dalton.
 Danvers and Middleton.
 Easthampton.
 Fall River.
 Falmouth.
 Fitchburg.
 Gardner.
 Great Barrington (Housatonic).

Greenfield.
 Haverhill.
 Hingham and Hull.
 Holden.
 Holyoke.
 Hudson.
 Lee.
 Leicester (Cherry Valley and
 Rochdale).
 Leominster.
 Lincoln and Concord.
 Lynn.
 Marlborough.
 Maynard.
 Montague.
 Newburyport.
 Northampton.
 North Andover.
 Northborough.

Norwood.
 Peabody.
 Pittsfield.
 Plymouth.
 Randolph and Holbrook.
 Rockport.
 Russell.
 Rutland.
 Salem and Beverly.
 Springfield.

Springfield and Ludlow.
 Stockbridge.
 Taunton.
 Wakefield.
 Westfield.
 West Springfield.
 Weymouth.
 Williamsburg.
 Winchester.
 Worcester.

EXAMINATION OF SEWER OUTLETS DISCHARGING INTO THE SEA.

In connection with the improvements in and about Plymouth a plan was presented to the Department early in the summer for the extension of the main sewer outlet of the Plymouth sewerage system. This work has been completed and has effected an improvement in the disposal of sewage from this town. Very little change has been made in the conditions surrounding the other main sewer outlets discharging into the sea or into tidal estuaries. Some of these are highly objectionable and their improvement is greatly needed as noted in previous reports, but the outlets discharging into deep water continue to be satisfactory.

In 1914 the Department approved plans for a sewerage system for the town of Hull, including a proposed outlet into the sea. The system has not been constructed and offensive conditions are caused in some of the thickly settled sections of the town in the summer season by the lack of proper means of sewage disposal. An adequate sewerage system is an immediate necessity in these areas.

OBJECTIONABLE CONDITIONS DUE TO LACK OF SEWERAGE.

Attention has previously been called in the annual reports of this Department to the objectionable conditions due to the lack of adequate sewerage facilities in many of the larger towns. In many towns which have been provided with public water supplies for long periods and where the sewage is disposed of largely by means of cesspools, the ground is becoming saturated with sewage, and local waters are becoming more and more seriously polluted. With the improvement now rapidly taking place in the conditions affecting the construction of works, it is to be expected that adequate provision for sewage disposal in such towns will not be much longer delayed. Among the towns referred to are the following: —

Braintree.	Rockland.
Danvers.	Stoughton.
Hull.	Webster.
Mansfield.	Weymouth.
Marblehead.	Whitman.
Maynard.	Winchendon.

Plans for sewerage systems in most of these towns have already been prepared.

NUISANCES FROM NOXIOUS TRADES.

Several petitions have been received during the year relative to odors from offensive trades, particularly from oil refineries. Three refineries have been established in this Commonwealth since the war, — one at East Braintree, one at Fall River and one at Everett, where the crude oil treated contains considerable quantities of sulphur, and the gases given off, if not properly controlled, are extremely offensive. Furthermore, the pollution of waters near the refineries by oil has been a serious matter and a difficult one to control satisfactorily.

The complaints relative to the pollution of the air and water by these refineries, particularly by the odors therefrom, have been widespread, and a large amount of work has been necessary in the investigation of complaints and of methods of relief.

Changes have been made and appliances provided to prevent the escape of odor and oil at each of the refineries, and a great improvement has been effected in the control of the more objectionable odors. Much more remains to be done and further study of this problem is necessary in devising adequate means of preventing the escape of these odors and also in preventing the escape of oil which pollutes neighboring waters.

The refineries are located near thickly settled communities and at points unsuited for any purpose where danger of the escape of objectionable odor is involved. If the danger had been recognized in the beginning, suitable locations might probably have been found and the nuisance avoided. It is most important that locations proposed for offensive trades or processes that are likely to result in offensive odors or the pollution of inland waters shall be selected with proper care before the works are constructed for such purposes.

WATER SUPPLY NEEDS AND RESOURCES.

The work of investigating the water supply needs and resources of the State, under the provisions of chapter 49 of the Resolves of 1919, has been carried on as rapidly as possible during the year jointly with the Metropolitan District Commission, and a report thereon has been presented in a separate document.

PROTECTION OF THE PUBLIC HEALTH IN THE VALLEY OF THE NEPONSET RIVER.

Under the provisions of chapter 655 of the Acts of the year 1911, and legislation in amendment thereof and in addition thereto, the Department of Public Health has made returns to the Treasurer of the Commonwealth and to the board of assessors of each of the municipalities mentioned in said legislation of schedules and plans, showing the parcels of land which it finds have been benefited by the work done or by changes made under said legislation. Returns have also been made of the areas of said parcels and the names of the owners or occupants thereof, so far as they can be ascertained, together with the amount of the benefits which the Department finds accruing to each of said parcels.

Under further provisions of said legislation, the Department of Public Health has made application to the Supreme Judicial Court, requesting the court to appoint three commissioners to determine what proportion of one-half of the total expense incurred under the acts above referred to shall be paid by the various municipalities mentioned therein, and the commissioners have been appointed by the court.

EXAMINATION OF PUBLIC WATER SUPPLIES.

The public water supplies throughout the State have been examined as usual during the year by the engineers of this Division, and the waters of the various sources have been analyzed chemically and microscopically, the latter in the case of surface waters, and bacteriological examinations have been made of these waters where such tests appeared to be necessary or desirable. There have been four cases where emergency supplies have been found necessary because of the brief period of low rainfall in the months from August to October, inclusive. The following are the average yearly results of chemical analyses of samples of water from public sources examined in the year 1921.

ANALYSES OF THE WATER OF PUBLIC WATER SUPPLIES.

Averages of Chemical Analyses of Surface-water Sources for the Year 1921.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Suspended.		
Metropolitan Water District.	Wachusett Reservoir, upper end	.25	3.66	.0016	.0137	.0024	.23	1.0
	Wachusett Reservoir, lower end	.13	3.45	.0011	.0102	.0014	.21	1.0
	Sudbury Reservoir . . . .	.14	4.03	.0013	.0125	.0022	.25	1.3
	Framingham Reservoir No. 3 . .	.15	3.94	.0016	.0124	.0016	.25	1.4
	Hopkinton Reservoir . . . .	.54	4.47	.0016	.0147	.0020	.32	1.2
	Ashland Reservoir . . . .	.56	4.47	.0017	.0165	.0021	.26	1.3
	Framingham Reservoir No. 2 . .	.74	6.15	.0046	.0199	.0027	.56	1.6
	Lake Cochituate . . . .	.13	6.78	.0014	.0188	.0047	.58	2.5
	Chestnut Hill Reservoir . . . .	.14	3.94	.0012	.0114	.0018	.28	1.4
	Weston Reservoir . . . .	.12	4.19	.0011	.0118	.0020	.26	1.2
	Spot Pond . . . .	.08	3.67	.0012	.0131	.0021	.30	1.3
	Tap in State House . . . .	.13	3.90	.0006	.0103	.0015	.26	1.4
	Tap in Revere . . . .	.06	3.85	.0006	.0103	.0011	.29	1.4
	Tap in Quincy . . . .	.11	3.93	.0005	.0095	.0011	.28	1.3
Abington	Big Sandy Pond . . . .	.08	3.65	.0019	.0120	.0026	.70	0.7
Adams (Fire District).	Dry Brook . . . .	.19	7.40	.0006	.0081	.0007	.15	4.9
	Bassett Brook . . . .	.00	4.45	.0018	.0032	.0001	.14	2.9
Amherst	Amethyst Brook large reservoir	.42	4.24	.0027	.0107	.0016	.16	0.7
	Amethyst Brook small reservoir	.18	3.52	.0026	.0098	.0026	.16	0.9
Andover	Haggett's Pond . . . .	.12	4.69	.0020	.0143	.0028	.33	1.6
Ashburnham	Upper Naukeag Lake . . . .	.05	2.68	.0018	.0090	.0012	.16	0.4
Ashfield	Bear Swamp Brook . . . .	.21	4.52	.0011	.0102	.0005	.14	2.3
Athol	Phillipston Reservoir . . . .	.56	4.00	.0013	.0280	.0103	.12	1.1
	Buckman Brook Reservoir . . . .	.19	3.58	.0009	.0150	.0030	.12	0.8
	Inlet of filter . . . .	.35	3.62	.0011	.0146	.0027	.13	1.0
	Outlet of filter . . . .	.41	3.87	.0016	.0144	.0030	.13	1.0
Barre	Reservoir . . . .	.17	4.22	.0037	.0242	.0079	.21	1.0
Blandford (Fire District).	Freeland Brook . . . .	.08	3.50	.0014	.0053	.0008	.30	1.5
BROCKTON	Silver Lake . . . .	.10	3.80	.0014	.0098	.0011	.52	0.9
CAMBRIDGE	Lower Hobbs Brook Reservoir	.17	5.48	.0024	.0200	.0027	.40	2.1
	Upper Hobbs Brook Reservoir	.43	6.60	.0038	.0241	.0040	.42	2.4
	Stony Brook Reservoir . . . .	.43	6.75	.0027	.0200	.0038	.46	2.4

Averages of Chemical Analyses of Surface-water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Suspended.		
CAMBRIDGE — <i>Con.</i>	Fresh Pond . . . . .	.20	6.93	.0057	.0198	.0044	.55	2.9
Cheshire	Thunder Brook . . . . .	.00	6.22	.0007	.0027	.0002	.11	5.0
	Kitchen Brook . . . . .	.00	6.57	.0004	.0023	.0001	.07	4.6
Chester (Fire District).	Austin Brook Reservoir . . . . .	.10	3.75	.0006	.0086	.0008	.09	1.6
	Horn Pond . . . . .	.10	3.25	.0006	.0130	.0018	.10	1.6
CHICOPEE	Morton Brook . . . . .	.02	3.99	.0014	.0040	.0009	.20	1.0
	Cooley Brook . . . . .	.31	4.37	.0027	.0078	.0014	.18	1.2
Clinton	Tap in town . . . . .	.14	4.55	.0005	.0115	.0023	.18	1.5
Colrain (Griswoldville).	McClellan Reservoir . . . . .	.01	7.82	.0007	.0055	.0001	.15	5.0
Concord	Nagog Pond . . . . .	.02	3.83	.0009	.0094	.0009	.33	1.1
Dalton (Fire District).	Egypt Brook Reservoir . . . . .	.18	3.91	.0016	.0098	.0012	.12	1.5
	Windsor Reservoir . . . . .	.30	5.50	.0026	.0152	.0023	.13	2.6
	Cady Brook . . . . .	.11	5.42	.0006	.0060	.0004	.12	2.7
Danvers	Middleton Pond . . . . .	.53	4.83	.0044	.0201	.0040	.35	1.2
	Swan Pond . . . . .	.24	4.89	.0018	.0174	.0020	.34	2.0
Egremont (South)	Goodale Brook . . . . .	.02	4.85	.0000	.0014	—	.11	2.9
FALL RIVER	North Watuppa Lake . . . . .	.11	3.96	.0017	.0144	.0024	.47	0.9
Falmouth	Long Pond . . . . .	.04	3.76	.0011	.0087	.0015	.99	0.4
FITCHBURG	Meetinghouse Pond . . . . .	.08	3.19	.0023	.0154	.0023	.18	0.9
	Scott Reservoir . . . . .	.11	3.46	.0033	.0189	.0055	.21	0.7
	Wachusett Lake . . . . .	.15	3.33	.0026	.0170	.0025	.15	0.7
	Falulah Brook . . . . .	.15	3.35	.0023	.0120	.0019	.17	0.7
	Ashby Reservoir . . . . .	.30	3.61	.0051	.0183	.0030	.16	0.7
	Gardner	Crystal Lake06	5.33	.0020	.0147	.0024	.31	2.1
GLOUCESTER	Dike's Brook Reservoir . . . . .	.26	4.03	.0027	.0120	.0013	.68	0.4
	Wallace Reservoir . . . . .	.60	4.78	.0015	.0194	.0040	.80	0.5
	Haskell Brook Reservoir . . . . .	.16	3.88	.0015	.0085	.0008	.68	0.4
Great Barrington (Fire District).	East Mountain Reservoir . . . . .	.04	5.22	.0024	.0097	.0013	.10	4.3
	Green River . . . . .	.00	9.95	.0008	.0045	.0006	.13	9.4
Great Barrington (Housatonic).	Long Pond . . . . .	.05	7.50	.0002	.0164	.0020	.14	6.0
Greenfield (Fire District No. 1).	Glen Brook Upper Reservoir . . . . .	.05	6.50	.0084	.0090	.0002	.40	4.2
	Glen Brook Lower Reservoir . . . . .	.04	6.95	.0054	.0088	.0012	.34	4.0
Hadley (Water Supply District).	Hart's Brook Reservoir . . . . .	.11	4.97	.0136	.0099	.0021	.19	1.7

Averages of Chemical Analyses of Surface-water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Suspended.		
Hatfield . . .	Running Gutter Brook Reservoir	.08	7.17	.0025	.0045	.0004	.24	2.5
HAVERHILL . . .	Johnson's Pond . . . . .	.16	5.10	.0013	.0140	.0022	.43	2.2
	Crystal Lake . . . . .	.13	3.68	.0007	.0130	.0013	.32	1.3
	Kenoza Lake . . . . .	.15	5.29	.0011	.0156	.0033	.39	2.1
	Lake Saltonstall . . . . .	.04	6.40	.0018	.0154	.0025	.60	2.8
	Pentucket Lake . . . . .	.10	4.79	.0013	.0145	.0025	.41	1.9
	Millvale Reservoir . . . . .	.56	5.77	.0019	.0177	.0020	.33	2.0
Hingham	Accord Pond . . . . .	.18	3.41	.0012	.0111	.0013	.49	0.6
	Fulling Mill Pond . . . . .	.67	5.71	.0091	.0275	.0094	.69	1.5
Hinsdale (Fire District).	Reservoir . . . . .	.08	2.67	.0007	.0083	.0015	.10	0.5
HOLYOKE	Whiting Street Reservoir . . . . .	.04	5.21	.0027	.0125	.0020	.18	2.7
	Fomer Reservoir . . . . .	.31	3.97	.0016	.0095	.0014	.15	1.5
	Wright and Ashley Pond . . . . .	.06	5.47	.0024	.0115	.0015	.15	2.7
	High Service Reservoir . . . . .	.04	4.27	.0030	.0148	.0024	.16	1.7
	White Reservoir . . . . .	.18	3.61	.0061	.0154	.0046	.14	1.4
Hudson	Gates Pond . . . . .	.06	3.84	.0032	.0163	.0048	.24	1.2
Huntington (Fire District).	Cold Brook Reservoir . . . . .	.06	3.80	.0012	.0048	.0004	.14	1.3
Ipswich	Dow's Brook Reservoir . . . . .	.23	5.59	.0012	.0151	.0035	.60	2.0
LAWRENCE	Merrimack River, filtered . . . . .	.42	6.15	.0043	.0079	-	.49	1.3
	Lee	Codding Brook Upper Reservoir	.10	3.76	.0006	.0072	.0003	.11	1.5
	Codding Brook Lower Reservoir	.08	4.36	.0018	.0069	.0005	.16	1.9
	Basin Pond Brook . . . . .	.41	4.63	.0015	.0105	.0010	.09	1.6
Lenox	Reservoir . . . . .	.03	7.37	.0005	.0063	.0012	.14	5.9
	Laurel Lake . . . . .	.06	14.59	.0109	.0179	.0026	.26	14.2
LEOMINSTER	Morse Reservoir . . . . .	.17	2.86	.0028	.0115	.0014	.16	0.5
	Haynes Reservoir . . . . .	.20	2.87	.0045	.0165	.0021	.15	0.5
	Fall Brook Reservoir . . . . .	.10	3.08	.0018	.0103	.0016	.18	0.7
Lincoln	Sandy Pond . . . . .	.03	4.02	.0009	.0121	.0017	.31	0.9
Longmeadow	Cooley Brook . . . . .	.07	4.78	.0024	.0068	.0017	.24	2.5
LYNN	Birch Reservoir . . . . .	.10	4.73	.0045	.0155	.0022	.56	1.7
	Breed's Reservoir . . . . .	.23	5.66	.0047	.0158	.0027	.59	2.0
	Walden Reservoir . . . . .	.31	6.28	.0024	.0158	.0016	.64	2.5
	Hawkes Reservoir . . . . .	.52	7.51	.0045	.0248	.0037	.69	2.8

Averages of Chemical Analyses of Surface-water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Suspended.		
Manchester . . .	Gravel Pond . . . . .	.09	4.48	.0014	.0130	.0017	.76	1.0
MARLBOROUGH . . .	Lake Williams . . . . .	.08	5.14	.0022	.0145	.0029	.47	2.0
	Milham Brook Reservoir . . . . .	.46	5.51	.0035	.0179	.0043	.30	1.6
Maynard	White Pond . . . . .	.18	3.33	.0009	.0115	.0024	.24	0.8
Milford	Charles River, filtered . . . . .	.14	6.22	.0005	.0047	-	.28	2.3
Montague ¹	Lake Pleasant . . . . .	.02	2.80	.0094	.0098	.0023	.15	0.6
Nantucket	Wannacomet Pond . . . . .	.13	7.85	.0093	.0265	.0118	2.21	1.7
NEW BEDFORD	Little Quittacas Pond . . . . .	.37	3.83	.0020	.0156	.0022	.43	0.7
	Great Quittacas Pond . . . . .	.54	4.20	.0019	.0160	.0023	.44	0.7
NEWBURYPORT	Artichoke River . . . . .	.32	6.72	.0080	.0283	.0058	.62	2.6
NORTH ADAMS	Notch Brook Reservoir . . . . .	.04	7.42	.0026	.0067	.0016	.10	5.7
	Beaman Reservoir . . . . .	.02	6.83	.0017	.0101	.0019	.12	4.9
NORTHAMPTON	Middle Reservoir . . . . .	.18	4.73	.0028	.0106	.0019	.14	1.7
	Mountain Street Reservoir . . . . .	.07	4.59	.0009	.0065	.0009	.12	1.7
North Andover	Great Pond . . . . .	.12	4.73	.0018	.0161	.0033	.44	1.9
Northborough	Lower Reservoir . . . . .	.72	5.14	.0028	.0234	.0039	.24	1.0
	Upper Reservoir . . . . .	.73	5.35	.0018	.0221	.0048	.25	1.1
Northbridge	Cook Allen Reservoir . . . . .	.00	3.11	.0002	.0024	.0002	.20	0.7
North Brookfield	Doane Pond . . . . .	.43	4.12	.0066	.0260	.0066	.21	0.8
	North Pond . . . . .	.37	3.48	.0104	.0316	.0096	.18	0.8
Northfield	Reservoir . . . . .	.08	3.10	.0002	.0042	.0004	.13	1.0
Norwood	Buckmaster Pond . . . . .	.14	4.30	.0100	.0273	.0087	.45	1.6
	Outlet of filter . . . . .	.06	3.73	.0017	.0070	-	.46	1.5
Orange	Reservoir . . . . .	.08	3.37	.0005	.0027	.0000	.13	0.7
Palmer (Fire District No. 1).	Lower Reservoir . . . . .	.20	4.07	.0019	.0122	.0024	.17	0.9
PEABODY	Spring Pond . . . . .	.32	6.44	.0069	.0144	.0021	.70	2.5
	Suntaug Lake . . . . .	.08	5.90	.0057	.0149	.0029	.91	2.3
PITTSFIELD	Ashley Lake . . . . .	.15	3.67	.0035	.0150	.0029	.16	1.5
	Ashley Brook . . . . .	.10	7.21	.0013	.0114	.0029	.13	6.1
	Hathaway Brook . . . . .	.03	9.81	.0009	.0046	.0004	.14	8.0
	Mill Brook . . . . .	.35	4.68	.0012	.0137	.0018	.10	1.9

¹ Supply for Turner's Falls Fire District, Millers Falls Water Supply District and Lake Pleasant Water Supply District.

Averages of Chemical Analyses of Surface-water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Suspended.		
PITTSFIELD — <i>Con.</i>	Sacket Brook . . . . .	.08	8.08	.0017	.0061	.0006	.14	6.1
	Farnham Reservoir . . . . .	.34	3.90	.0020	.0148	.0022	.08	1.5
Plymouth	Little South Pond . . . . .	.01	3.18	.0016	.0136	.0023	.61	0.2
	Great South Pond . . . . .	.01	2.94	.0018	.0117	.0024	.60	0.2
Randolph	Great Pond . . . . .	.43	5.28	.0008	.0165	.0037	.49	1.5
Rockport	Cape Pond . . . . .	.24	10.60	.0021	.0155	.0032	3.75	1.8
Russell	Black Brook . . . . .	.18	4.02	.0005	.0079	.0007	.15	1.3
Rutland	Muschopauge Lake . . . . .	.03	3.45	.0006	.0087	.0004	.29	0.8
SALEM	Wenham Lake . . . . .	.43	7.27	.0088	.0221	.0038	.76	2.5
	Longham Reservoir	1.15	7.23	.0053	.0247	.0038	.78	1.9
	Ipswich River at pumping station.	.91	10.87	.0080	.0232	.0080	.70	4.7
Shelburne (Shelburne Falls Fire District).	Fox Brook . . . . .	.01	6.73	.0001	.0031	.0003	.12	4.0
Southbridge	Hatchet Brook Reservoir No. 3	.19	3.56	.0021	.0138	.0029	.15	0.7
	Hatchet Brook Reservoir No. 4	.21	3.20	.0016	.0142	.0023	.16	0.6
South Hadley (Fire District No. 1).	Leaping Well Reservoir . . . . .	.07	3.21	.0015	.0103	.0027	.15	0.8
	Buttery Brook Reservoir . . . . .	.18	5.04	.0024	.0102	.0029	.31	1.2
Spencer	Shaw Pond . . . . .	.02	2.55	.0008	.0113	.0012	.21	0.7
SPRINGFIELD	Westfield Little River, filtered . . . . .	.13	3.64	.0004	.0066	—	.12	1.1
Stockbridge	Lake Averic . . . . .	.08	6.71	.0010	.0123	.0024	.13	4.6
Stoughton	Muddy Pond Brook . . . . .	.05	4.35	.0004	.0044	.0011	.34	0.8
TAUNTON	Assawompsett Pond . . . . .	.28	3.64	.0023	.0140	.0016	.41	0.6
	Elder's Pond . . . . .	.11	3.78	.0022	.0128	.0016	.43	0.7
Wakefield	Crystal Lake . . . . .	.16	5.96	.0070	.0182	.0028	.75	2.0
Wareham (Onset)	Jonathan Pond . . . . .	.01	3.10	.0008	.0086	.0014	.62	0.3
Wayland	Snake Brook Reservoir . . . . .	.76	5.06	.0029	.0207	.0039	.23	1.8
WESTFIELD	Montgomery Reservoir . . . . .	.46	3.82	.0047	.0150	.0019	.16	0.5
	Tillotston Brook Reservoir . . . . .	.11	3.54	.0017	.0062	.0005	.17	0.8
West Springfield	Bear Hole Brook . . . . .	.07	6.97	.0049	.0087	.0019	.18	3.8
	Bear Hole Brook, filtered . . . . .	.01	6.62	.0008	.0033	—	.21	4.0
Weymouth	Great Pond . . . . .	.60	4.74	.0028	.0150	.0037	.38	0.5
Williamsburg	Reservoir . . . . .	.09	4.63	.0002	.0063	.0005	.16	2.2
Williamstown	Reservoirs . . . . .	.02	7.28	.0004	.0029	—	.12	5.2
Winchester	North Reservoir . . . . .	.02	4.14	.0022	.0128	.0015	.36	1.6

Averages of Chemical Analyses of Surface-water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Suspended.		
Winchester — <i>Con.</i>	South Reservoir . . . .	.02	3.98	.0026	.0112	.0019	.35	1.5
	Middle Reservoir . . . .	.08	3.75	.0034	.0162	.0017	.34	1.4
WORCESTER	Bottomly Reservoir . . . .	.24	4.67	.0029	.0161	.0034	.23	1.6
	Kent Reservoir . . . . .	.20	5.12	.0023	.0163	.0036	.19	1.4
	Leicester Reservoir . . . .	.14	4.02	.0037	.0156	.0038	.20	1.2
	Mann Reservoir . . . . .	.19	4.70	.0018	.0152	.0016	.19	1.6
	Upper Holden Reservoir . . .	.12	3.27	.0012	.0106	.0013	.20	1.0
	Lower Holden Reservoir . . .	.09	3.12	.0012	.0098	.0010	.19	1.1
	Kendall Reservoir . . . . .	.14	3.72	.0016	.0118	.0016	.17	1.2

Averages of Chemical Analyses of Ground-water Sources for the Year 1921.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albu- minoid.		Nitrates.	Nitrites.		
Adams (Fire District).	Tubular wells . . . . .	.00	12.11	.0001	.0019	.14	.0200	.0000	9.4	.010
Amesbury	Tubular wells . . . . .	.40	13.89	.0049	.0040	.50	.0098	.0001	6.9	.341
Ashland	Tubular wells, old supply .	.00	6.60	.0002	.0015	.57	.0055	.0000	2.2	.077
	Tubular wells, new supply	.00	5.27	.0003	.0023	.41	.0072	.0000	2.0	.008
ATTLEBORO	Large well . . . . .	.00	5.18	.0005	.0035	.44	.0115	.0000	2.1	.008
Auburn	Tubular wells . . . . .	.00	7.82	.0001	.0013	.56	.1037	.0000	3.4	.012
Avon	Wells . . . . .	.00	6.47	.0006	.0025	.47	.1483	.0000	2.2	.006
Ayer	Large well . . . . .	.00	6.83	.0008	.0018	.55	.0693	.0000	3.1	.016
	Tubular wells . . . . .	.00	6.17	.0011	.0021	.36	.0123	.0000	2.9	.021
Barnstable	Tubular wells . . . . .	.00	4.23	.0006	.0011	1.04	.0033	.0000	0.6	.025
Bedford	Large well . . . . .	.00	5.02	.0002	.0024	.30	.0060	.0000	2.6	.017
Billerica	Old wells . . . . .	.14	9.78	.0009	.0058	.48	.0255	.0005	3.1	.307
	New wells . . . . .	.07	11.77	.0017	.0057	.36	.0090	.0000	4.3	.243
Braintree	Filter-gallery . . . . .	.35	6.13	.0017	.0163	.62	.0340	.0000	1.9	.023

Averages of Chemical Analyses of Ground-water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Bridgewater . . .	Wells . . . . .	.00	5.57	.0005	.0014	.61	.0346	.0000	1.4	.022
Brookline . . .	Tubular wells and filter-gallery, filtered.	.05	9.13	.0004	.0052	.73	.0265	.0000	4.1	.007
Canton	Springdale well . . . . .	.04	5.20	.0002	.0027	.44	.0227	.0000	1.7	.016
	Well near Henry's Spring . . . . .	.09	5.47	.0001	.0023	.44	.0325	.0000	1.9	.012
Chelmsford (North Chelmsford Fire District).	Tubular wells . . . . .	.08	5.28	.0086	.0074	.45	.0620	.0002	1.9	.013
Chelmsford (Water District).	Tubular wells . . . . .	.00	9.02	.0003	.0019	.72	.1323	.0009	3.3	.009
CHICOPEE (Fairview)	Tubular wells . . . . .	.02	5.84	.0015	.0022	.25	.0625	.0000	1.8	.037
Cohasset	Tubular wells . . . . .	.11	13.42	.0004	.0061	1.77	.1378	.0000	5.1	.011
	Filter-gallery . . . . .	.70	14.00	.0510	.0064	.89	.0080	.0000	5.3	.360
	Dug well, filtered . . . . .	.04	8.69	.0037	.0056	1.12	.0257	.0001	3.2	.013
Dedham	Large well and tubular wells.	.01	11.08	.0010	.0040	1.07	.1300	.0001	4.4	.011
Deerfield (Fire District).	Wells . . . . .	.00	4.87	.0003	.0020	.17	.0033	.0000	2.0	.016
Douglas	Tubular wells . . . . .	.00	5.22	.0006	.0011	.42	.0498	.0001	1.6	.018
Dracut (Water Supply District).	Tubular wells . . . . .	.00	8.65	.0003	.0015	.67	.1050	.0001	4.1	.007
Dracut (Collinsville).	Tubular wells . . . . .	.10	5.60	.0005	.0040	.30	.0150	.0000	2.3	.092
Dudley	Tubular wells . . . . .	.00	3.77	.0002	.0014	.23	.0067	.0000	1.1	.012
Duxbury (Fire and Water District).	Tubular wells . . . . .	.00	4.70	.0001	.0012	.79	.0105	.0000	0.8	.006
East Brookfield	Tubular wells . . . . .	.00	4.30	.0000	.0011	.20	.0062	.0000	1.0	.005
Easthampton	Tubular wells . . . . .	.00	6.47	.0002	.0011	.21	.0187	.0000	3.8	.007
Easton (North Easton Village District).	Well . . . . .	.00	5.21	.0001	.0020	.49	.0546	.0000	1.8	.009
Edgartown	Large well . . . . .	.00	3.47	.0002	.0016	.95	.0023	.0000	0.8	.007
Fairhaven	Tubular wells . . . . .	.28	8.97	.0005	.0077	.97	.1133	.0000	3.2	.014
Foxborough (Water Supply District).	Tubular wells . . . . .	.00	5.15	.0004	.0012	.49	.0380	.0001	1.8	.007
Frammingham	Filter-gallery . . . . .	.00	13.06	.0169	.0046	2.05	.0157	.0002	5.7	.009
Franklin	Tubular wells . . . . .	.00	5.93	.0003	.0009	.59	.0293	.0000	1.8	.007
Grafton	Filter-gallery . . . . .	.01	10.65	.0003	.0027	1.18	.1225	.0000	4.2	.011
Granville	Well . . . . .	.02	4.13	.0003	.0019	.11	.0050	.0001	1.6	.040
Groton	Large well . . . . .	.03	6.23	.0002	.0018	.21	.0067	.0000	3.0	.007
Groton (West Groton Water Supply District).	Tubular wells . . . . .	.00	5.20	.0004	.0016	.17	.0088	.0000	2.7	.008
Hingham	Wells . . . . .	.10	5.38	.0010	.0057	.65	.0142	.0000	1.5	.013
Holliston	Large well . . . . .	.31	4.52	.0017	.0131	.37	.0060	.0000	1.5	.025
Hopkinton	Tubular wells . . . . .	.00	11.20	.0007	.0024	.79	.2300	.0000	4.3	.015

Averages of Chemical Analyses of Ground-water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Huntington (Fire District).	Tubular wells . . . .	.00	5.30	.0002	.0015	.23	.0117	.0000	2.1	.021
Kingston	Tubular wells . . . .	.00	4.30	.0007	.0018	.77	.0147	.0001	1.2	.014
Leicester (Water Supply District).	Wells . . . . .	.10	6.90	.0002	.0031	.31	.0850	.0001	2.3	.017
Leicester (Cherry Valley and Rochdale Water District).	Wells . . . . .	.19	4.30	.0017	.0117	.27	.0100	.0000	1.6	.012
Littleton	Tubular wells . . . .	.00	3.97	.0002	.0009	.20	.0130	.0000	1.7	.007
LOWELL	Boulevard wells (tubular)	.48	6.42	.0373	.0051	.37	.0182	.0002	2.4	.344
	Boulevard wells, filtered .	.03	5.46	.0005	.0029	.42	.0327	.0000	2.1	.019
Manchester	Wells . . . . .	.00	11.50	.0001	.0014	1.85	.1297	.0000	3.9	.015
Mansfield (Water Supply District).	Large well . . . . .	.00	4.72	.0002	.0014	.32	.1144	.0000	1.7	.007
	Inlet of filter . . . . .	.24	11.71	.0068	.0101	1.31	.0098	.0000	5.1	.101
	Outlet of filter . . . . .	.18	12.35	.0004	.0078	1.29	.0092	.0000	4.9	.013
Marion	Wells . . . . .	.10	14.63	.0002	.0051	1.83	.0138	.0000	5.8	.015
	Tubular wells . . . .	.00	5.35	.0003	.0013	.60	.0285	.0000	1.2	.012
Marshfield	Wells . . . . .	.00	14.15	.0093	.0025	3.63	.0840	.0096	3.6	.015
Mattapoisett	Tubular wells . . . .	.00	5.78	.0005	.0017	.85	.0576	.0000	2.6	.012
Medfield	Spring . . . . .	.00	4.07	.0008	.0021	.31	.0113	.0000	1.4	.008
Medway	Wells . . . . .	.00	6.57	.0006	.0018	.60	.0341	.0000	2.8	.007
Merrimac	Tubular wells . . . .	.00	8.12	.0003	.0018	.54	.0223	.0000	3.3	.009
Methuen	Tubular wells . . . .	.27	7.52	.0040	.0075	.45	.0241	.0000	3.2	.083
Middleborough (Fire District).	Well . . . . .	.28	6.67	.0084	.0058	.55	.0356	.0001	2.4	.592
	Filtered water . . . . .	.02	6.08	.0006	.0043	.62	.0378	.0000	2.2	.021
Millbury	Well . . . . .	.01	4.55	.0004	.0029	.29	.0230	.0001	2.1	.016
Millis	Spring . . . . .	.00	11.03	.0002	.0020	.84	.2300	.0000	4.9	.008
Monson	Large well . . . . .	.17	3.77	.0003	.0043	.20	.0070	.0000	0.7	.020
Nantucket	Wells in Wyers Valley	.00	4.77	.0000	.0011	1.53	.0083	.0000	1.3	.013
Natick	Large well . . . . .	.00	9.88	.0006	.0022	.85	.0373	.0001	5.0	.007
Needham	Wells . . . . .	.00	6.83	.0004	.0017	.65	.0713	.0001	2.7	.017
	Hicks Spring . . . . .	.00	8.30	.0004	.0021	.93	.2377	.0000	2.8	.007
NEWBURYPORT	Wells and Artichoke River, filtered.	.12	6.41	.0005	.0091	.68	.0210	.0000	2.8	.030
NEWTON	Tubular wells and filter-gallery.	.00	5.85	.0001	.0019	.40	.0220	.0000	2.1	.006
No. Attleborough	Wells . . . . .	.00	6.83	.0005	.0015	.56	.0433	.0001	2.6	.007
Norton	Tubular wells . . . .	.00	4.83	.0001	.0011	.39	.0050	.0000	1.3	.011
Norwood	Tubular wells . . . .	.11	7.96	.0015	.0049	.53	.0339	.0000	3.4	.066

Averages of Chemical Analyses of Ground-water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albu- minoid.		Nitrates.	Nitrites.		
Oak Bluffs . . .	Springs . . . . .	.00	5.03	.0000	.0007	.93	.0113	.0000	0.8	.011
Oxford	Tubular wells . . . . .	.00	5.43	.0002	.0014	.37	.0433	.0000	2.1	.007
Palmer (Bondsville)	Tubular wells . . . . .	.00	7.33	.0002	.0017	.24	.0190	.0000	2.2	.009
Pepperell	Tubular wells . . . . .	.00	3.67	.0001	.0014	.20	.0062	.0000	1.5	.010
Provincetown	Tubular wells . . . . .	.02	17.18	.0007	.0013	7.51	.0065	.0001	4.4	.025
Reading	Filter-gallery . . . . .	.75	10.35	.0125	.0154	.92	.0173	.0000	2.7	.320
	Filtered water . . . . .	.21	15.40	.0004	.0051	.76	.0075	.0002	6.9	.089
Salisbury	Well . . . . .	.18	8.13	.0010	.0062	.56	.0073	.0000	3.3	.028
Scituate	Tubular wells . . . . .	.00	15.92	.0002	.0020	2.89	.1483	.0000	5.2	.015
Sharon	Well . . . . .	.00	14.10	.0003	.0010	2.39	.2420	.0000	6.6	.008
	Tubular wells . . . . .	.00	5.24	.0002	.0019	.54	.0344	.0000	2.0	.007
Sheffield	Spring . . . . .	.00	3.50	.0000	.0006	.10	.0050	.0000	2.3	.005
Shirley (Shirley Vil- lage Water Dis- trict).	Well . . . . .	.00	4.60	.0004	.0010	.42	.0935	.0000	1.3	.009
Shrewsbury	Tubular wells . . . . .	.00	4.57	.0002	.0018	.44	.0290	.0000	1.6	.005
South Hadley (Fire District No. 2).	Large well . . . . .	.00	3.85	.0003	.0006	.24	.0460	.0000	1.1	.008
Uxbridge	Tubular wells . . . . .	.00	6.43	.0002	.0015	.54	.0797	.0000	1.9	.006
Walpole	Tubular wells . . . . .	.00	5.20	.0001	.0012	.45	.0427	.0000	1.9	.023
WALTHAM	Old well . . . . .	.09	9.89	.0044	.0035	.71	.0160	.0000	3.9	.069
	New well . . . . .	.00	6.85	.0005	.0030	.52	.0169	.0000	3.2	.007
Ware	Wells . . . . .	.00	7.15	.0001	.0013	.62	.2000	.0000	3.1	.008
Wareham (Fire Dis- trict).	Tubular wells . . . . .	.00	2.97	.0002	.0015	.56	.0030	.0001	0.6	.008
Webster	Wells . . . . .	.00	4.92	.0007	.0018	.36	.0117	.0000	1.7	.014
Wellesley	Tubular wells . . . . .	.00	9.95	.0006	.0023	1.02	.0958	.0000	4.2	.009
	Well at Williams Spring	.00	14.40	.0006	.0022	1.11	.5200	.0000	5.6	.016
	Filter-gallery . . . . .	.00	9.32	.0011	.0025	.91	.0772	.0000	4.1	.008
Westborough	Filter basin . . . . .	.01	4.11	.0023	.0086	.30	—	—	1.4	.017
West Brookfield	Tubular wells . . . . .	.00	4.63	.0001	.0011	.31	.0787	.0000	1.8	.010
Westford	Tubular wells . . . . .	.00	3.90	.0008	.0048	.19	.0060	.0000	2.2	.005
Weston	Well . . . . .	.21	6.88	.0010	.0080	.49	.0163	.0000	3.0	.010
Winchendon	Old wells . . . . .	.23	4.12	.0023	.0028	.16	.0080	.0000	1.9	.174
	New wells . . . . .	.16	4.35	.0003	.0039	.15	.0080	.0000	0.9	.008
Woburn	Filter-gallery . . . . .	.00	13.20	.0010	.0036	1.43	.0463	.0000	6.2	.007
Worthington (Fire District).	Springs . . . . .	.02	2.70	.0006	.0012	.15	.0300	.0001	1.0	.015
Wrentham	Tubular wells . . . . .	.00	3.90	.0004	.0012	.27	.0103	.0000	1.5	.008

WATER SUPPLY STATISTICS.

During the year ending Nov. 30, 1921, no new water supplies were introduced in the cities and towns of Massachusetts and very few extensions were made to existing supplies. The establishment of the town of East Brookfield, however, which had a separate water supply from the town of Brookfield, increases by one the number of municipalities supplied with water in 1921.

CONSUMPTION OF WATER.

The consumption of water in the various cities and towns where records of the consumption are kept is shown in the following table. In towns used extensively as summer resorts, large quantities of water are used by summer visitors and this amount is credited to the permanent population of the town, making the figures of per capita daily consumption of water larger than is actually the case; while in certain municipalities having but a small part of their population supplied with water from the public works, the per capita consumption figures are probably smaller than is actually the case. There is also a certain number of cases where the consumption of water per person is greatly increased by the use of excessive quantities of water for manufacturing or other purposes.

The consumption of water in 1921 was in many places lower, and in some places considerably lower, than in previous years. This reduction has been due to a number of causes, all of which have a tendency to reduce water consumption from municipal works. Chief among these are the exceedingly mild winter, which was one of the mildest experienced in New England for many years, and the excessive rainfall of the summer, especially in the eastern part of the State. The year was also characterized by a severe financial depression, reducing greatly the volume of business, and the quantity of water used for manufacturing, mechanical and general industrial purposes was much less than usual. The records of consumption are shown in the following table: —

Consumption of Water in Various Cities and Towns in 1921.

CITY OR TOWN.	Esti- mated Popu- lation.	AVERAGE DAILY CONSUMPTION.		CITY OR TOWN.	Esti- mated Popu- lation.	AVERAGE DAILY CONSUMPTION.	
		Gallons.	Gallons per Inhabit- ant.			Gallons.	Gallons per Inhabit- ant.
Metropolitan Water District: ¹	1,216,642	117,407,400	97	Bridgewater . . .	8,438	213,000	25
Arlington . . .	19,421	1,100,300	57	BROCKTON . . .	67,047	2,991,000	45
Belmont . . .	11,283	678,300	60	Brookline . . .	38,600	3,519,000	91
BOSTON . . .	748,585	85,609,200	114	CAMBRIDGE . . .	109,868	10,860,000	99
CHELSEA . . .	43,184	3,101,300	72	Canton . . .	6,010	382,000	64
EVERETT . . .	40,600	3,530,600	87	Chelmsford . . .	5,782	133,000	23
Lexington . . .	6,512	441,700	68	Clinton . . .	12,979	829,000	64
MALDEN . . .	49,143	2,468,700	50	Concord . . .	6,461	592,000	92
MEDFORD . . .	40,743	1,853,900	46	Danvers and Mid- dleton.	12,303	1,463,000	119
MELROSE . . .	18,468	1,064,700	58	Dedham . . .	10,792	738,000	68
Milton . . .	9,538	402,500	42	Dracut . . .	5,532	116,000	21
Nahant . . .	1,318	182,100	138	Dudley . . .	3,701	159,000	43
QUINCY . . .	49,316	4,269,500	87	Duxbury . . .	1,553	98,000	63
REVERE . . .	29,552	1,958,600	66	East Bridgewater .	3,486	121,000	35
SOMERVILLE . .	94,338	6,919,400	73	East Longmeadow .	2,435	38,000	16
Stoneham . . .	7,949	610,400	77	Easton . . .	5,041	179,000	36
Swampscott . .	8,253	718,800	87	Edgartown . . .	1,190	82,000	69
Watertown . . .	22,445	1,624,400	72	Fairhaven . . .	7,493	410,000	55
Winthrop . . .	15,994	873,000	55	FALL RIVER . . .	120,485	6,971,000	58
Abington and Rock- land.	13,453	608,000	45	Falmouth . . .	3,500	406,000	116
Acton . . .	2,164	117,000	54	FITCHBURG . . .	41,304	4,437,000	107
Acushnet . . .	3,213	40,000	12	Foxborough . . .	4,213	337,000	80
Agawam . . .	5,117	194,000	38	Framingham . . .	17,268	1,025,000	59
Amesbury . . .	10,335	514,000	50	Franklin . . .	6,508	326,000	50
Andover . . .	8,326	600,000	72	Gardner . . .	17,090	692,000	40
Ashburnham . .	2,012	117,000	58	GLOUCESTER . . .	22,947	1,536,000	67
ATTLEBORO . . .	19,981	1,102,000	55	Grafton ² . . .	7,014	164,000	23
Avon . . .	2,178	96,000	44	Greenfield . . .	16,030	1,509,000	94
Barnstable . . .	4,836	167,000	35	Groton . . .	2,185	144,000	66
Bedford . . .	1,362	62,000	46	Groveland . . .	2,705	46,000	17
BEVERLY . . .	22,561	1,543,000	68	HAVERHILL . . .	54,770	5,717,000	104
Billerica . . .	3,726	482,000	129	Holliston . . .	2,707	127,000	47
Braintree . . .	10,827	955,000	88	HOLYOKE . . .	60,203	6,848,000	114

¹ Figures for metropolitan consumption are exclusive of Newton and are based entirely on meter readings. District result based on pumpage, but will vary slightly from the above.

² Based on 184-day period.

Consumption of Water in Various Cities and Towns in 1921 — Continued.

CITY OR TOWN.	Esti- mated Popu- lation.	AVERAGE DAILY CONSUMPTION.		CITY OR TOWN.	Esti- mated Popu- lation.	AVERAGE DAILY CONSUMPTION.	
		Gallons.	Gallons per Inhabit- ant.			Gallons.	Gallons per Inhabit- ant.
Hudson . . .	7,776	297,000	38	North Brookfield . . .	2,610	284,000	109
Ipswich . . .	6,201	373,000	60	Norton . . .	2,374	150,000	63
Lancaster . . .	2,461	82,000	33	Norwood . . .	12,957	1,231,000	95
LAWRENCE . . .	95,072	4,203,000	44	Oak Bluffs . . .	1,047	212,000	202
Lenox . . .	2,691	286,000	106	Orange . . .	5,395	149,000	28
Lincoln . . .	1,042	223,000	214	PEABODY . . .	19,737	3,276,000	166
Littleton . . .	1,286	46,000	36	Pepperell . . .	2,468	162,000	66
LOWELL . . .	113,716	6,537,000	57	PITTSFIELD . . .	42,195	5,904,000	140
Ludlow . . .	7,713	211,000	27	Plainville . . .	1,365	36,000	26
LYNN . . .	99,817	7,665,000	77	Plymouth . . .	13,068	1,453,000	111
Manchester . . .	2,466	292,000	118	Provincetown . . .	4,246	295,000	69
Mansfield . . .	6,352	472,000	74	Randolph and Hol- brook.	7,964	514,000	65
Marblehead . . .	7,324	601,000	82	Reading . . .	7,565	269,000	36
Marion . . .	1,288	97,000	75	Rockport . . .	3,878	254,000	65
MARLBOROUGH . . .	15,028	706,000	47	SALEM . . .	43,594	5,664,000	130
Mattapoissett . . .	1,277	70,000	55	Salisbury . . .	1,701	126,000	74
Maynard . . .	7,150	325,000	45	Saugus . . .	11,004	562,000	51
Medway . . .	2,978	133,000	45	Scituate . . .	2,534	347,000	137
Merrimac . . .	2,187	127,000	58	Sharon . . .	2,467	157,000	64
Methuen . . .	15,425	851,000	55	Shirley . . .	2,262	82,000	36
Middleborough . . .	8,453	416,000	49	Shrewsbury . . .	3,890	111,000	29
Milford and Hope- dale.	16,248	819,000	50	Southbridge . . .	14,251	770,000	54
Millbury . . .	5,725	313,000	55	SPRINGFIELD . . .	134,943	12,279,000	91
Millis . . .	1,494	45,000	30	Stockbridge . . .	1,764	271,000	154
Montague and Erv- ing. ¹	8,970	688,000	77	Stoughton . . .	6,865	403,000	59
Nantucket ² . . .	2,797	292,000	104	TAUNTON . . .	37,333	3,237,000	87
Natick . . .	10,907	639,000	59	Tisbury . . .	1,275	151,000	118
Needham . . .	7,106	433,000	61	Uxbridge . . .	5,477	383,000	70
NEW BEDFORD . . .	123,546	9,368,000	76	Wakefield . . .	13,073	620,000	47
NEWBURYPORT . . .	15,679	1,320,000	84	Walpole . . .	5,446	778,000	143
NEWTON . . .	46,643	3,762,000	81	WALTHAM . . .	31,068	1,941,000	62
North Andover . . .	6,326	440,000	70	Ware . . .	8,525	473,000	55
North Attleborough	9,238	520,000	56	Wareham . . .	4,415	182,000	41
Northbridge . . .	10,358	772,000	75	Webster . . .	13,397	678,000	51

¹ Does not include supply at Montague Center.² Does not include supply at Siasconset.

Consumption of Water in Various Cities and Towns in 1921 — Concluded.

CITY OR TOWN.	Esti- mated Popu- lation.	AVERAGE DAILY CONSUMPTION.		CITY OR TOWN.	Esti- mated Popu- lation.	AVERAGE DAILY CONSUMPTION.	
		Gallons.	Gallons per Inhabit- ant.			Gallons.	Gallons per Inhabit- ant.
Wellesley . . .	6,224	543,000	87	Weymouth . . .	15,275	1,168,000	76
West Bridgewater . . .	2,941	107,000	36	Whitman . . .	7,147	255,000	36
West Brookfield . . .	1,281	36,000	28	WOBURN . . .	16,606	1,732,000	104
WESTFIELD . . .	18,643	2,159,000	116	WORCESTER . . .	183,165	14,975,000	82
Westford . . .	3,235	141,000	45	Wrentham . . .	2,886	88,000	30
Weston . . .	2,282	148,000	65				

RAINFALL.

The rainfall for the year 1921 was very slightly below the normal, as shown by records of long-continued observations in various parts of the State. These records indicate that the normal is 44.59 inches, while the record for 1921 was 43.70, a deficiency of 0.89 of an inch. The rainfall exceeded the normal in the months of April, June, July and November, the greatest excess occurring in the latter part of June and in July, when several stations in the eastern portion of the State reported over 10 inches of rain between June 28 and July 16. The greatest deficiency in any month occurred in October, when the average rainfall was 1.45 inches, or 2.25 inches less than the normal. Notable deficiencies occurred also in the months of August and September, the total for the three months amounting to 5.66 inches. Even this short period of deficient rainfall threatened a shortage of water in a number of places, but the excessive rains of November prevented further decrease in the yield of sources of supply.

The following table gives the normal rainfall in the State for each month as deduced from observations at various places for a long period of years, together with the average rainfall at those places for each month during the year 1921, and the departure from the normal: —

MONTH.	Normal Rainfall (Inches).	Rainfall in 1921 (Inches).	Excess or Deficiency in 1921 (Inches).	MONTH.	Normal Rainfall (Inches).	Rainfall in 1921 (Inches).	Excess or Deficiency in 1921 (Inches).
January . . .	3.73	2.67	-1.06	August . . .	4.18	2.28	-1.90
February . . .	3.67	2.89	-0.78	September . . .	3.47	1.96	-1.51
March . . .	3.94	2.90	-1.04	October . . .	3.70	1.45	-2.25
April . . .	3.63	5.43	+1.80	November . . .	3.87	7.47	+3.60
May . . .	3.65	2.93	-0.72	December . . .	3.66	2.27	-1.39
June . . .	3.28	3.58	+0.30	Totals . . .	44.59	43.70	-0.89
July . . .	3.81	7.87	+4.06				

FLOW OF STREAMS.

Sudbury River.

The average flow of the Sudbury River during the year 1921 was 788,000 gallons per day per square mile of drainage area, or about 19 per cent below the normal flow for the past forty-seven years. The flow was above the normal in the months of May and July, but less than the normal in the other ten months of the year. The greatest excess occurred in the month of July, and the greatest deficiency in the month of April. The average flow for the driest six months, June to November, inclusive, was 294,000 gallons per day per square mile, or about 22 per cent below the normal flow for that period during the past forty-seven years.

In order to show the relation between the flow of the Sudbury River during each month of the year 1921 and the normal flow of that stream, as deduced from observations during forty-seven years, from 1875 to 1921, inclusive, the following table has been prepared. The drainage area of the Sudbury River above the point of measurement is 75.2 square miles.

Table showing the Average Daily Flow of the Sudbury River for Each Month in the Year 1921, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal Flow.

MONTH.	NORMAL FLOW.		ACTUAL FLOW IN 1921.		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1.756	1.135	1.511	.976	-.245	-.159
February	2.484	1.605	1.307	.845	-1.177	-.760
March	4.229	2.733	3.513	2.270	-.716	-.463
April	3.051	1.972	1.770	1.144	-1.281	-.828
May	1.698	1.098	2.565	1.658	+ .867	+ .560
June . . . . .	.776	.501	.265	.171	-.511	-.330
July . . . . .	.312	.201	1.580	1.021	+1.268	+ .820
August . . . . .	.346	.223	.091	.059	-.255	-.164
September . . . . .	.346	.223	-.089	-.058	-.435	-.281
October . . . . .	.598	.387	-.151	-.098	-.749	-.485
November	1.132	.732	1.032	.667	-.100	-.065
December	1.470	.950	1.186	.766	-.284	-.184
Average for whole year	1.511	.977	1.219	.788	-.292	-.189

The following table gives the rainfall upon the Sudbury River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, from 1916 to 1921, inclusive, together with the average for a period of forty-seven years, from 1875 to 1921:—

Rainfall, in Inches, received and collected on the Sudbury River Drainage Area.

MONTH.	1916.			1917.			1918.			1919.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	1.53	1.680	109.8	3.50	.909	25.9	3.47	.486	14.0	3.52	2.329	66.1
February	5.91	2.262	38.2	2.68	1.216	45.5	3.58	2.914	81.3	3.40	1.477	43.4
March	4.16	3.245	78.1	4.96	3.940	79.4	2.50	3.896	156.2	4.79	4.916	102.7
April	4.19	5.243	125.1	2.41	2.425	100.5	4.43	2.530	57.1	2.93	2.957	101.0
May	3.43	2.567	74.9	4.93	2.632	53.4	1.16	1.141	98.8	4.60	2.301	50.0
June	4.77	2.068	43.4	4.23	1.802	42.7	3.65	.319	8.7	1.86	.193	10.4
July	5.17	1.044	20.2	1.11	.076	6.8	4.07	.171	4.2	5.47	.533	9.8
August	2.01	.139	6.9	6.40	.361	5.6	1.61	-.096	-6.0	3.75	.164	4.4
September	1.80	.044	2.5	1.52	.100	6.6	8.60	1.100	12.8	5.28	1.232	23.3
October	1.49	-.009	-.6	5.65	.860	15.2	1.04	.490	47.0	2.16	.498	23.1
November	2.28	.189	8.3	1.31	.757	57.6	2.75	.843	30.7	5.90	2.202	37.3
December	3.22	.562	17.4	2.81	.678	24.2	3.68	1.673	45.5	1.98	1.952	98.6
Totals and averages .	39.96	19.034	47.6	41.51	15.756	38.0	40.54	15.467	38.2	45.64	20.754	45.5

Rainfall, in Inches, received and collected on the Sudbury River Drainage Area
— Concluded.

MONTH.	1920.			1921.			MEAN FOR FORTY-SEVEN YEARS, 1875-1921.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	3.26	.556	17.1	2.78	1.742	62.7	3.99	2.025	50.7
February	6.49	1.239	19.1	4.10	1.361	33.2	4.15	2.608	62.9
March	4.45	9.262	207.9	2.72	4.050	148.8	4.30	4.876	113.4
April	5.19	5.017	96.6	5.30	1.973	37.2	3.62	3.404	94.1
May	3.45	3.292	95.6	3.23	2.957	91.6	3.30	1.958	59.3
June	6.67	2.929	43.9	3.82	.295	7.7	3.17	.866	27.3
July	2.04	.506	24.9	6.86	1.822	26.6	3.71	.359	9.7
August	1.78	-.070	-4.0	1.20	.105	8.7	3.76	.398	10.6
September	3.53	.110	3.1	1.88	-.699	-5.3	3.38	.386	11.4
October	1.01	-.046	-4.6	1.12	-.175	-15.6	3.62	.690	19.1
November	5.68	1.154	20.3	7.95	1.152	14.5	3.83	1.263	33.0
December	5.11	2.141	41.9	2.54	1.367	53.8	3.77	1.694	45.0
Totals and averages .	48.66	26.090	53.6	43.50	16.550	38.0	44.60	20.527	46.0

The following table gives the record of the yield of the Sudbury River watershed for each of the past six years and the mean for forty-seven years, the flow being expressed in gallons per day per square mile of watershed:—

Yield of the Sudbury River Drainage Area in Gallons per Day per Square Mile.¹

MONTH.	1916.	1917.	1918.	1919.	1920.	1921.	Mean for Forty-seven Years, 1875-1921.
January	942,000	510,000	273,000	1,306,000	312,000	976,000	1,135,000
February	1,356,000	755,000	1,809,000	917,000	743,000	845,000	1,605,000
March	1,820,000	2,209,000	2,187,000	2,759,000	5,192,000	2,270,000	2,733,000
April	3,037,000	1,405,000	1,466,000	1,713,000	2,911,000	1,144,000	1,972,000
May	1,439,000	1,476,000	639,000	1,290,000	1,846,000	1,658,000	1,098,000
June	1,198,000	1,044,000	185,000	112,000	1,696,000	171,000	501,000
July	585,000	43,000	96,000	299,000	284,000	1,021,000	201,000
August	78,000	202,000	-54,000	92,000	-39,000	59,000	223,000
September	26,000	58,000	637,000	713,000	64,000	-58,000	223,000
October	-5,000	482,000	274,000	279,000	-26,000	-98,000	387,000
November	110,000	438,000	489,000	1,275,000	669,000	667,000	732,000
December	315,000	380,000	938,000	1,095,000	1,200,000	766,000	950,000
Average for whole year	904,000	750,000	736,000	988,000	1,239,000	788,000	977,000
Average for driest six months	186,000	267,000	269,000	458,000	360,000	294,000	376,000

¹ The drainage area of the Sudbury River used in making up these records included water surfaces amounting to about 2 per cent of the whole area from 1875 to 1878, inclusive, subsequently increasing by the construction of storage reservoirs to about 3 per cent in 1879, to 3.5 per cent in 1885, to 4 per cent in 1894, and to 6.5 per cent in 1898. The drainage area also contains extensive areas of swampy land, which, though covered with water at times, are not included in the above percentages of water surfaces.

Nashua River.

The average flow of the South Branch of the Nashua River at the outlet of the Wachusett Reservoir, Clinton, during the year 1921 was 1,092,000 gallons per day per square mile, or 0.5 of 1 per cent in excess of the normal for the past twenty-five years. Owing to the excessive precipitation in the latter part of 1920 and the very mild winter of 1920-21, the flow of the Nashua River in the month of January was in excess of the normal, though the rainfall was below the average. The flow in the months of May and July was greatly in excess of the normal, while the greatest deficiency occurred in June, the flow being only slightly more than half the normal. Deficiencies also occurred in the months of February, March, April, August, September and October.

In order to show the relation between the flow of the Nashua River during each month of the year 1921 and the normal flow of that stream as deduced from observations during twenty-five years, 1897 to 1921, inclusive, the following table has been prepared. The drainage area of the Nashua River above the point of measurement was 119 square miles from 1897 to 1907, and 118.19 square miles from 1908 to 1913, inclusive. Since Jan. 1, 1914, the city of Worcester has been diverting water from 9.35 square miles of this drainage area for the supply of that city, leaving the net drainage area 108.84 square miles. In the calculations of yield, allowance has been made for water overflowing from the Worcester area.

Table showing the Average Daily Flow of the South Branch of the Nashua River for Each Month in the Year 1921, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal Flow.

MONTH.	NORMAL FLOW.		ACTUAL FLOW IN 1921.		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1 813	1 172	2 187	1 413	+ .374	+ .241
February	2 086	1 348	1 651	1 067	-.435	-.281
March	4 112	2 658	3 883	2 510	-.229	-.148
April	3 320	2 146	2 988	1 931	-.332	-.215
May	1 998	1 292	3 205	2 071	+1.207	+ .779
June	1 236	.799	.743	.480	-.493	-.319
July . . . . .	.722	.467	1 579	1 021	+ .857	+ .554
August . . . . .	.618	.400	.380	.246	-.238	-.154
September . . . . .	.556	.359	.176	.114	-.380	-.245
October . . . . .	.722	.467	.245	.158	-.477	-.309
November	1 203	.778	1 224	.791	+ .021	+ .013
December	1 821	1 177	1 970	1 273	+ .149	+ .096
Average for whole year	1 682	1 087	1 690	1 092	+ .008	+ .005

The following table gives the rainfall upon the Nashua River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, 1916 to 1921, inclusive, together with the average for the past twenty-five years:—

Rainfall, in Inches, received and collected on the Nashua River Drainage Area.

MONTH.	1916.			1917.			1918.			1919.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	1.60	2.346	146.7	3.37	1.224	36.3	2.97	.864	29.1	3.23	2.392	74.1
February	5.98	3.030	50.7	3.05	1.476	48.3	4.25	3.260	76.6	3.51	1.279	36.5
March	3.32	3.374	101.5	4.21	4.409	104.8	2.24	4.614	206.0	5.27	5.621	106.7
April	3.65	5.696	156.0	1.80	2.535	140.6	3.47	2.775	80.0	2.57	2.954	115.0
May	3.34	3.028	90.7	3.89	2.350	60.5	1.07	1.201	112.8	6.06	3.931	64.9
June	6.57	3.546	53.9	4.47	2.122	47.4	4.57	.902	19.8	2.01	.798	39.6
July	5.66	1.937	34.2	1.22	.471	38.8	2.80	.499	17.8	5.00	.713	14.3
August	1.72	.506	29.5	4.46	.552	12.4	2.82	.284	10.1	4.17	.467	11.2
September	4.21	.506	12.0	1.20	.144	12.0	7.18	1.041	14.5	6.78	1.887	27.8
October	1.42	.250	17.6	6.03	.990	16.4	1.58	.609	38.6	2.35	.884	37.6
November	3.15	.554	17.6	1.25	.540	43.1	3.08	1.004	32.6	6.01	3.168	52.7
December	2.81	.820	29.2	2.31	.694	30.0	3.74	1.884	50.4	2.09	2.305	110.4
Totals and averages	43.43	25.593	58.9	37.26	17.507	47.0	39.77	18.937	47.6	49.05	26.399	53.8

MONTH.	1920.			1921.			MEAN FOR TWENTY-FIVE YEARS, 1897-1921.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	3.17	1.153	36.4	2.67	2.521	94.3	3.55	2.091	58.9
February	6.26	1.210	19.3	4.07	1.719	42.2	3.90	2.188	56.1
March	4.26	8.356	196.0	2.87	4.477	156.1	4.04	4.741	117.2
April	6.13	6.031	98.4	6.51	3.329	51.1	3.87	3.705	95.7
May	4.01	3.695	92.1	3.01	3.695	123.0	3.41	2.304	67.6
June	6.07	3.317	54.6	3.75	.828	22.1	3.78	1.379	36.5
July	4.33	1.443	33.3	6.41	1.821	28.4	4.18	.832	19.9
August	2.91	.584	20.1	1.94	.438	22.6	4.00	.713	17.8
September	6.39	.931	14.6	2.35	.197	8.4	3.78	.620	16.4
October . . . . .	.63	.731	116.1	2.00	.282	14.1	3.18	.833	26.2
November	5.49	2.246	40.9	7.31	1.366	18.7	3.63	1.343	37.0
December	6.01	4.619	76.9	2.77	2.271	82.1	4.01	2.100	52.4
Totals and averages	55.66	34.316	61.7	45.66	22.944	50.3	45.33	22.849	50.4

The following table gives a record of the yield of the Nashua River for each of the past six years and the mean for the past twenty-five years, the flow being expressed in gallons per day per square mile of watershed:—

*Yield of the Nashua River Drainage Area in Gallons per Day per Square Mile.*¹

MONTH.	1916.	1917.	1918.	1919.	1920.	1921.	Mean for Twenty-five Years, 1897-1921.
January	1,315,000	686,000	484,000	1,341,000	646,000	1,413,000	1,172,000
February	1,816,000	916,000	2,024,000	794,000	725,000	1,067,000	1,348,000
March	1,891,000	2,472,000	2,590,000	3,155,000	4,685,000	2,510,000	2,658,000
April	3,300,000	1,468,000	1,608,000	1,711,000	3,498,000	1,931,000	2,146,000
May	1,697,000	1,317,000	673,000	2,204,000	2,071,000	2,071,000	1,292,000
June	2,054,000	1,229,000	523,000	462,000	1,922,000	480,000	799,000
July	1,086,000	264,000	280,000	400,000	809,000	1,021,000	467,000
August	284,000	309,000	159,000	262,000	327,000	246,000	400,000
September	294,000	84,000	603,000	1,093,000	540,000	114,000	359,000
October	140,000	555,000	341,000	495,000	409,000	158,000	467,000
November	321,000	313,000	582,000	1,835,000	1,301,000	791,000	778,000
December	460,000	389,000	1,056,000	1,292,000	2,590,000	1,273,000	1,177,000
Average for whole year.	1,215,000	834,000	902,000	1,257,000	1,629,000	1,092,000	1,087,000
Average for driest six months.	432,000	320,000	412,000	752,000	870,000	468,000	543,000

¹ The drainage area used in making up these records included water surfaces amounting to 2.2 per cent of the whole area from 1897 to 1902, inclusive, to 2.4 per cent in 1903, to 3.6 per cent in 1904, to 4.1 per cent in 1905, to 5.1 per cent in 1906, to 6 per cent in 1907, to 7 per cent in 1908, 1909 and 1910, to 6.5 per cent in 1911, to 6.8 per cent in 1912, to 7 per cent in 1913, to 7.4 per cent in 1914 and 1915, to 7.6 per cent in 1916, to 7.4 per cent in 1917 and 1918, and to 7.5 per cent in 1919, 1920 and 1921.

Merrimack River.

The flow of the Merrimack River has been measured for many years at Lawrence, above which place the river has a total drainage area of 4,663 square miles, which includes 118¹ square miles on the South Branch of the Nashua River, 75 square miles on the Sudbury River, and 18 square miles tributary to Lake Cochituate, or a combined area of 211¹ square miles from which water is drawn at the present time for the supply of the Metropolitan Water District. The flow as measured at Lawrence includes the water wasted from these three drainage areas, the aggregate quantity of which, in the wet months of the year, is considerable, but which becomes very small in the dry months. Records of the quantity of water wasted have been kept by the Metropolitan District Commission and its predecessors, and these quantities have been deducted from the flow

¹ Including 9.35 square miles from which water is drawn for the supply of the city of Worcester.

as measured at Lawrence. In presenting the record of the flow of the river, these three drainage areas have been deducted from the total above Lawrence, so that the net drainage area above that point was 4,567 square miles in 1880, 4,570 square miles in the years 1881 to 1897, inclusive, and 4,452 square miles since the latter year.

The average flow of the Merrimack River during the year 1921 amounted to 1.412 cubic feet per second, or 913,000 gallons per day, per square mile of drainage area, or 4 per cent below the normal flow for the past forty-two years for which records are available. The flow was in excess of the normal in the months of January, March, July, August and December, and less than the normal in the other seven months of the year.

In order to show the relation between the flow of this stream during each month of the year 1921 and the normal flow as deduced from observations during forty-two years, from 1880 to 1921, inclusive, the following table has been prepared:—

Table showing the Average Monthly Flow of the Merrimack River at Lawrence for the Year 1921, in Cubic Feet per Second per Square Mile of Drainage Area; also, Departure from the Normal Flow.

MONTH.	Normal Flow, 1880-1921.	Actual Flow in 1921.	Excess or Deficiency.
January	1.277	1.679	+.402
February	1.373	.995	-.378
March	2.769	3.689	+.920
April	3.439	2.700	-.739
May	2.212	1.957	-.255
June	1.250	.597	-.653
July . . . . .	.748	1.031	+.283
August . . . . .	.661	.683	+.022
September . . . . .	.646	.425	-.221
October . . . . .	.806	.475	-.331
November	1.115	1.057	-.058
December	1.278	1.652	+.374
Average for whole year	1.465	1.412	-.053

The following table gives the record of the flow of the Merrimack River at Lawrence for each of the past six years and the mean for forty-two years, the flow being expressed in cubic feet per second per square mile of drainage area:—

Flow of the Merrimack River at Lawrence in Cubic Feet per Second per Square Mile.

MONTH.	1916.	1917.	1918.	1919.	1920.	1921.	Mean for Forty-two Years, 1880-1921.
January	1.527	1.023	.466	1.314	.570	1.679	1.277
February	1.674	.770	.819	.872	.618	.995	1.373
March	1.735	2.316	1.983	3.383	4.082	3.689	2.769
April	4.323	3.242	3.337	2.542	6.002	2.700	3.439
May	2.733	2.124	1.540	2.741	3.545	1.957	2.212
June	3.101	3.037	.757	1.007	1.607	.597	1.250
July	1.531	1.024	.553	.539	.746	1.031	.748
August . . . . .	.924	.629	.470	.401	.678	.683	.661
September . . . .	.972	.549	.847	.653	.680	.425	.646
October . . . . .	.798	.613	.991	.699	1.051	.475	.806
November . . . . .	.743	.882	1.126	1.648	.921	1.057	1.115
December	1.154	.569	1.492	1.331	3.258	1.652	1.278
Average for whole year.	1.768	1.398	1.198	1.427	1.980	1.412	1.465
Average for driest six months.	1.020	.711	.791	.825	.947	.711	.871

Sudbury, Nashua and Merrimack Rivers.

The following table shows the weekly fluctuations during the year 1921 in the flow of the Sudbury River at Framingham, the South Branch of the Nashua River at the outlet of the Wachusett Reservoir, Clinton, and the Merrimack River at Lawrence. The flow of these streams, particularly that of the Sudbury River and of the South Branch of the Nashua River, serves to indicate the flow of other streams in eastern Massachusetts. The area of the Sudbury River watershed is 75.2 square miles, of the South Branch of the Nashua River 118.19 square miles, and of the Merrimack River 4,452 square miles.

Table showing the Average Weekly Flow of the Sudbury, South Branch of the Nashua and the Merrimack Rivers for the Year 1921, in Cubic Feet per Second per Square Mile of Drainage Area.

WEEK ENDING SUNDAY —	FLOW IN CUBIC FEET PER SECOND PER SQUARE MILE.			WEEK ENDING SUNDAY —	FLOW IN CUBIC FEET PER SECOND PER SQUARE MILE.		
	Sudbury River.	South Branch, Nashua River.	Merrimack River.		Sudbury River.	South Branch, Nashua River.	Merrimack River.
Jan. 2 . . .	1.459	2.016	1.877	July 3 . . .	2.945	3.898	.914
9 . . .	2.694	2.891	2.246	10 . . .	2.068	1.698	1.019
16 . . .	2.281	3.333	1.844	17 . . .	1.451	1.054	1.413
23 . . .	1.046	1.522	1.627	24 . . .	.441	.589	.850
30 . . .	.607	1.071	1.012	31 . . .	1.084	1.452	.718
Feb. 6 . . .	.726	1.281	.912	Aug. 7 . . .	.583	.616	.789
13 . . .	1.071	1.620	1.108	14 . . .	.154	.389	.703
20 . . .	1.616	2.002	1.006	21 . . .	.127	.487	.663
27 . . .	1.140	1.394	.952	28 . . .	— .190	.092	.605
Mar. 6 . . .	5.146	4.315	1.943	Sept. 4 . . .	— .205	.132	.464
13 . . .	4.541	6.148	4.488	11 . . .	— .081	.089	.396
20 . . .	3.260	3.068	4.066	18 . . .	— .109	.085	.403
27 . . .	1.939	2.870	3.948	25 . . .	— .028	.377	.431
Apr. 3 . . .	2.066	2.149	3.677	Oct. 2 . . .	— .059	.157	.447
10 . . .	1.720	1.819	2.537	9 . . .	— .107	.236	.458
17 . . .	1.233	2.405	2.016	16 . . .	— .209	.117	.407
24 . . .	1.694	3.999	2.619	23 . . .	— .188	.481	.519
May 1 . . .	2.862	6.805	3.222	30 . . .	— .165	.249	.580
8 . . .	4.650	4.217	3.201	Nov. 6 . . .	— .066	.435	.580
15 . . .	2.941	3.097	1.794	13 . . .	.620	.591	.602
22 . . .	1.203	1.517	1.689	20 . . .	.946	1.473	.917
29 . . .	1.514	1.821	1.259	27 . . .	.944	1.563	1.916
June 5 . . .	.639	.916	.820	Dec. 4 . . .	4.164	2.978	1.584
12 . . .	.091	.497	.639	11 . . .	1.385	1.225	1.875
19 . . .	— .135	.127	.555	18 . . .	1.463	2.199	1.260
26 . . .	— .198	.372	.482	25 . . .	2.196	2.478	2.190

EXAMINATION OF RIVERS.

The distribution of the rainfall in the year 1921 has been, on the whole, favorable for the maintenance of satisfactory sanitary conditions in the rivers of the State for the reason that the flow was exceptionally large during the spring and the greater part of the summer and was not extraordinarily low at any other period of the year. Manufacturing also was considerably decreased by the business depression, and the quantity of manufacturing wastes discharged into the rivers was less than normal.

Aberjona River.

The results of the analyses of samples of water from the Aberjona River show no material change from the last two or three years. Complaint was made during the year relative to the pollution of this stream, however, and the conditions complained of have not been wholly removed. It is probably impracticable to remedy satisfactorily the remaining sources of pollution of the main stream until a sewer is constructed in the easterly part of this watershed, in which are located the factories which now cause the most serious pollution of the river.

Assabet River.

The results of the analyses of samples of water from the Assabet River show that from a point above Westborough a slight increase in pollution has taken place as far down as the town of Hudson, while below Hudson the pollution was more marked. Below Maynard, also, the pollution was greater than in 1920, though not as great as in certain earlier years.

Blackstone River.

The results of analyses of samples of water from the Blackstone River above the Worcester sewage disposal works indicate a less objectionable condition than has been the case in several years in the past, but below the sewage disposal works the river has shown more evidence of pollution than during the past two years. The same is true below Millbury, though farther down the valley its condition has shown little change in the last few years.

Charles River.

The Charles River immediately below Milford has been more polluted than at any time since 1910, a condition due largely to the overflow of sewage during the reconstruction of the underdrainage system of the Milford sewage disposal works. At Medway and Medfield, also, the river shows evidence of greater pollution, but farther down the stream there has been little change as compared with the conditions in former years. The factories along this stream and its tributaries have not been operated to capacity during the year and there has been less pollution by factory waste than in previous years.

Chicopee River.

The condition of the Chicopee River and its tributaries has in general been about the same as last year. The Ware River, one of the main tributaries, has, on the whole, been less objectionable during the year than in recent years, due to the high rainfall of the summer and a reduction in the amount of manufacturing. The Seven Mile River, the main feeder of the Quaboag River, one of the three main tributaries of the Chicopee, has been badly polluted for a number of years by the overflow of sewage from the sewerage system of the town of Spencer. This sewage is causing very objectionable conditions in the water of Quaboag Pond farther down the river. It will be necessary to prevent the overflow of sewage from the Spencer sewerage system into the Seven Mile River in order to protect the public health in the valley of this river below Spencer.

Concord and Sudbury Rivers.

The condition of the Sudbury River has not been objectionable during the year, and the same is true of the Concord River to a point near its entrance into the city of Lowell, where it has been polluted at times as in previous years.

Connecticut River.

The condition of the Connecticut River, which is polluted by sewage in large quantities from the cities and towns along its banks, has shown little change as compared with previous years, and there is very little evidence of increasing pollution of the main stream excepting in the immediate neighborhood of some of the main sewer outlets. These conditions have been remedied in several instances by the extension of the sewer outlets to a proper distance from the shore. Mill River below Northampton has shown evidence of greater pollution than during the last two years, and the same is true of the Manhan River at the mouth.

Deerfield River.

The condition of the Deerfield River has not been objectionable during the year.

French River.

The French River below Webster has shown more evidence of pollution than in 1919 or 1920. This condition is likely to continue until the sewage of the town of Webster is purified before discharge into the stream. Plans for disposal works were approved by this Department some years ago, but the works have not yet been constructed.

Hoosick River.

There has been a marked increase in the pollution of the Hoosick River below North Adams as compared to 1920, and during the year the Department has again recommended that the sewage of the city of North Adams be removed from the river and properly purified.

Housatonic River.

The branches of the Housatonic River above Pittsfield have shown a slight increase in the amount of pollution in the past year, and the condition of the West Branch below Pittsfield was objectionable during the period of low flow in the late summer and fall. The main stream immediately below Pittsfield has shown more evidence of pollution than in 1920, but at Stockbridge and Great Barrington conditions have not changed materially in the last two or three years.

Merrimack River.

The Merrimack River below Lawrence has shown a greater degree of pollution than in 1920, though the conditions have not been as objectionable as during the three years previous to 1920. Above Haverhill a slight increase in pollution has been noted, but below Haverhill the condition of the river has not changed materially as compared with its condition last year.

Millers River.

The Millers River has shown less evidence of pollution below Gardner than at any time for several years, and lower down its course its condition has not been materially different from that of previous years.

Nashua River.

The North Branch of the Nashua River below Fitchburg has shown greater evidence of pollution than in 1920. A large quantity of manufacturing waste, together with sewage from public sewers which overflows at times of storm, is discharged into the river in this city.

The sewage of the city of Leominster, excepting that from a very small section of the city which is still being diverted to an experimental filter, is discharged untreated into Monoosnock Brook and flows thence into the North Branch of the river below the city.

The North Branch of the Nashua River at its mouth has shown more evidence of pollution than in 1920, and this was also true of the South Branch below Clinton. The main stream below the confluence of the two branches has been on the whole in a slightly better condition than during the last few years.

Neponset River.

The results of the analyses of samples of water from the Neponset River show a slight increase in pollution just above and just below Hawes Brook, and the same is true of Hawes Brook at the mouth. At points farther downstream an improvement has taken place, and in Hyde Park and at the mouth the river has been in better condition than for many years.

North River in Peabody and Salem.

The North River in Peabody and Salem has been the cause of very serious complaint during the year, and the condition of this stream was the subject of a hearing before the Department in response to a petition from the city of Salem. The following recommendation was made relative to this stream:—

The Department of Public Health has considered the petition of the city of Salem requesting a hearing upon the condition of North River and such action by this Department as it may deem necessary to abate an alleged nuisance therein, and in response to this petition has examined the locality and has given a hearing as requested in the petition.

The Department finds that a nuisance exists in the North River, caused by the discharge of foul organic matters of various kinds into the river or upon its banks whence it is washed into the stream at times of rain. One of the chief causes of complaint appears to be the surcharging of the trunk sewer, the carrying capacity of which has been found to be greatly reduced at times by deposits

therein. These deposits result from a variety of causes. The manufacturing wastes before being discharged into the sewers are generally passed through settling tanks or other form of treatment, but there are indications that wastes from different processes after entering the sewers cause a precipitation of solid matters which collects on the bottom and sides of the trunk sewer. Furthermore, examinations have shown that in the operation of the pumps the sewage is at times ponded in the trunk sewer, reducing the velocity of flow and thus tending to cause deposits therein. It is evident that the capacity of the force main is but little in excess of the usual flow of sewage, making proper operation of the system increasingly difficult as time goes on.

In order to prevent the discharge of waste matters into the North River and remove the nuisance therein, it is important, first, to investigate fully the causes of the present nuisance, the means necessary for its prevention, and to devise a suitable plan for relief. Such an investigation will involve an expenditure of a considerable sum of money for which no provision has been made in the appropriations available to this Department. The Department recommends that the city of Salem, either alone or in conjunction with the city of Peabody, petition the Legislature for an order directing a thorough investigation of the whole question of the condition of North River and of the trunk sewer and its appurtenances, and the preparation of a practicable plan for the removal of the nuisance now existing in North River. The investigation should be committed to such agency as the Legislature may direct, and a suitable sum of money provided to defray the necessary expenses of the work.

Taunton River.

The condition of the Salisbury Plain River below Brockton, and that of the Coweaset River below the Brockton sewage filters, has of late varied considerably from year to year. The results of analyses indicate in general a slight improvement in the condition of the former stream during the past year, while the reverse is true of the latter. The condition of the Coweaset River should show improvement when the new Brockton sewage disposal works now just completed are put into operation. The Town River into which the Coweaset River discharges has been slightly more polluted than during 1920 both above and below Bridgewater. Above Taunton the main river has been more noticeably polluted than in 1920 but less than in earlier years, while below Taunton at Berkeley Bridge the condition of the river has been more objectionable than in 1920.

Other Rivers.

The examinations of other rivers have shown no change in their condition worthy of note.

EXAMINATION OF SEWAGE DISPOSAL WORKS.

The following tables contain statistics concerning the more important sewage disposal works in the State and the average results of analyses of samples of sewage and effluent.

In general the quantity of sewage received at most of the sewage disposal works has been slightly less than in 1920 and except in a few cases has been of about the usual strength.

At Andover a large mill and many dwelling houses have been constructed recently close to the filter beds and a sewerage system has been extended to include this new settlement, which is known as Shawsheen Village, but much of the sewage from this new section of the town has been discharged untreated into the Shawsheen River during the year. The quantity of sewage delivered at the disposal works for a number of years has exceeded their capacity, and near the end of the year a plan was presented providing for the abandonment of this sewage disposal works and the disposal of the sewage elsewhere.

At Brockton the additional sewage disposal works, comprising a series of large settling tanks and $1\frac{1}{2}$ acres of trickling filters, had been practically completed at the end of the year and will soon be placed in operation.

Several of the sewage disposal works in the State, particularly those at Clinton, Framingham, Milford, Natick and Norwood, have been heavily overloaded during the year, and at some of these places, namely, at Clinton and Milford, considerable quantities of sewage have been allowed to overflow without treatment. At Framingham the load on the sewage filters is greater in comparison to the area than at any other plant in the State, but it has been possible through the careful management which these filters have received to prevent the overflow of any considerable quantity of untreated sewage, though sewage stands on the surface of the filters sometimes for long periods.

At Gardner and Northbridge additional sewerage facilities have been provided. At Milford the underdrainage system of the filter beds was thoroughly cleaned during the past year, but a large addition to the disposal works is necessary in order to treat all the sewage and prevent the serious pollution of the Charles River by untreated sewage.

Considerable quantities of sewage have also been allowed to overflow without treatment from the sewerage systems at Easthampton, Leicester, Pittsfield, Southbridge and Spencer, but no material diffi-

culty has been encountered in the treatment of the sewage at Attleboro, Concord, Hopedale, Hudson, Marlborough, North Attleborough and Northbridge.

At Worcester the work of improving the sewage disposal works, as required by chapter 171, Special Acts of the year 1919, has been carried on as rapidly as practicable during the year. Nearly all excavation was completed at the end of the year and a few of the hoppers of the Imhoff tanks were in place. The walls and flooring for the trickling filters were also well under way and excavation begun for the secondary settling tanks.

TABLE NO. 1. — Average Results of the Analyses of Monthly Samples of Sewage as received at the Disposal Works. (Fats determined in about 74 Per Cent of the Samples.)

[Parts in 100,000.]

City or Town.	RESIDUE ON EVAPORATION.						AMMONIA.			Chlorine.	OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.	
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.			Unfiltered.	Filtered.	Unfiltered.	Filtered.			
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.		Total.	Dissolved.								Suspended.
Andover	66.43	45.90	20.53	37.52	19.75	17.77	3.40	.69	.40	.29	7.10	3.98	.214	.113	1.37	12.79	
ATTLEBORO ¹	41.88	31.96	9.92	18.24	11.84	6.40	2.79	.46	.25	.21	3.44	1.99	.262	.110	.98	—	
BROCKTON ²	64.20	47.18	17.02	35.38	22.50	12.88	5.51	.86	.47	.39	7.87	4.59	.206	.098	1.67	7.93	
Clinton	180.33	92.32	88.01	119.20	45.55	73.65	3.07	1.49	.84	.65	17.63	9.34	.237	.085	3.12	41.57	
Concord ¹	28.85	23.77	5.08	15.95	11.78	4.17	2.02	.37	.21	.16	3.53	2.22	.173	.093	.68	—	
Easthampton ¹	58.23	39.97	18.26	35.30	18.97	16.33	4.68	.75	.45	.30	6.62	4.30	.138	.053	1.41	—	
FIRCHBURG	64.96	34.20	30.76	36.54	16.11	20.43	2.14	.73	.33	.40	8.95	4.55	.864	.163	1.63	9.68	
Framingham ²	99.81	57.80	42.01	58.88	26.65	32.23	3.91	1.43	.75	.68	12.57	7.43	.325	.095	2.57	20.41	
Franklin ¹	30.37	23.40	6.97	15.17	9.80	5.37	3.40	.37	.26	.11	3.45	2.26	.074	.043	.75	—	
Gardner (Gardner area) ³	86.25	56.95	29.30	51.25	27.85	23.40	12.30	1.91	1.02	.89	12.38	6.22	.267	.083	2.90	17.55	
Gardner (Templeton area)	69.70	52.70	17.00	38.57	24.42	14.15	6.22	.62	.40	.40	8.33	5.02	.191	.087	1.92	7.38	
Hopedale ¹	68.57	39.73	28.84	37.57	20.40	17.17	5.38	1.25	.73	.52	8.83	5.33	.242	.063	2.34	—	
Hudson	85.89	63.60	22.29	37.84	20.76	17.08	6.56	1.13	.64	.49	7.91	4.20	.305	.094	2.24	11.63	
Leicester ³	42.80	30.95	11.85	24.05	15.37	8.68	2.84	.62	.40	.22	4.24	5.95	.133	.049	1.21	—	
Marion	25.75	20.36	5.39	11.89	8.88	3.31	1.75	.29	.19	.10	2.72	1.66	.204	.105	.63	—	
MARLBOROUGH	71.13	46.35	24.78	38.15	19.78	18.37	4.43	.93	.52	.41	9.38	4.71	.328	.124	1.80	13.54	
Milford ³	60.60	38.10	22.50	28.60	15.80	12.80	3.77	.60	.28	.32	6.83	3.65	.283	.121	1.37	—	
Natick ²	46.85	38.13	8.72	20.10	13.65	6.45	3.09	.45	.26	.19	4.12	2.54	.212	.082	.90	2.91	
North Attleborough ¹	27.13	20.30	6.83	13.60	8.53	5.07	1.22	.38	.22	.16	3.99	3.20	.189	.095	.98	—	
Northbridge ¹	50.50	37.90	12.60	28.33	18.17	10.16	4.35	.89	.51	.38	5.46	4.82	—	—	1.60	—	
Norwood	75.10	54.65	20.45	29.80	20.18	9.62	2.98	.60	.32	.28	7.26	4.13	.201	.083	1.41	6.07	
Pittsfield ²	38.08	31.22	6.86	17.75	13.62	4.13	2.09	.34	.21	.13	3.23	1.92	.183	.087	.71	2.71	
Southbridge ¹	66.20	39.33	26.87	36.70	16.27	20.43	5.41	.77	.32	.45	8.77	3.23	.230	.068	1.83	10.31	
Spencer ¹	40.47	27.80	12.67	20.53	10.73	9.80	2.51	.55	.30	.25	5.15	2.66	.215	.075	1.10	5.12	
Stockbridge ³	33.25	28.30	4.95	14.55	12.75	1.80	1.67	.29	.19	.10	2.98	2.66	—	—	.60	—	
Westborough	42.08	32.38	9.70	21.45	14.10	7.35	2.33	.54	.33	.21	5.59	3.18	.145	.061	1.15	4.47	
WORCESTER (day) ⁴	93.28	57.40	35.88	44.64	16.90	28.64	3.16	.95	.31	.64	12.00	5.34	2.725	.885	2.11	—	
WORCESTER (night) ¹	60.93	45.47	21.46	29.23	12.57	16.66	1.49	.53	.17	.36	6.82	3.12	3.960	1.376	1.44	—	

¹ Six samples.

² At pumping station.

³ Four samples.

⁴ Five samples.

TABLE No. 2. — Average Results of the Analyses of Monthly Samples of Sewage as applied to Filter Beds after Preliminary Treatment as indicated. (Fats determined in about 74 Per Cent of the Samples.)

[Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	RESIDUE ON EVAPORATION.						AMMONIA.			Chlorine.	OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.	
		TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	Total.	Dissolved.		Suspended.	Unfiltered.	Filtered.	Unfiltered.			Filtered.
		Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.											
Andover	Tank	55.05	48.02	7.03	25.22	20.70	4.52	3.40	.53	.36	.17	8.78	5.26	3.78	.132	.078	1.08	7.13
ATTLEBORO ¹	None	41.88	31.96	9.92	18.24	11.84	6.40	2.79	.46	.25	.21	7.16	3.44	1.99	.262	.110	.98	—
BROCKTON	Tanks	41.71	33.82	7.89	19.29	13.82	5.47	3.76	.46	.26	.20	6.98	5.24	3.22	.165	.098	.87	3.81
CLINTON	Basins	66.18	57.42	8.76	32.69	28.11	4.58	2.69	.64	.45	.19	5.02	7.64	6.27	.220	.116	1.32	12.29
Concord	None	28.85	23.77	5.08	15.95	11.78	4.17	2.02	.37	.21	.16	3.67	3.53	2.22	.173	.093	.68	—
Easthampton ¹	Tanks	47.00	33.90	13.10	24.07	13.45	10.62	4.75	.61	.38	.23	6.88	4.82	2.93	.137	.052	1.08	—
FITCHBURG	Imhoff tanks	35.65	31.80	3.85	15.75	13.27	2.48	2.22	.33	.23	.10	5.97	4.26	3.02	.408	.236	.86	3.40
FRANKINGHAM ²	None	99.81	57.80	42.01	58.88	26.65	32.23	3.91	1.43	.75	.68	11.90	12.57	7.43	.325	.095	2.57	20.41
Franklin ¹	Tanks	24.03	22.13	1.90	10.97	9.76	1.21	1.81	.23	.19	.04	3.16	2.21	1.68	.094	.048	.48	—
Gardner (Gardner area) ³	None	86.25	56.95	29.30	51.25	27.85	23.40	12.30	1.91	1.02	.89	8.35	12.38	6.22	.267	.083	2.90	17.55
Gardner (Templeton area)	Tanks	44.21	37.32	6.89	20.58	14.77	5.81	4.14	.45	.31	.14	8.06	3.62	2.61	.143	.083	.92	3.49
Hopedale ¹	Tanks	54.13	40.90	13.23	29.80	18.87	10.93	6.83	.71	.37	.34	7.10	5.97	3.40	.213	.088	1.37	—
Hudson	Tanks	55.47	45.56	9.91	24.71	17.54	7.17	5.06	.47	.30	.17	11.14	3.77	2.58	.165	.089	.92	4.57
Leicester ³	None	42.80	30.95	11.85	24.05	15.37	8.68	2.84	.62	.40	.22	4.24	5.95	4.80	.133	.049	1.21	—
Marion	None	25.75	20.36	5.39	11.89	8.58	3.31	1.75	.29	.19	.10	3.42	2.72	1.66	.204	.105	.63	—
MAHLBOROUGH	Tanks	53.02	43.67	9.35	21.95	16.18	5.77	4.45	.60	.38	.22	8.78	5.29	3.64	.173	.107	1.14	4.47
Milford ³	Tanks	45.40	36.65	8.75	19.50	13.35	6.15	3.14	.47	.24	.23	6.10	4.83	2.85	.243	.090	1.06	—
Natick ²	None	45.83	38.13	8.72	20.10	13.65	6.45	3.09	.45	.26	.19	7.36	4.12	2.54	.212	.082	.90	2.91
North Attleborough ¹	Tanks	23.07	18.53	4.54	8.23	6.93	1.30	1.32	.16	.10	.06	3.78	1.78	1.26	.108	.062	.39	—
Northbridge ¹	Tanks	23.83	19.10	4.73	12.73	9.13	3.60	3.20	.31	.21	.10	2.78	2.98	1.83	—	—	.67	—
Norwood	Tank	55.02	43.62	11.40	20.58	13.96	6.62	2.29	.37	.20	.17	12.07	4.73	2.95	.233	.089	.92	2.96
PITTSFIELD ²	None	38.08	31.22	6.86	17.75	13.62	4.13	2.09	.34	.21	.13	4.81	3.23	1.92	.183	.087	.71	2.71
Southbridge ¹	Tanks	40.47	33.70	12.13	20.53	12.23	8.30	4.43	.48	.23	.25	8.38	4.17	2.53	.400	.147	1.08	3.27
Spencer	None	40.47	27.80	12.67	20.53	10.73	9.80	2.51	.55	.30	.25	4.13	5.15	2.86	.215	.075	1.10	5.12
Stockbridge ³	None	33.25	28.30	4.95	14.55	12.75	1.80	1.67	.29	.19	.10	3.38	2.98	2.36	—	—	.60	—
Westborough	None	42.08	32.38	9.70	21.45	14.10	7.35	2.33	.54	.33	.21	5.08	5.59	3.18	.145	.061	1.15	4.47
WORCESTER (day) ⁴	Tanks	93.28	57.40	35.88	44.64	16.00	28.64	3.16	.95	.31	.64	9.63	12.00	5.34	2.725	.885	2.11	—

¹ Six samples.

² At pumping station.

³ Four samples.

⁴ Five samples.

TABLE No. 3. — Efficiency of Settling Tanks and Other Forms of Preliminary Treatment as indicated by the Foregoing Tables.

[Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	SUSPENDED SOLIDS.			TOTAL ALBUMINOID AMMONIA.			OXYGEN CONSUMED.			FATS. ¹			CHLORINE.	
		Raw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or Treated Sewage.
Andover	Tank	20.53	7.03	66	.69	.53	23	7.10	5.26	26	12.79	7.13	44	8.01	8.78
BROCKTON	Tanks	17.02	7.89	54	.86	.46	47	7.87	5.24	33	7.93	3.81	52	8.90	6.98
Clinton	Basins	88.01	8.76	90	1.49	.64	57	17.63	7.64	57	41.57	12.29	70	6.32	5.02
Easthampton	Tanks	18.26	13.10	28	.75	.61	19	6.62	4.82	27	—	—	—	6.70	6.88
FITCHBURG	Inhoff tanks	30.76	3.85	87	.73	.33	55	8.95	4.26	52	9.68	3.40	65	6.16	5.97
Franklin	Tanks	6.97	1.90	73	.37	.23	38	3.52	2.21	37	—	—	—	3.45	3.16
Gardner (Templeton area)	Tanks	17.00	6.89	59	1.02	.45	56	8.33	3.62	57	7.38	3.49	53	10.47	8.06
Hopedale	Tanks	28.84	13.23	54	1.25	.71	43	8.83	3.97	32	—	—	—	6.08	7.10
Hudson	Tanks	22.29	9.91	56	1.13	.47	58	7.91	3.77	52	11.63	4.57	61	17.93	11.14
MARLBOROUGH	Tanks	24.78	9.35	62	.93	.60	35	9.38	5.29	44	13.54	4.47	67	8.58	8.78
Milford	Tanks	22.50	8.75	61	.60	.47	22	6.83	4.83	29	—	—	—	7.38	6.10
North Attleborough	Tanks	6.83	4.54	34	.38	.16	58	3.20	1.78	44	—	—	—	3.99	3.78
Northbridge	Tanks	12.60	4.73	62	.89	.31	65	7.10	2.98	58	—	—	—	5.46	2.78
Norwood	Tank	20.45	11.40	41	.60	.37	38	7.26	4.73	35	6.07	2.96	52	15.90	12.07
Southbridge	Tanks	26.87	12.13	55	.77	.48	38	7.27	4.17	43	10.31	3.27	68	8.77	8.38
WORCESTER	Chemical precipitation.	21.46	5.24	76	.53	.20	62	6.82	1.93	72	—	—	—	6.90	6.03

¹ Fats determined in about 74 per cent of the samples.

TABLE No. 4. — Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton and Fitchburg, and of their Effluents, etc. Per Cents removed, etc.

BROCKTON.

[Parts in 100,000.]

	RESIDUE ON EVAPORATION.			AMMONIA.			Chlorine.	NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	Remarks.
	LOSS ON IGNITION.			ALBUMINOID.				Nitrates.	Nitrites.	Unfiltered.	Filtered.			
	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.									Suspended.
Sewage as applied to trickling filter.	38.82	32.76	6.06	3.66	.45	.26	.19	6.91	-	4.51	2.85	.78	3.52	Trickling filter now has an area of 2 acres and a depth of 10 feet of crushed stone from 1.5 to 3 inches in size. Only 1/2 acre is used at a time for two-hour periods. The average rate of operation was about 658,762 gallons per acre per day. All sewage discharged to the trickling filter passes through settling tanks. Period of sedimentation averaged about 15 hours. Tank cleaned once per week.
Effluent from trickling filter	42.04	35.02	7.02	4.13	.28	.17	.11	7.31	.5208	3.09	2.06	.67	1.80	
Per cent removed	-	-	-	-	38	35	42	-	-	31	30	14	49	
Settled effluent from trickling filter.	42.55	36.04	6.51	3.88	.36	.23	.13	8.13	.4566	3.67	2.54	.72	2.14	
Per cent removed by tank	-	-	-	6	-	-	-	-	-	-	-	-	-	
Per cent removed by trickling filter and settling tank.	-	-	-	-	20	12	32	-	-	19	11	8	39	
					49	-	27	-	-	-	-	-	-	

TABLE No. 4. — Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton and Fitchburg, and of their Effluents, etc. Per Cents removed, etc. — Concluded.

FITCHBURG.

[Parts in 100,000.]

	RESIDUE ON EVAPORATION.			AMMONIA.			NITROGEN AS —		OXYGEN CONSUMED.		Remarks.				
	LOSS ON IGNITION.			ALBUMINOID.			Nitrates.	Nitrites.	Unfiltered.	Filtered.					
	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.						Suspended.	Chlorine.	Kjeldahl Nitrogen.	Fats.
Imhoff tank effluent as applied to trickling filter.	35.65	31.80	3.85	15.75	13.27	2.48	2.22	.33	.23	.10	5.97	-	-.86	3.40	The trickling filter has an area of 2.14 acres and a depth of 10 feet of stone from 1 to 3 inches in size.
Effluent from trickling filter	32.48	29.52	2.96	13.68	12.28	1.40	.92	.16	.11	.05	5.80	.0288	.49	-	The average rate of operation was about 1,300,000 gallons per acre per day for area used (1.86 acres).
Per cent removed	9	7	23	13	7	44	58	52	52	50	3	-	43	-	Period of sedimentation one and one-half hours. Tanks cleaned five times.
Settled effluent from trickling filter as discharged to Nashua River.	31.85	28.83	3.02	12.65	11.00	1.65	.94	.14	.09	.05	5.84	.9036	.45	-	
Per cent removed by tank	2	2	-	8	10	-	-	13	18	-	-	-	8	-	
Per cent removed by trickling filter and settling tanks.	11	9	22	20	17	33	58	58	61	50	-	-	48	-	

TABLE NO. 5. — *Average Results of Analyses of Monthly Samples of Effluent from Sand Filters.*

[Parts in 100,000.]

CITY OR TOWN.	Free Ammonia.	Total Albuminoid Ammonia.	Chlorine.	NITROGEN AS —		Iron.
				Nitrates.	Nitrites.	
Andover ¹	2.13	.1161	7.74	.3561	.0189	.438
BROCKTON ¹	4.13	.0943	8.84	.1194	.0059	1.515
Clinton ¹	1.80	.0885	4.35	.1245	.0051	2.436
Concord ²	.03	.0121	3.60	.7119	.0006	.014
Easthampton ²	.87	.0657	5.65	.5680	.0112	.790
Framingham ¹	2.60	.0945	8.78	.3003	.0135	1.563
Franklin ²	1.64	.0663	4.07	.1722	.0154	.477
Gardner (Gardner area) ³	1.28	.0878	7.78	1.6617	.0135	.215
Gardner (Templeton area)	2.22	.1540	9.38	1.2842	.0749	.149
Hopedale ¹	1.72	.0675	6.22	2.7231	.0027	.081
Hudson	2.07	.0985	9.68	1.2508	.0344	.120
Leicester ³	1.30	.0625	4.61	.2550	.0109	.316
Marion	.45	.0394	4.78	.4877	.0041	.093
MARLBOROUGH ¹	.58	.0304	6.74	1.8043	.0077	.060
Milford	2.53	.0885	5.68	.4588	.0118	1.050
Natick	2.00	.0555	7.19	.1443	.0082	.987
North Attleborough ²	.04	.0092	2.84	.6259	.0029	.019
Northbridge ²	.12	.0151	2.95	.9805	.0212	.021
Norwood	1.39	.0755	14.30	.3147	.0425	.615
PITTSFIELD ¹	.86	.0634	5.01	.4467	.0307	.260
Southbridge ⁴	3.60	.0815	6.98	.1815	.0071	1.790
Spencer ²	.05	.0151	3.73	.9673	.0029	.045
Stockbridge ¹	.28	.0372	2.75	.4387	.0108	.115
Westborough ¹	1.47	.0649	5.92	.1235	.0081	.828
WORCESTER ⁵	1.87	.0688	9.30	.9888	.0098	2.420

¹ Regular samples from two or more underdrains in one average.² Six samples.³ Four samples.⁴ Eleven samples.⁵ Five samples.

TABLE NO. 6. — *Efficiency of Sand Filters (Per Cent of Free and Albuminoid Ammonia removed).*

[Parts in 100,000.]

CITY OR TOWN.	FREE AMMONIA.			TOTAL ALBUMINOID AMMONIA.			CHLORINE.		Rate of Operation with Even Distribution (Gallons per Acre per Day). ¹
	Applied Sewage.	Effluent.	Per Cent removed.	Applied Sewage.	Effluent.	Per Cent removed.	Applied Sewage.	Effluent.	
Andover	3.40	2.13	37	.53	.1161	78	8.78	7.74	67,000
BROCKTON	3.76	4.13	-	.46	.0943	80	6.98	8.84	-
Clinton	2.69	1.80	33	.64	.0885	86	5.02	4.35	49,000
Concord	2.02	.03	99	.37	.0121	97	3.67	3.60	104,000
Easthampton	4.75	.87	82	.61	.0657	89	6.88	5.65	-
Framingham	3.91	2.60	34	1.43	.0945	93	11.90	8.78	54,000
Franklin	1.81	1.64	9	.23	.0663	71	3.16	4.07	79,000
Gardner (Gardner area)	12.30	1.28	90	1.91	.0878	95	8.35	7.78	} 80,000
Gardner (Templeton area)	4.14	2.22	46	.45	.1540	66	8.06	9.38	
Hopedale	6.83	1.72	75	.71	.0675	90	7.10	6.22	-
Hudson	5.06	2.07	59	.47	.0985	79	11.14	9.68	54,000
Leicester	2.84	1.30	54	.62	.0625	90	4.24	4.61	-
Marion	1.75	.45	74	.29	.0394	86	3.42	4.78	-
MARLBOROUGH	4.45	.58	87	.60	.0304	95	8.78	6.74	47,000
Milford	3.14	2.53	19	.47	.0885	81	6.10	5.68	93,000
Natick	3.09	2.00	35	.45	.0555	88	7.36	7.19	69,000
North Attleborough	1.32	.04	97	.16	.0092	94	3.78	2.84	113,000
Northbridge	3.20	.12	96	.31	.0151	95	2.78	2.95	50,000
Norwood	2.29	1.39	39	.37	.0755	80	12.07	14.30	-
PITTSFIELD	2.09	.86	59	.34	.0684	80	4.81	5.01	83,000
Southbridge	4.43	3.60	19	.48	.0815	83	8.38	6.98	118,000
Spencer	2.51	.05	98	.55	.0151	97	4.13	3.73	-
Stockbridge	1.67	.28	83	.29	.0372	87	3.38	2.75	-
Westborough	2.33	1.47	37	.54	.0649	88	5.08	5.92	79,000
WORCESTER	3.16	1.87	41	.95	.0688	93	9.63	9.30	51,000

¹ See also Table No. 7.

TABLE No. 7. — *Extent of Sewerage Works, Rate of Operation of Sand Filters.*

CITY OR TOWN.	Popu- lation, Census of 1920.	Approxi- mate Length of Sanitary Sewers (Miles).	Approxi- mate Number of House Con- nections.	ESTIMATED QUANTITY OF SEWAGE TREATED (GALLONS PER DAY).			Estimated Quantity of Sewage per Connection (Gallons per Day).	Net Area of Filter Beds (Acres).	Estimated Rate of Operation with Even Dis- tribution (Gallons per Acre per Day).
				Average for Year.	Average for Month of Maximum Flow.	Average for Month of Minimum Flow.			
Andover	8,268	—	—	243,000	285,000	207,000	—	67,000	
ATTLEBORO	19,731	30.88	1,187	649,000 ²	—	404,000	646	42,000	
BROCKTON	66,251	89.92	6,882	3,202,000 ³	—	—	465	51,000	
Clinton	12,979	22.03	1,631	1,289,000	1,493,000	1,317,000	790	49,000	
Concord	6,461	8.92	482	445,000	686,000	338,000	923	104,000	
Easthampton	11,261	19.35	1,213	—	—	—	—	—	
FITCHBURG	41,029	—	—	2,416,000 ²	—	—	—	—	
Framingham	17,033	26.51	2,361	1,137,000	1,462,000	822,000	482	54,000	
Franklin	6,497	16.00	594	257,000	421,000	69,000	433	79,000	
Gardner	16,971	28.64	1,866	1,000,000 ²	—	—	536	80,000	
Hopedale	2,777	—	—	—	693,000	—	—	54,000	
Hudson	7,607	10.50	701	486,000	—	365,000	693	54,000	
Marion	1,288	3.93	167	—	—	—	—	—	
MARLBOROUGH	15,028	30.99	2,224	979,000	1,575,000	550,000	440	47,000	
Millford	13,471	18.19	1,355	865,000	1,067,000	451,000	638	93,000	
Natick	10,907	15.64	1,419	867,000	1,331,000	581,000	611	69,000	
North Attleborough	9,238	16.60	672	793,000	857,000	702,000	1,180	113,000	
Northbridge	10,174	—	661	600,000	671,000	493,000	901	50,000	
Norwood	12,627	18.79	1,225	1,250,000	—	—	1,020	118,000	
PITTSFIELD	41,763	61.85	4,910	3,418,000	3,769,000	2,570,000	696	83,000	
Southbridge	14,245	16.70	1,153	1,000,000 ²	—	—	867	118,000	
Spencer	5,930	—	—	—	—	—	—	—	
Westborough	5,789	9.60	529	457,000	604,000	334,000	864	79,000	
WORCESTER	179,754	186.98 ⁴	—	3,680,000 ^{2,5}	—	—	—	51,060	

1 Additional area under construction.
 2 Data for months of maximum flow not complete.
 3 Includes quantity treated by the trickling filter, amounting to about 1,317,000 gallons per day.
 4 Includes 69.81 miles of combined services.
 5 Amount treated by sand filters. Total flow 21,200,000 gallons per day.

TABLE NO. 8. — *General Features.*

[For data concerning the trickling filters at Brockton and Fitchburg see Table No. 4.]

CITY OR TOWN.	Year of Construction of and Additions to Works.	Depth of Under-drains (Feet).	Distance Apart of Under-drains (Feet).	Filtering Material.	Attention given to Disposal Works.
Andover	1898	4	20	Fair sand, small quantity of gravel; practically all handled in construction.	One man all the time.
ATTLEBORO	1912, 1913	4-7	35	Excellent sand and gravel; found in place	One man all the time; others when necessary.
BROCKTON	1893, 1905, 1908, 1912	5.5	30	Good sand and gravel; found in place	Four men all the time; large force when necessary.
Clinton	1898, 1899	8	60-70	Good sand and gravel; found in place	Two men all the time; others when necessary.
Concord	1899	none	-	Good sand overlaid with gravel; found in place . .	One man once a day.
Easthampton	1908	3.5	20-40	Good sand and gravel; largely found in place . . .	One man all the time; one other when necessary.
Framingham	1890	4-4.5	30-40	Good sand and gravel	Three or more men in summer; only one in winter.
Franklin	1915	4.5	26	Good sand and gravel	One man every two or three days; others when necessary.
Gardner (Gardner area)	1891	5	20	Good sand; handled in construction	One man all the time; others when necessary.
Gardner (Templeton area)	1901, 1909	3-4	20-30	Coarse sand; handled in construction	One man all the time; more when necessary.
Hopedale	1900	3	35-60	Some good sand and some rather fine sand	One man all the time.
Hudson	1904, 1910	5-6	50-100	Good sand and gravel; found in place	One man all the time; others when necessary.
Leicester	1894	4	8	Hard, compact sand; found in place	Very little attention.
Marion	1906	5	-	Mostly good sand; pockets of fine sand and some ledge; largely found in place.	One man every day in summer; every other day in winter.
MARLBOROUGH	1891, 1908, 1909, 1910, 1911	4.5-6	30-50	Rather fine sand; found in place	One man all the time; others when necessary.
Milford	1907	5	40	Rather fine sand; found in place	One man every day; others when necessary.
Natick	1896	6	36	Sand of good quality, but strata of very fine sand in places; found in place.	One man all the time; others when necessary.
North Attleborough	1909, 1910	5-6.5	55	Coarse sand and gravel; largely found in place . .	One man every day; others when necessary.
Northbridge	1906, 1907	4	50-75	Coarse sand and gravel; mostly handled	Two men all the time; others when necessary.
Norwood	1909	4-6	40	Good sand and gravel; found in place	One man every day; others when necessary.
PITTSFIELD	1901, 1915	4	35	Good sand; mostly found in place	Two men all the time; others when necessary.
Southbridge	1908	4	40	Fair sand and gravel; considerable quantity handled, some found in place.	One man once a day.
Spencer	1897	- ¹	-	Good sand and gravel; largely found in place . . .	One man all the time; others when necessary.
Stockbridge	1899	{ 3-4.5 3-4.5	23 30	Sand filters, good quality sand	One man all the time.
Westborough	1892, 1911	5	30-40	Irrigation area, rather fine sand	One man all the time; others when necessary.
WORCESTER	1898 ²	4-6	35-50	Good sand and gravel; handled in construction . .	Several men all the time; a large force when necessary.

¹ Only three beds underdrained.

² Year of first construction of sand filters. Many additions.

DIVISION OF WATER AND SEWAGE
LABORATORIES

H. W. CLARK, *Director*

REPORT OF DIVISION OF WATER AND SEWAGE LABORATORIES.

During the year 1921 this Division made 9,360 chemical, 2,105 microscopical and 2,706 bacterial analyses, as shown in a following summary. The results of a large part of this work are given in the tables of analyses in the report of the Division of Sanitary Engineering. Much of this analytical work was carried on to determine the quality of the public water supplies of the State and of the effluents from filters treating or purifying such supplies, the condition of the rivers, the character of the sewage entering rivers or passing to filtration areas, the degree of purification obtained at these areas, the character of factory wastes, and the quality of the effluents from filters receiving such wastes.

Considerable work was done in regard to corrosion of service pipes, the determination of lead, manganese, carbonic acid, etc., in special samples of water, and many analyses of spring waters, water from domestic wells, ice supplies, etc., were made. Further than this, considerable analytical and bacterial work was carried on to determine the quality of shellfish from different areas of the State and also the condition of the water over these areas. Special studies were made of methods for the treatment and disposal of sewage, of the condition and efficiency of certain municipal sewage disposal areas, of the efficiency of small septic tanks for houses, factories, etc., and of many general questions concerning the treatment of trade wastes, the disposal of sewage by trickling filters, aëration, activated sludge tanks and similar processes.

The purification of water by means of chemical coagulants and rapid sand filtration has, because of new questions arising during the past two years concerning this method and the results obtained from it, acquired new importance, hence more complete studies are being carried on at the experiment station than ever before and with better equipment than previously available.

Besides the work already mentioned, many special chemical and bacterial investigations were made during the year, both upon laboratory methods and technique and upon questions submitted to this Division for explanation. It is impossible to give in detail all the

work of the Division, but a brief summary of some of the work carried on at the Lawrence Experiment Station is reported in the following pages.

The following table summarizes the analytical work of the Division during the year: —

State House Laboratories.

Samples from public water supplies:	
Surface waters	2,396
Ground waters	1,055
Samples from domestic wells, ice supplies, etc.	212
Samples from rivers	1,037
Samples from sewage disposal works:	
Sewages	402
Effluents	600
Samples of wastes and effluents from factories	87
Samples of sea water from various locations	25
Miscellaneous samples (partial analyses)	48
	5,862
Microscopical examinations	2,105
Special examinations of water for manganese and lead	437
Other special examinations	89
	2,631

Lawrence Experiment Station.

Chemical examinations on account of investigations concerning the disposal of domestic sewage and factory wastes, filtration and other treatment of water supplies and swimming pools, ice supplies, etc.	1,978
Mechanical and chemical examinations of sand	83
Bacterial examinations of water from public water supplies, sewage effluents, ice, etc.	1,564
Bacterial examinations in connection with methods of purification of sewage and water	1,103
Bacterial examinations of samples of shellfish	39
	4,767

CHARACTER OF THE SEWAGE USED AT THE LAWRENCE EXPERIMENT STATION.

Since 1915 sewage has been pumped to the station through a pipe about 1,850 feet long from the Osgood Street sewer on the south side of the Merrimack River at a point above the entrance of any trade

waste, and the following table gives the average analyses for the year of the sewage used. "Regular sewage" is the average of samples collected four times daily of the sewage as pumped; "settled sewage" is the average of sedimentation of the regular sewage. The average analysis of the sewage applied during the year to Filters Nos. 1, 4 and 9A is given in the table. A second table gives the total solid matters and the solid matters in suspension in the sewage as pumped and in the settled sewage. This settled sewage is applied to some of the filters and used in activated sludge Tank No. 485 and in certain other experiments described later.

Average Analyses.

Regular Sewage.

[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.		Total.	In Solution.			
	Total.	In Solution.					
3.93	.89	.47	1.62	.87	8.2	5.08	1,170,000

Settled Sewage.

4.14	.69	.42	1.29	.82	7.0	4.23	730,000
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Sewage applied to Filters Nos. 1, 4 and 9A.

3.43	.56	-	1.14	-	7.5	4.09	1,170,000
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Average Solids.

Regular Sewage.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
63.0	30.5	32.5	44.4	16.3	28.1	18.6	14.2	4.4

Settled Sewage.

52.2	25.5	26.7	40.7	18.1	22.6	11.5	7.4	4.1
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OPERATION OF SEPTIC TANKS.

Since June, 1920, two septic tanks, Nos. 507 and 508, have been in operation at the station. Each of these tanks is constructed of concrete. Tank No. 507 is 4 feet long, 2 feet wide and 40 inches deep, with a sloping bottom, and has a capacity of 185 gallons. The sewage enters the tank through a trapped inlet and discharges through a pipe reaching 15 inches below the surface. A baffle is placed one-third of the distance from the inlet, extends to within 8 inches of the surface, and reaches to within 10 inches of the bottom of the tank. A trapped outlet is provided for the escape of gas, and air is carefully excluded.

Tank No. 508 consists of two compartments, each of the same size and construction as Tank No. 507 except there are no baffles within the tank. The overflow of the first compartment passes into the second 6 inches below the surface of the liquid in the second compartment and 2 feet 8 inches from the outlet of the tank. From this tank air is also excluded and its inlet and outlet are trapped, and there is a trapped outlet for the escape of gas.

Fresh sewage was applied to Tank No. 507 and regular station sewage to Tank No. 508. Into the first tank 90 gallons of sewage were passed daily, and into the second, 185 gallons, giving approximately two days' storage of this sewage in each tank. During the year and one-half of operation, up to Nov. 30, 1921, the following results were obtained:—

Very little gas was given off by either tank, although the effluent from Tank No. 508 had a strong odor of hydrogen sulphide during certain days. At times a considerable amount of suspended matter passed away in the effluents from each tank, but these effluents were always much clearer than the applied sewage, indicating the removal of colloids. Thirty-one per cent of the samples of effluent from each tank were stable on incubation. On April 5, after about ten months' operation, both tanks were opened and careful measurements made of the sludge. It was found by these measurements that during the operation of Tank No. 507, 52 per cent of the total entering sludge and 41 per cent of the organic matter of the sludge had been destroyed or had passed away in the effluent. Of the total sludge entering Tank No. 508, 60 per cent had been destroyed, and of the organic matter in the sludge, 62 per cent. Each tank contained a considerable volume of wet sludge; that in Tank No. 507, for instance, filled 26 per cent by volume of the tank, this sludge being 6.13 per cent solid matter, of which about half was organic matter. The first compartment of

Tank No. 508 had 28 per cent of its capacity occupied by sludge, and the second compartment, 20 per cent, this sludge containing on examination about 6 per cent of solid matter of which approximately half was organic matter.

Reviewing the experiments up to date it can be said that the percentage of sludge digestion in these tanks is not materially different from that obtained in other septic tanks operated at the station in former years, but the effluents from these tanks have been clearer and much less offensive. In previous experimental work the exclusion of air has not been as complete as in the operation of these tanks.

Tables showing the average analysis of the sewage applied to and of the effluent from these tanks follow: —

Average Analyses.

Station Sewage applied to Closed Septic Tank No. 507.

[Parts in 100,000.]

AMMONIA.			KJELDAHL NI- TROGEN.		Chlorine.	Oxygen con- sumed.	Fats.	Bacteria per Cubic Centi- meter.
Free.	ALBUMINOID.		Total.	In So- lution.				
	Total.	In So- lution.						
3.95	.87	.51	1.65	1.01	5.5	4.80	4.4	4,170,000

Effluent from Closed Septic Tank No. 507.

3.64	.41	.29	.79	.56	5.4	2.61	1.6	754,000
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Regular Sewage applied to Closed Septic Tank No. 508.

3.71	.75	.40	1.47	.78	7.2	4.48	3.4	1,330,000
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Effluent from Closed Septic Tank No. 508.

3.28	.30	.20	.58	.37	6.7	2.03	1.0	326,000
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*Average Solids.**Station Sewage applied to Closed Septic Tank No. 507.*

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
73.4	33.5	39.9	49.6	20.2	29.4	23.8	13.3	10.5

Effluent from Closed Septic Tank No. 507.

48.7	19.3	29.4	42.2	14.9	27.3	6.5	4.4	2.1
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Regular Sewage applied to Closed Septic Tank No. 508.

54.8	26.5	28.3	39.1	16.1	23.0	15.7	10.4	5.3
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Effluent from Closed Septic Tank No. 508.

37.3	13.6	23.7	33.7	11.3	22.4	3.6	2.3	1.3
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PURIFICATION OF SEWAGE BY AËRATION. — ACTIVATED SLUDGE.

Activated sludge Tank No. 485, started in April, 1917, has always been operated by the continuous flow method. It consists of three compartments about 75 inches deep and 30 inches in diameter, the capacity of each compartment being 230 gallons or a total of 690 gallons. The overflow from the last compartment passes through settling tanks with a combined capacity of 760 gallons. The greater part of the sludge collects in the first settling tank and is pumped back to the activated sludge tank at frequent intervals. Sludge from the second settling tank is drawn off daily into a third tank where it is aërated and every few days pumped back to the activated sludge tank. Tank No. 485 is aërated through perforated brass pipes placed in the bottom of the tank, and the total amount of air applied is equal to 3.25 cubic feet per gallon of sewage treated. Theoretically the sewage passes through the tank in six and one-half hours. Usually, dissolved oxygen is present in the last two sections of the activated sludge tank and about 50 per cent of the time in the first section. Eighty-seven per cent of the samples of effluent taken during the year were stable, and the average nitrates in this effluent averaged 0.27

part in 100,000. During the year the amount of dry sludge removed from the tank was equivalent to 724 pounds per 1,000,000 gallons of sewage treated, and this sludge contained 5.94 per cent of nitrogen and 3.7 per cent of fats. As the difference between the solids in suspension in the applied sewage and in the effluent from the tank was equivalent to 967 pounds per 1,000,000 gallons, apparently 243 pounds were lost by oxidation.

Slate aërating Tank No. 509, put in operation in July, 1920, has been operated in such a way as to compare its results with the operation of Tank No. 485. This tank has a surface area of about 15 square feet, is 6 feet deep and holds 650 gallons. It contains a stack of layers of slate held 2 inches apart by concrete blocks, these slates occupying, however, only 4.3 per cent of the total capacity of the tank. It is aërated by means of perforated brass pipes like Tank No. 485. The volume of air used per gallon of sewage treated and the period of aëration have been the same in both tanks, but No. 509 has been operated on the fill and draw plan. During the year 67 per cent of the samples from this tank were stable, but the sludge was not as stable as that from Tank No. 485.

Tables showing the character of the sewage applied to and of the effluent from these tanks follow:—

Average Analyses.

Sewage applied to Activated Sludge Tank No. 485.

[Parts in 100,000.]

APPEAR- ANCE.		AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	NITROGEN AS —		Oxygen consumed.	Bacteria per Cubic Centimeter.
Turbidity.	Color.	Free.	ALBUMINOID.		Total.	In Solution.		Nitrates.	Nitrites.		
			Total.	In Solution.							
-	-	3.34	.83	.42	1.60	.82	7.3	-	-	4.92	730,000

Effluent from Activated Sludge Tank No. 485.

0.7	.60	2.68	.24	.18	.43	.34	8.0	.27	.0204	1.32	532,000
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Sewage applied to Slate Aërating Tank No. 509.

-	-	3.38	.72	.44	1.42	.90	6.6	-	-	4.12	1,170,000
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Effluent from Slate Aërating Tank No. 509.

1.2	.62	1.77	.26	.20	.54	.42	5.8	.21	.0179	1.50	655,000
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*Average Solids.**Sewage applied to Activated Sludge Tank No. 485.*

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
65.3	30.8	34.5	50.1	21.5	28.6	15.2	9.3	5.9

Effluent from Activated Sludge Tank No. 485.

37.5	12.2	25.3	34.9	10.6	24.3	2.6	1.6	1.0
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Sewage applied to Slate Aërating Tank No. 509.

53.8	26.9	26.9	38.3	17.5	20.8	15.5	9.4	6.1
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Effluent from Slate Aërating Tank No. 509.

32.1	11.7	20.4	28.5	10.2	18.3	3.6	1.5	2.1
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OPERATION OF TRICKLING FILTERS.

Ten trickling filters were in operation during 1921. Filter No. 135, the oldest and in its twenty-second year of operation, received sewage at the rate of 1,358,000 gallons per acre daily and all samples of its effluent were stable. This filter is operated as an example of permanency, and contains 10 feet in depth of fine broken stone; its construction has been described in many experiment station reports.

Two sets of trickling filters were in operation during the year. One set, Nos. 452 to 455, inclusive, 4, 6, 8 and 10 feet in depth, respectively, is constructed of broken stone that will pass a 1½-inch screen but be retained by a ½-inch screen; a second set, Nos. 472 to 475, inclusive, also 4, 6, 8 and 10 feet in depth, respectively, is constructed of very coarse broken stone. These filters were operated to continue the study of depth of filtering material and trickling filter efficiency. The filters in both sets were operated at rates in proportion to their depth, namely, about 180,000 gallons for each foot of depth of material. The following tables show that with both sets the deeper filters operating at rates two and one-half times as great as the shallower filters produced better effluents; that the effluents from

the filters of finer material, Nos. 452 to 455, inclusive, were about equal in stability, — all the samples from the shallowest and deepest filter being stable; and that of the coarser set of filters the deepest filter produced an effluent of the most stable quality although operated at a very high rate.

As an example of what can be expected of refiltration of a trickling filter effluent, Filter No. 502 was put in operation in January, 1920, and is constructed of 6 feet in depth of crushed stone that will pass a 2-inch screen but be retained by a 1-inch screen. The effluent from Filter No. 473, after sedimentation, has been applied at the rate of 4,350,000 gallons per acre daily.

Tables showing the character of the effluent from each filter follow:—

Average Analyses.

Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 472, 473, 474, 475, 502 and Applied No. 502.

[Parts in 100,000.]

Filter Number.	Quantity applied. — Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS—		Oxygen consumed.	Bacteria per Cubic Centimeter.
		Free.	ALBUMINOID.				Ni- trates.	Ni- trites.		
			Total.	In So- lution.						
135 . .	1,358,000	2.33	.43	.23	.86	6.7	1.69	.0157	2.65	229,000
452 . .	706,000	2.99	.54	.30	1.09	6.8	1.39	.0270	3.08	260,000
453 . .	1,090,000	3.15	.47	.29	.99	6.6	1.37	.0465	2.92	215,000
454 . .	1,450,000	2.53	.51	.27	1.00	6.7	1.52	.0330	2.96	245,000
455 . .	1,820,000	2.35	.45	.26	.93	6.7	2.13	.0187	2.79	226,000
472 . .	730,000	3.28	.54	.29	1.14	6.6	.62	.0744	3.02	364,000
473 . .	1,100,000	3.33	.51	.32	1.10	6.2	.80	.0386	3.10	291,000
474 . .	1,460,000	2.80	.54	.29	1.10	6.7	.96	.0251	2.90	335,000
475 . .	1,820,000	2.27	.51	.30	1.04	6.5	1.74	.0343	2.96	212,000
502 . .	4,350,000	2.78	.43	.26	.81	6.6	.98	.0336	2.43	347,000
A. 502 .	—	3.05	.51	.28	1.03	6.5	.59	.0285	2.88	291,000

Average Solids.

Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 472, 473, 474, 475, 502 and Applied No. 502.

[Parts in 100,000.]

FILTER NUMBER.	UNFILTERED.			FILTERED.			IN SUSPENSION.		
	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
135	49.0	19.7	29.3	38.8	14.2	24.6	10.2	5.5	4.7
452	52.1	21.4	30.7	38.2	13.8	24.4	13.9	7.6	6.3
453	47.5	18.6	28.9	36.0	12.6	23.4	11.5	6.0	5.5
454	49.7	19.8	29.9	37.9	13.8	24.1	11.8	6.0	5.8
455	52.1	22.9	29.2	41.2	16.4	24.8	10.9	6.5	4.5
472	48.2	18.6	29.6	34.4	11.0	23.4	13.8	7.6	6.2
473	47.3	19.2	28.1	37.1	14.2	22.9	10.2	5.0	5.2
474	48.9	19.9	29.0	36.6	13.1	23.5	12.3	6.8	5.5
475	53.1	23.0	30.1	40.2	16.0	24.2	12.9	7.0	5.9
502	44.7	17.7	27.0	35.9	12.6	23.3	8.8	5.1	3.7
A. 502	45.0	18.2	26.8	35.6	13.4	22.2	9.4	4.8	4.6

OPERATION OF CONTACT FILTERS.

One contact filter, No. 175, is kept in operation at the station for a study of permanency and for illustration of this method of purification. This filter, started in 1901, is constructed of 39 inches in depth of coke, all of which will pass a 1-inch screen, 75 per cent a $\frac{1}{2}$ -inch screen and practically none a $\frac{1}{4}$ -inch screen. During 1921 the filter was flooded daily with settled sewage, stood full four hours before draining and was allowed to rest every sixth week. The effluent was well-nitrified during the year and all samples collected were stable. Due to clogging, the material of this filter has been removed and washed twice during its period of operation, — once in 1911 and again in 1920.

The following table gives the average analysis of its effluent: —

*Average Analyses.**Effluent from Contact Filter No. 175.*

[Parts in 100,000.]

Quantity applied. Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen consumed.	Bacteria per Cubic Centimeter.
	Free.	ALBUMINOID.				Nitrates.	Nitrites.		
		Total.	In Solution.						
352,000	1.38	.31	.22	.66	6.7	2.35	.0374	1.98	364,000

*Average Solids.**Effluent from Contact Filter No. 175.*

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
46.5	20.1	26.4	42.2	17.5	24.7	4.3	2.6	1.7

INTERMITTENT SAND FILTERS OPERATED WITH UNTREATED SEWAGE.

Filters Nos. 1, 4 and 9A.

Each of these three sand filters is 1/200 of an acre in area, and at the end of the year Filters Nos. 1 and 4 had been operated continuously for nearly thirty-four years and Filter No. 9A for thirty-one years. Regular sewage without preliminary clarification has always been applied to them, and for many years it has been the practice to apply only as much sewage to each filter as can be purified without materially increasing the amount of organic matter stored within the filter.

The following table gives data concerning the operation of these filters:—

FILTER NUMBER.	Depth (Feet).	Effective Size of Sand (Millimeter).	Date first operated.	Actual Volume of Sewage applied since Start (Gallons).	Volume of Sewage applied daily during 1921 (Gallons per Acre).
1	5	.48	Dec. 10, 1888	3,198,700	31,500
4	5	.04	Dec. 19, 1887	1,159,700	19,700
9A	5	.17	Nov. 18, 1890	2,689,400	35,200

For many years the surfaces of Filters Nos. 1 and 9A have been trenched and ridged late in the fall and leveled in the spring. The surface of Filter No. 4 is arranged in circular trenches, 14 inches wide, and filled to a depth of 12 inches with sand of an effective size of 0.48 millimeter. Sewage is applied to these trenches, grass being allowed to grow on the ridges. In winter board coverings are put over the trenches in all three filters. They were put on Nov. 26, 1920, and removed April 4, 1921. The surfaces of the filters were dug over to a depth of from 8 to 10 inches twice and raked eleven times. An examination of the sand in Filters Nos. 1 and 9A is made about the first of July each year. The greater part of the stored organic matter is found in the upper foot of sand, and there has been a gradual increase although it has fluctuated from year to year. The sand that was removed from Filter No. 9A in November, 1920, was washed with a crude, improvised washer and replaced July 8, 1921. About one-sixth of the sand was lost in washing, and the organic matter, as indicated by albuminoid ammonia, was reduced 49 per cent. In some laboratory experiments 83 per cent of the albuminoid ammonia was removed by washing.

Average Analyses.

Effluent from Filter No. 1.

[Parts in 100,000.]

TEMPERATURE (DEGREES F.).		AMMONIA.		Chlorine.	NITROGEN AS —		Oxygen consumed.	Alkalinity.	Bacteria per Cubic Centimeter.
Ap-plied.	Efflu-ent.	Free.	Albumi-noid.		Ni-trates.	Ni-trites.			
59	54	.3055	.0526	6.1	2.49	.0015	.45	—1.8	5,750

Effluent from Filter No. 4.

59	49	.0319	.0207	6.7	2.21	.0020	.34	—1.7	250
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Effluent from Filter No. 9A.

59	56	.8660	.0621	6.3	1.53	.0007	.57	—0.2	9,150
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*Sand Analyses.**Albuminoid Ammonia in First Foot of Sand in Filters Nos. 1 and 9A.*

[Parts in 100,000.]

YEAR.	Filter No. 1.	Filter No. 9A.
1910	66.1	56.5
1915	74.9	81.1
1918	106.0	86.3
1919	91.4	68.0
1920	112.2	92.3
1921	124.0	32.6 ¹

¹ Sand washed.

MECHANICAL FILTRATION OF MERRIMACK RIVER WATER.

Filter No. 520.

Studies in regard to the purification of Merrimack River water by coagulation and rapid filtration were begun in May in order to learn more definitely than ever before the efficiency of this method when treating a water as badly polluted as this but containing little suspended matter. The filter used was constructed of concrete, 25 inches square, and contained 30 inches in depth of sand of an effective size of 0.44 millimeter. Below the sand were 15 inches of graded gravel held upon a brass strainer of the usual mechanical filter type. While provision was made for the use of compressed air for washing the filter, it was found that more satisfactory results could be obtained with this small filter by washing with filtered water. The rate of operation of the filter was automatically controlled. The raw water and the aluminum sulphate applied were passed into a mixing tank and then into a baffled sedimentation basin giving approximately three hours' storage. The filter was operated for two months at the rate of 50,000,000 gallons per acre daily and from that time until the end of the year at a 70,000,000-gallon per acre daily rate. The amount of aluminum sulphate used varied from 1.5 to 2.5 grains per gallon according to the quality of the water filtered and necessary for maximum color and bacterial removal. The average run of the filter between washings was twenty-four hours, and the volume of filtered water used in washing, 2.3 per cent. While the color of the river water averaged about 0.45 part, it was increased during July following heavy rains to 0.75 part. Daily determinations of bacteria, color,

alkalinity, etc., were made of the effluent from the filter but somewhat less frequently of the applied water. The following tables show the results obtained both in color removal and bacterial efficiency. The average color of the applied water was 0.45 and of the filter effluent 0.07, and as good color removal was obtained when the color of the water was 0.75 as when at its lowest point. Perhaps the most significant bacterial result was the removal of *B. coli*. The *B. coli* score of the effluent during the year was 12, that is, the average number of coli found in each 100 cubic centimeters. At times, especially when the larger amount of aluminum sulphate was used, the bacterial efficiency of the filter was much greater than this, as shown by the tables.

As there has been considerable discussion of late in regard to after-growths of bacteria in the effluents from mechanical water filters, alleged to be due to the passage of colloids through such filters especially at times of high color of the applied water, the breaking of these colloids and the release of bacteria, investigations along this line were made during the year. In this investigation thirty-seven samples of the effluent from the filter, collected at different periods, were studied. After immediate analysis the remainder of each sample was kept seven days in a 20° C. incubator and again examined. In 7 of these samples there was an increase of bacteria in the four-day count; in 5, a decrease; and in 25, no change. In the twenty-four hour 37° C. count, 34 of the samples were unchanged. In none of them was there an increase in the *B. coli* score but there was a decrease in 22, and 15 were unchanged. It was found during the operation of this filter that such slow coagulation of the river water occurred at low temperatures that it was almost impossible to obtain satisfactory filter results during such periods.

Average Chemical Analyses.

River Water applied to Mechanical Filter No. 520.

[Parts in 100,000.]

Color.	AMMONIA.			Oxygen consumed.	Iron.	Alkalinity.	Soap Hardness.
	Free.	ALBUMINOID.					
		Total.	In Solution.				
.42	.0181	.0201	.0156	.51	.080	1.4	1.5

Effluent from Mechanical Filter No. 520.

[1.75 to 2.0 grains per gallon of aluminum sulphate used.]

.06	.0106	.0052	-	.13	.012	0.7	1.8
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Average Chemical Analyses — Concluded.

River Water applied to Mechanical Filter No. 520.

[Parts in 100,000.]

Color.	AMMONIA.			Oxygen consumed.	Iron.	Alkalinity.	Soap Hardness.
	Free.	ALBUMINOID.					
		Total.	In Solution.				
.48	.0206	.0218	.0184	.58	.067	1.4	1.5

Effluent from Mechanical Filter No. 520.

[2.0 to 2.5 grains per gallon of aluminum sulphate used.]

.07	.0104	.0054	-	.14	.006	0.5	1.8
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Average Bacterial Analyses.

Merrimack River Water.

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 c.c.
Four Days, 20° C.	TWENTY-FOUR HOURS, 37° C.		.001 c.c.	.01 c.c.	0.1 c.c.	1.0 c.c.	10 c.c.	
	Total.	Red.						
2,800	850	130	0	57	100	100	-	6,100

River Water after Coagulation applied to Mechanical Filter No. 520.

[1.75 grains per gallon of aluminum sulphate used.]

240	150	25	-	0	29	71	100	330
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Effluent from Mechanical Filter No. 520.

29	2	0	-	-	0	14	45	18
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Merrimack River Water.

2,610	350	68	0	38	91	100	-	4,500
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River Water after Coagulation applied to Mechanical Filter No. 520.

[2.0 grains per gallon of aluminum sulphate used.]

340	80	11	-	0	40	80	100	440
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*Average Bacterial Analyses — Concluded.**Effluent from Mechanical Filter No. 520.*

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 c.c.
Four Days, 20° C.	TWENTY-FOUR HOURS, 37° C.		.001 c.c.	.01 c.c.	0.1 c.c.	1.0 c.c.	10 c.c.	
	Total.	Red.						
24	1	0	-	-	0	9	31	12

Merrimack River Water.

1,800	480	77	0	67	100	100	-	7,000
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River Water after Coagulation applied to Mechanical Filter No. 520.

[2.25 grains per gallon of aluminum sulphate used.]

84	20	5	-	0	0	67	100	70
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Effluent from Mechanical Filter No. 520.

11	1	0	-	-	-	0	43	4
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Merrimack River Water.

1,860	170	88	0	67	100	100	-	7,000
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River Water after Coagulation applied to Mechanical Filter No. 520.

[2.5 grains per gallon of aluminum sulphate used.]

680	27	4	-	0	50	100	100	550
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Effluent from Mechanical Filter No. 520.

3	2	0	0	-	-	-	31	1
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SLOW SAND FILTRATION OF WATER TREATED WITH ALUMINUM SULPHATE.

Filter No. 519 was started May 20, 1921, is 1/20,000 of an acre in area, and contains 4½ feet in depth of sand of an effective size of 0.23 millimeter. It was operated at a rate of 5,000,000 gallons per acre daily, and water was applied to it that had received the same treat-

ment as the water applied to Filter No. 520, that is, river water that had received from 1.5 to 2.5 grains per gallon of aluminum sulphate and that had been settled at least three hours. This filter filtered three times as much water between scrapings as the mechanical filter did between washings; the average removal of bacteria was slightly lower than that of the mechanical filter but the removal of *B. coli* was much better, the score being 1, and during one hundred and eighty-five days of operation it was scraped five times.

Effluent from Sand Filter No. 519.

[Parts in 100,000.]

Color.	AMMONIA.		Chlorine.	NITROGEN AS —		Oxygen consumed.	Iron.	Alkalinity.	Soap Hardness.	BACTERIA PER CUBIC CENTIMETER.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 c.c.
	Free.	Total Albuminoid.		Nitrates.	Nitrites.					Four Days, 20° C.	TWENTY- FOUR HOURS, 37° C.		.001 c.c.	.01 c.c.	0.1 c.c.	1.0 c.c.	10 c.c.	
											Total.	Red.						
.07	.0023	.0052	.64	.024	.0002	.15	.010	0.5	1.7	22	9	0	-	-	0	0	31	1

REMOVAL OF COLOR FROM WATER.

Operation of the three filters of sand impregnated with ferric and aluminum hydroxide described in the last four reports has been continued and six similar filters were started during the year, the rate of operation of all of them being 5,000,000 gallons per acre daily. Filters of this type after a period of operation need to be regenerated by dissolving out as much as possible of the stored organic matter with caustic soda, this being done by dissolving the soda in a certain volume of water and passing this solution through the filter several times. The six filters started during 1921 were operated for the purpose of determining the most efficient amount of aluminum hydroxide to use in the sand and the most economical amount of caustic soda to use in regenerating the filters.

Filter No. 488, started in May, 1917, has a depth of 4 feet and contains sand of an effective size of 0.25 millimeter, and when it was first put into operation an amount of ferric sulphate equal to 64.5 tons per acre was precipitated as ferric hydroxide throughout the filter, this amount being equivalent to 0.72 pounds of ferric sulphate per cubic foot of sand. During its period of operation up to the end of 1921 the filter has been regenerated thirty times, with an average period of operation between treatments of forty-eight days. The

amount of caustic soda used during the year averaged 0.47 grain per gallon of water filtered, the average amount during the entire period of operation, 0.49 grain. The amount of ferric sulphate per gallon of water filtered will decrease regularly with the period of operation as little or no ferric hydroxide will need to be added to that now in the sand. The amount of sulphate precipitated in the sand is equivalent to 0.13 grain per gallon of water filtered since the filter was started. The average amount of free carbon dioxide in the effluent from this filter during 1921 was 0.4 part, the same as in the applied canal water, and the increased amount of mineral matter in the effluent was 0.14 part in 100,000.

Filter No. 494, put into operation in January, 1918, is of the same size and depth and contains the same grade of sand as Filter No. 488. When first put in operation an amount of aluminum sulphate equal to 80.5 tons per acre was precipitated as hydroxide throughout the sand. During its period of operation this filter has been treated with caustic soda twenty-four times, with an average period of forty-five days' operation between treatments. The amount of caustic soda used per gallon of water filtered equaled 0.52 grain. The aluminum sulphate used during the period of operation has been equivalent to 0.21 grain per gallon of water filtered. This filter does not increase the free carbon dioxide in the effluent above the amount present in the raw water.

Filter No. 496, put in operation in September, 1918, contains 4 feet in depth of sand of an effective size of 0.25 millimeter, and this filter receives the mixed effluents from Filters Nos. 488 and 494. During its entire period of operation up to the end of 1921, it was treated with caustic soda seven times, with an average period of operation of one hundred and seventeen days between treatments. The amounts of caustic soda and ferric sulphate used per gallon of water filtered during the whole period of operation of this filter were equivalent to 0.20 and 0.09 grain, respectively. The average color of the effluent from this filter was 0.07 part in 100,000, the same as that of mechanical Filter No. 520, in the operation of which approximately 2 grains of aluminum sulphate per gallon were used.

The following tables give the results of the operation of these three filters from the time each was started to the end of 1921. In connection with these results the following facts can be noted: Filter No. 488 was scraped very lightly three times in 1917 and once in 1920; Filter No. 494 was scraped once in 1920; Filter No. 496 was operated without any removal of sand. During the year Filter No. 496 reduced the color, albuminoid ammonia and oxygen consumed of the applied water 50, 34 and 36 per cent, respectively. The bacterial efficiency of

the combined filters, namely, Nos. 488, 494 and 496, was 98.2 per cent total bacteria and 99.88 per cent *B. coli*.

Six new filters, Nos. 512 to 517, inclusive, were started Feb. 2, 1921. These are 1/80,000 of an acre in area and contain 4½ feet in depth of sand of an effective size of 0.23 millimeter. Filters Nos. 512 and 513 contain 75 tons per acre of commercial aluminum sulphate precipitated as aluminum hydroxide throughout the sand, Filters Nos. 514 and 515, 150 tons, and Filters Nos. 516 and 517, 225 tons. These amounts are equivalent to 0.76, 1.53 and 2.29 pounds, respectively, of aluminum sulphate per cubic foot of sand. In regenerating these filters, the first of each pair received 5 tons of caustic soda per acre and the second 10 tons.

Studying carefully all the results of these six filters obtained during the year, there appears to be no practical difference in the degree of purification effected by the different amounts of aluminum sulphate used although the filters with the larger amounts of sulphate, Nos. 514 to 517, inclusive, ran longer between treatments than did the filters with 75 tons. Washing out the excess caustic from Filters Nos. 516 and 517 required, however, approximately twice as long as this operation with the other four filters. It would seem, therefore, that of the three amounts of alum tried in these experiments 150 tons per acre is the most efficient. As stated previously, one of each of the three pairs of filters containing the same amount of aluminum hydroxide was treated with 5 tons of caustic and the other with 10 tons. The larger amounts in every case removed more of the stored organic matter. However, the purification effected by the filters treated with the smaller amounts was practically the same as that by the filters receiving the larger amount. Probably satisfactory results would be obtained by the regular use of 5 tons with an occasional 10-ton treatment. The percentage of the organic matter collected by the aluminum or ferric hydroxide which was removed by the caustic treatment is shown in a following table. The average increase in mineral matter in the effluents from these six filters due to residual soda was 0.41 part in 100,000.

Per Cent removed by Treatment with NaOH.

	FILTER NO.								
	488.	494.	495.	512.	513.	514.	515.	516.	517.
Color	42	49	61	39	46	28	42	13	31
Albuminoid ammonia	36	40	41	38	51	37	43	12	27
Oxygen consumed	42	48	35	37	41	32	34	16	28

Per Cent Reduction of Organic Matter.

	FILTER No.								
	488.	494.	496.	512.	513.	514.	515.	516.	517.
Color	75	64	50	73	73	73	78	76	71
Albuminoid ammonia	55	46	34	46	49	49	54	57	52
Oxygen consumed	58	54	36	60	60	63	67	63	67

Further Data obtained from the Operation of Filters Nos. 512 to 517, inclusive.

	FILTER No.					
	512.	513.	514.	515.	516.	517.
Tons of aluminum sulphate per acre precipitated in filter.	75	75	150	150	225	225
Number of days between regenerations	67	67	89	89	90	90
Grains of caustic soda per gallon of water filtered.	.21	.42	.16	.32	.16	.32
Approximate percentage of wash water	3.7	3.7	2.8	2.8	5.5	5.5

*Average Chemical Analyses for the Entire Period of Operation, 1917 to 1921, inclusive.**Merrimack River Water applied to Filters Nos. 488 and 494.*

[Parts in 100,000.]

APPEARANCE.		AMMONIA.			Chlorine.	NITROGEN AS —		Oxygen consumed.	Iron.	Alkalinity.	Soap Hardness.
Turbidity.	Color.	Free.	ALBUMINOID.			Ni- trates.	Ni- trites.				
			Total.	In Solution.							
0.2	.41	.0157	.0179	.0137	.44	.022	.0007	.54	.0503	1.0	1.2

Effluent from Filter No. 488.

0	.14	.0073	.0075	-	.44	.024	.0011	.22	.0155	1.3	1.3
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Effluent from Filter No. 494.

0	.16	.0079	.0085	-	.44	.023	.0009	.25	.0199	1.3	1.4
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Effluent from Filter No. 496.

0	.07	.0029	.0052	-	.44	.025	.0004	.15	.0160	1.3	1.4
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Average Bacterial Analyses for the Entire Period of Operation, 1917 to 1921, inclusive.

Merrimack River Water applied to Filters Nos. 488 and 494.

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 c.c.
Four Days, 20° C.	TWENTY-FOUR HOURS, 37° C.		.001 c.c.	.01 c.c.	0.1 c.c.	1.0 c.c.	10 c.c.	
	Total.	Red.						
5,890	566	216	2.4	47	94	100	-	7,340

Effluent from Filter No. 488.

2,870	73	8	-	0.2	16	58	88	225
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Effluent from Filter No. 494.

3,720	84	9	-	0.5	15	58	83	241
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Effluent from Filter No. 496.

767	32	2	-	-	1.7	17	44	35
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Summary of Results for Entire Period of Operation, 1917 to 1921, inclusive.

[Parts in 100,000.]

	PER CENT REDUCTION BY FILTER NO.			PER CENT REMOVED BY NaOH FROM FILTER NO.		
	488.	494.	496.	488.	494.	496.
Color	66	61	47	57	52	61
Albuminoid ammonia	58	52	35	37	43	81
Oxygen consumed	59	54	36	45	50	97

FILTRATION OF WATER AS POLLUTED AS MERRIMACK RIVER WATER BELOW LAWRENCE.

Filter No. 521 was started on July 21, 1921, is 1/20,000 of an acre in area and contains 4½ feet in depth of sand of an effective size of 0.23 millimeter. To it was applied a very polluted water, as shown in the following tables, and its rate of operation was 5,000,000 gallons per acre daily until October 17 when it was reduced to 2,500,000. During a period of operation of one hundred and fifty days it was scraped four times.

*Average Chemical Analyses.**Merrimack River below Lawrence.*

[Parts in 100,000.]

APPEARANCE.		AMMONIA.			Chlo- rine.	NITROGEN AS —		Oxygen con- sumed.	Iron.	Alka- linity.	Soap Hard- ness.
Tur- bidity.	Color.	Free.	ALBUMINOID.			Ni- trates.	Ni- trites.				
			Total.	In So- lution.							
0.3	.50	.0310	.0508	.0254	.74	.017	.0007	1.04	—	—	1.6

Water applied to Filter No. 521.

0.3	.45	.0589	.0489	.0158	.68	.021	.0012	.78	.251	1.6	1.8
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Effluent from Filter No. 521.

0	.29	.0127	.0117	—	.67	.048	.0018	.34	.037	1.4	1.6
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*Average Bacterial Analyses.**Merrimack River below Lawrence.*

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			PER CENT OF SAMPLES CONTAINING B. COLI.						B. Coli in 100 c.c.
Four Days, 20° C.	TWENTY-FOUR HOURS, 37° C.		Four Days, 20° C.	TWENTY-FOUR HOURS, 37° C.		.0001 c.c.	.001 c.c.	.01 c.c.	0.1 c.c.	1.0 c.c.	10 c.c.	
	Total.	Red.		Total.	Red.							
13,000	3,300	1,520	—	—	—	0	83	100	100	—	—	85,000

Water applied to Filter No. 521.

9,200	2,600	940	—	—	—	0	30	83	100	—	—	32,000
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Effluent from Filter No. 521.

440	135	13	95.2	94.8	98.6	0	0	0	33	80	97	300
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LAWRENCE CITY FILTERS.

The city of Lawrence takes its water supply from the Merrimack River, which is polluted by the sewage and trade wastes of the cities and towns above. Since 1893 this water supply has been purified by

slow sand filtration, and since 1918 liquid chlorine has been applied to the effluents from the filters. Two filters are in use, — the older one, 2.2 acres in area, is divided into three sections by concrete walls, and contains 4 feet in depth of sand of an effective size of approximately 0.25 millimeter. Until 1917 this filter was entirely uncovered, but during 1917 and 1918 the easterly section was rebuilt and made a concrete filter, with bottom, sides and roof. In 1907 a covered filter, three-fourths of an acre in area, was constructed. This second filter contains about 4 feet in depth of sand of an effective size of approximately 0.25 millimeter. The average amount of liquid chlorine applied to the effluents from these filters during 1921 was 0.44 part per 1,000,000.

The following tables present the bacterial and chemical results of operation. The first table shows the number of *B. coli* in 100 cubic centimeter samples of effluent collected directly at the filters and in samples collected during the past four years from other points on the distribution system. This table is arranged to show the results during the comparatively warm months, May to October, inclusive, and during the colder months, November to April, inclusive. Other tables give the regular average bacterial analyses of the water applied to and of the effluents from these filters, from the distributing reservoir, etc., and the average chemical analyses of the river water applied to and of the effluents from the filters, etc.

Number of B. Coli in 100 Cubic Centimeters by Scoring Method.

WATER FROM —	NOVEMBER TO APRIL, INCLUSIVE.				MAY TO OCTOBER, INCLUSIVE.			
	1918.	1919.	1920.	1921.	1918.	1919.	1920.	1921.
Merrimack River, intake	14,300	29,000	14,300	25,200	6,300	9,900	9,300	10,800
Old city filter	73	170	34	7	22	32	3	8
New city filter	25	45	16	15	33	12	12	11
Both filters ¹	42	100	28	3	25	23	7	7
Reservoir	58	33	12	3	9	19	2	2
City Hall tap	18	33	16	2	8	2	0	2
Experiment Station tap	32	195	14	9	14	10	3	1

¹ Since December, 1819, chlorine has been added to the mixed effluents of both filters before pumping to the reservoir.

*Average Bacterial Analyses.**Merrimack River. — Intake of the Lawrence City Filters.*

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 c.c.
Four Days, 20° C.	TWENTY-FOUR HOURS, 37° C.		Four Days, 20° C.	TWENTY-FOUR HOURS, 37° C.		.001 c.c.	.01 c.c.	0.1 c.c.	1.0 c.c.	10 c.c.	
	Total.	Red.		Total.	Red.						
5,400	500	85	-	-	-	11	62	100	100	-	18,000

Effluent from Lawrence City Filter (Old Filter).

16	3	0	99.7	99.4	100	-	-	0	5	27	7
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Effluent from Lawrence City Filter (New Filter).

17	3	0	99.7	99.4	100	-	-	0	10	40	13
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Mixed Effluents as pumped to the Distributing Reservoir.

14	4	0	-	-	-	-	-	0	1	34	5
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Water from the Outlet of the Distributing Reservoir.

39	3	0	-	-	-	-	-	0	0	29	3
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Water from a Tap at Lawrence City Hall.

37	4	0	-	-	-	-	-	0	0	23	2
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Water from a Tap at the Lawrence Experiment Station.

26	5	0	-	-	-	-	-	0	3	25	5
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*Average Chemical Analyses.**Merrimack River. — Intake of the Lawrence City Filters.*

[Parts in 100,000.]

Temperature (Degrees F.).	APPEAR- ANCE.		AMMONIA.			Chlorine.	NITROGEN AS —		Oxygen consumed.	Iron.	Soap Hardness.
	Turbidity.	Color.	Free.	ALBUMINOID.			Nitrates.	Nitrites.			
				Total.	In Solution.						
53	0.1—	.42	.0144	.0184	.0150	.43	.016	.0005	.56	.0520	1.2

Effluent from Lawrence City Filter (Old Filter).

55	0.1—	.41	.0124	.0083	—	.51	.027	.0002	.39	.0760	1.3
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Effluent from Lawrence City Filter (New Filter).

54	0	.33	.0044	.0082	—	.43	.019	.0002	.39	.0370	1.2
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Water from the Outlet of the Distributing Reservoir.

54	0	.38	.0068	.0083	—	.48	.030	.0001	.37	.0720	1.3
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Water from a Tap at Lawrence City Hall.

55	0.1—	.42	.0043	.0079	—	.51	.029	.0001	.35	.0750	1.3
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Water from a Tap at the Lawrence Experiment Station.

55	0.1—	.37	.0021	.0073	—	.48	.030	.0002	.35	.0760	1.3
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*Average Solids.**Merrimack River above Lawrence.*

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
6.28	2.43	3.85	5.59	2.14	3.45	0.69	0.29	0.40

Merrimack River below Lawrence.

11.23	5.06	6.17	9.14	4.08	5.06	2.09	0.98	1.11
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DIVISION OF FOOD AND DRUGS

HERMANN C. LYTHGOE, *Director*

REPORT OF DIVISION OF FOOD AND DRUGS.

During the year 1921 the Division of Food and Drugs of the Massachusetts Department of Public Health has been engaged in the usual routine work of the enforcement of the milk, food, drug, cold storage, slaughtering, bakery and soft drink laws, and in the examination of samples submitted by police authorities, and also in the manufacture of arsphenamine.

One inspector was discharged on May 31 and was not replaced. This naturally produced a reduction in the number of samples collected, which number is 3.4 per cent below the average of the previous five years. In proportion to the number of inspectors left, a reduction of 10 per cent of the samples would be expected.

During the present year there has been examined the largest number of samples on record, consisting of 7,103 samples of milk, 2,560 samples of foods, 605 samples of drugs, 247 samples of narcotic drugs, etc., submitted by police authorities, 3,831 samples of liquor submitted by police authorities, and 8 miscellaneous samples, consisting of coal, Famo, etc., examined for the State institutions and the Attorney-General's office, making a total of 14,354.

During the previous five years, the lowest number of samples was 9,928 in 1917. The highest number was 12,819 in 1919. Of the milk samples, the lowest number in the previous five years was 7,058 in 1917, and the highest was 9,738 in 1919. Of the food samples, the lowest in the previous five years was 1,382 in 1918, and the highest was 2,319 in 1916.

The amount of liquor submitted is increasing enormously, and if the present rate of increase continues, the work will be more than can be taken care of by the present force before the end of the next fiscal year. For this reason I have recommended that sufficient money be appropriated to employ an additional chemist should such be needed.

There have been 282 prosecutions, — slightly less than those of the past four years. The total amount of the fines imposed was \$4,936, which sum is somewhat less than the amount imposed during any one

of the preceding five years. Of the cases, 254 were convicted, 17 were found not guilty, and 11 were placed on file without plea.

One of the contributing factors to the small number of cases was the unusual purity of the milk supply.

The court cases are summarized in the following table:—

	Conviction.	Discharged.	Filed without Plea.
Milk:			
Low standard	16	-	-
Cream removed	4	-	-
Watered	26	2	-
Misuse of milk bottles	5	-	-
False advertising:			
Cocoa	1	-	-
Olive oil	1	-	-
Eggs	7	1	-
Misbranded:			
Compound oil	1	-	-
Grape juice	1	-	-
Olive oil	6	-	-
Eggs	3	-	-
Adulterated:			
Vanilla extract	1	-	-
Grape juice	1	-	-
Maple sugar	1	-	-
Olive oil	15	4	-
Sausage (starch)	16	-	-
Sausage (colored)	3	1	-
Soft drinks	18	1	9
Vinegar (low in acid)	6	1	-
Drugs	9	-	-
Decomposed food:			
Eggs	1	-	-
Butter	1	-	-
Canned corn	1	-	-
Kream Krist (cooking fat)	1	-	-
Shrimp	2	-	-

	Conviction.	Discharged.	Filed without Plea.
Cold storage:			
Eggs not marked	76	3	-
Absence of sign "Cold Storage Eggs"	2	-	-
Holding goods in storage exceeding twelve months	2	-	-
Absence of sign "Cold Storage Goods"	11	-	-
Representing cold-storage goods as fresh	1	-	-
Operating a warehouse without a license	1	-	-
Slaughtering:			
Illegal use of stamp	2	1	-
Slaughtering in absence of inspector	7	-	2
Selling unstamped meat	4	-	-
Selling diseased meat	1	1	-
Failure to condemn diseased meat	-	1	-
Slaughtering without license	-	1	-
Totals	254	17	11
	282		

The following table gives a summary of the confiscations during the past year: —

ARTICLE.	Number of Confiscations.	Weight (Pounds).
Eggs	4	1,560
Poultry	1	70
Game	1	37
Meat	44	13,628
Fish	4	1,320
Cheese	1	1,016½
Grapes	1	3,596
Kream Krisp	1	83
Vegetables	1	50
Walnuts	1	300
Totals	59	21,660½

MILK.

The inspectors collected 6,902 samples of milk, 3 per cent of which were found to be adulterated by the addition of water. This figure is the lowest in years and is due to various circumstances. In the first place, there has been a surplus of milk, resulting primarily from its high price, under which condition the temptation to water would naturally be reduced.

In the early part of the year, the small milk dealers complained to this Department of the sale of watered milk from their producers, which complaints were investigated, and the producers were convicted. During the months of January, February, March and April an unusual amount of watered milk was obtained. In fact, more than half the watered milk was obtained during these four months instead of during the months of July, August and September, as is usual. It is not at all improbable that the prosecutions instituted so early in the season had some bearing on the curtailment of adulteration.

The quality of the average milk sold throughout the State, as shown by our figures, does not differ materially from that of previous years. These figures are as follows:—

	Per Cent.
Total solids	12.47
Fat	3.76
Solids not fat	8.71

These figures represent the average of 6,518 samples found upon examination to be free from adulteration.

FOODS OTHER THAN MILK.

There were 2,560 samples of food examined, which is rather more than usual. This increase was due to an unusual examination of butter for the presence of excessive moisture, and to ascertain whether or not it was fit for extension of time in storage; to increased examination of soft drinks; and to increased examination of vinegar.

The butter sold in this State is practically all obtained from other States. The law requires this Department to adopt the standards of the United States Department of Agriculture, which standards require a fat content of not less than 82½ per cent. It was ascertained that a great deal of the butter coming into this State came in somewhat below this standard, in some instances as low as 77 per cent. Correspondence with the Department of Agriculture relative to this condition resulted in a declination to enforce the standard on the

part of the United States Department of Agriculture. The reason for this is obvious since the United States standard has no standing in the United States courts.

The revision of the law resulted in a necessary change of wording of section 13 of chapter 208 of the Acts of 1917, which change (General Laws, chapter 94, section 185) automatically revoked the butter standard adopted by this Department. This error in the statute has been corrected, and it will be necessary for this Department to readopt the standard.

Owing to unusual requests for extension of time in storage, a number of samples of butter were examined for their relative rancidity, and practically all of the 114 adulterated samples of butter were such as showed a relatively high rancidity, which would not, however, render the article unfit for food, but would naturally interfere with its keeping quality if kept in storage for any length of time. In making this examination, the amount of free fatty acids was determined on all the samples. It was found that samples requiring more than 10 cubic centimeters of tenth normal alkali to neutralize the free fatty acids in one gram of butter fat were distinctly off in flavor according to the original records of the inspector making the preliminary inspections in the warehouse.

When the figures for all the butter examined were arranged in a summation series and plotted on Whipple's logarithmic probability paper, the curve was found to be concave up to 10 cubic centimeters and convex above 10 cubic centimeters, showing a different series of article above and below this figure. When the figures were separated into two series, each one plotted as a probability series. Extensions were therefore either granted or refused in accordance with the figures obtained as described.

A number of samples of watered clams were obtained and considerable difficulty was encountered in the prosecution of a few cases, owing to the testimony of the clam diggers. For this reason an investigation was made in co-operation with the United States Department of Agriculture in the latter part of the year, by means of which information has been gathered which can be used next season to successfully combat the defence advanced by the clam diggers during the past season.

In the examination of eggs, the Division has carried out the procedure developed a few years ago, namely, to purchase eggs as sold in the retail stores; to note the advertising matter; and then to examine the eggs first by candling, whereby the fresh eggs are differentiated from those that are not fresh, and second, by determination

of the ammonia by means of which figure the approximate age of the egg can be ascertained. If the eggs are not fresh, additional evidence is collected by the inspector, and the dealer is prosecuted either for selling cold-storage eggs without marking the same, or for selling eggs misbranded as fresh eggs, or for violation of the false advertising law by advertising as fresh eggs, eggs which were not fresh. Certain of the wholesale egg dealers have criticized the Department for adopting this procedure on the ground that all eggs which are edible and have not been in cold storage are entitled to be called "fresh eggs." The courts have, however, upheld the contention of this Department, and, until the findings are reversed, it is of course incumbent upon the Department to proceed in the same manner in the future.

During the present season eggs came out of storage somewhat earlier than usual, and the violations which usually occur in the fall season were stopped rather earlier than usual. There were 93 cases in all relating to the sale of eggs, one of which was for the sale of rotten eggs.

There were 15 samples of grape juice examined, 12 of which were found to be adulterated. These were all the product of one concern and consisted of sugar, water, color and dried grapes, the total amount of grapes computed as grape juice being less than 10 per cent. The manufacturer was convicted of misbranding and adulterating.

The decomposed foods collected during the present year are somewhat less than those obtained in former years. A number of samples of rancid butter were obtained, which were either confiscated or ordered renovated. Two lots of canned goods were found with swelled heads. Three samples of decomposed eggs were obtained; 2 of decomposed bacon; 1 of decomposed nuts; 1 of decomposed shrimp; 3 of wormy confectionery; 4 of wormy figs; 2 of wormy macaroni; and 1 of wormy corn.

It has been found that there is a seasonal variation in the sale of adulterated sausages in this State. There is very little adulteration of this product in the spring, summer and early fall. In fact, there is a period of very nearly nine months when no adulterated sausages are found, and, consequently, no prosecutions are instituted. It is not at all improbable that the sausage dealers may take this absence of prosecution to mean that the Department is paying no attention to sausages, because year after year the same dealers begin in the fall to put more cereal in their product than the law permits. It requires about three months' work to stop these violations. When one considers that each 1 per cent of starch added to a sausage will increase the water content to an extent of 4 per cent, it is evident

that for each additional pound of starch the sausage dealer can add 4 pounds of water, and consequently make 4 per cent extra profit. The law prohibits the addition of more than 2 per cent of cereal or a product made from vegetable flour. These cereal products used contain starch varying from 40 to 80 per cent. It is impossible to actually determine the amount of cereal or other product added, but it is possible to determine the amount of starch added; therefore, when the examination shows the addition of 2 per cent of starch in a sample of sausage, it means that anywhere from 2 to $3\frac{1}{2}$ per cent of vegetable material has been added to the sausage.

Many of the sausage dealers periodically submit samples to chemists in order to keep the starch content of their product as high as possible, be within the law, and at the same time violate the law by adding more than the permitted 2 pounds of material per 100 pounds of finished product.

There were 8 samples of oleomargarine collected, representing 8 different brands, which were examined to ascertain whether or not there was any deficiency in fat, as was the case with the butter samples. In all cases the fat content was well above that established for fat in butter, and the moisture content showed no excess in any of the samples examined.

An unusual amount of adulteration was found in the case of olive oil. Eighty-six samples out of 228 collected were found to be adulterated with cotton seed oil. These traced to a few Italian and Greek wholesale dealers, and after repeated prosecutions, the practice of selling adulterated oil was practically stopped.

The inspectors visited nearly all the soft drink factories in the State, and, incidental to making sanitary inspections, obtained samples of the product. Out of 286 samples collected, 66 were found to contain saccharine. Wherever the manufacturer had been previously warned not to use saccharine, prosecutions were instituted, of which one resulted in acquittal; nine were placed on file without plea; and nineteen were convicted. None of these cases was appealed.

The Monsanto Chemical Company, which manufactures practically all the saccharine used in this country, did not come to the relief of the users of their product, notwithstanding the fact that the salesmen informed the soft drink manufacturers that the chemical company would defend any cases brought against them by the Department of Public Health, and that the use of the article was not in violation of the law. We have been unable to ascertain the names of these salesmen, and thus have been unable to prosecute them for false advertising of the goods which they were selling.

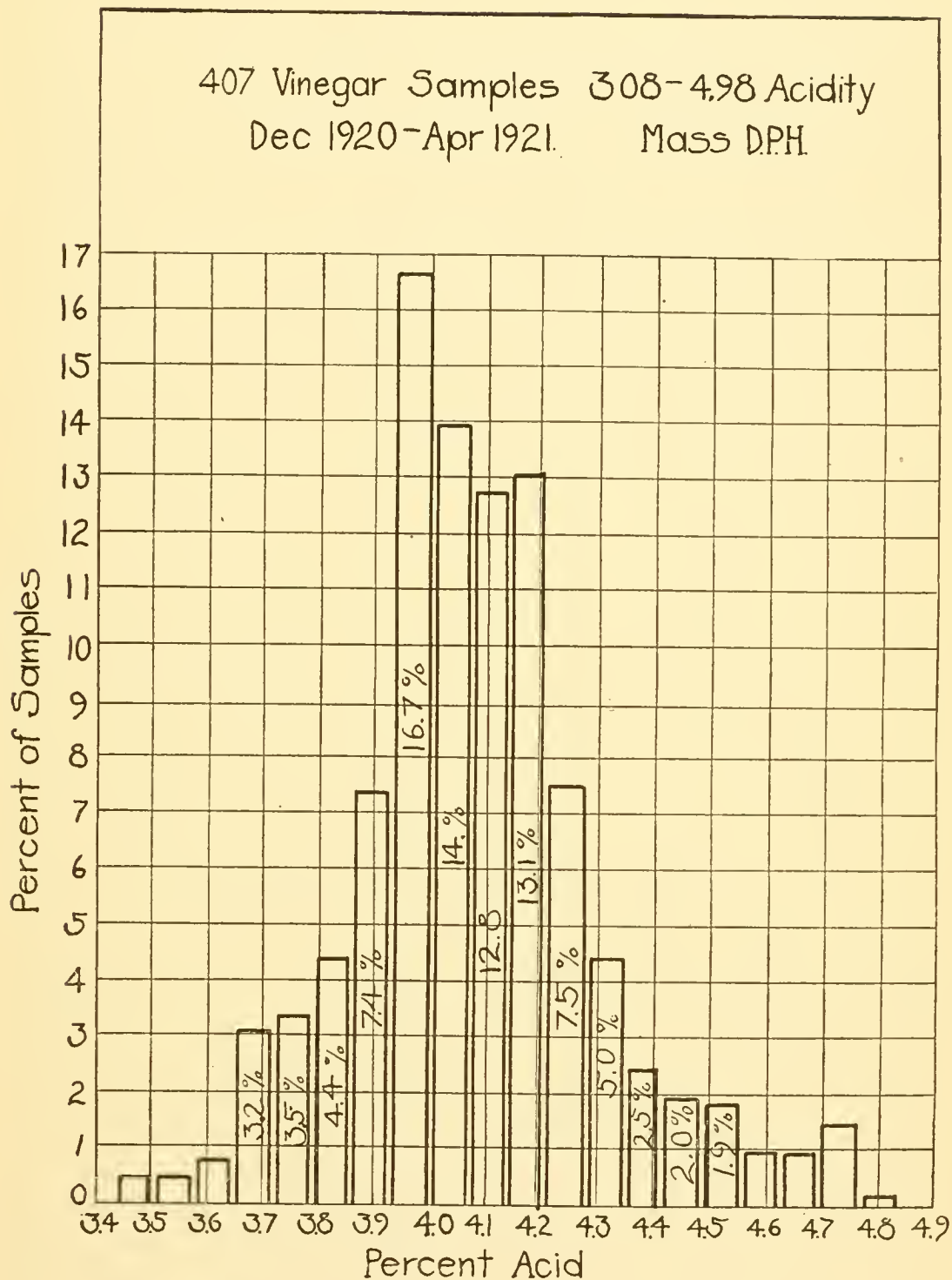
A large number of samples of vinegar have been examined, many of which were found to be just under 4 per cent in acid. One firm, shipping considerable vinegar into this State, was found to be selling vinegar containing 3.95 per cent acetic acid upon an average of 35 samples.

When one considers that each four hundredths variation in the acid content means 1 per cent more profit for the sale of water, it is readily seen that it is to the financial interest of the vinegar manufacturer to get his vinegar as close to 4 per cent as practicable. Many of the manufacturers who standardize their goods are not familiar with the use of indicators, and, therefore, are liable, in making the titrations, to err upon the side of alkalinity, particularly when using phenolphthalein as the indicator. This indicator is colorless in acid solution and red in alkaline solution. It also has the peculiarity of being practically neutral in solutions containing bicarbonate. The average untrained man would add the alkali until he obtained a good red color, thereby exceeding the neutral point by one-tenth or two-tenths of a cubic centimeter, which the trained chemist would not do. The alkali solution, if not properly kept, is liable to absorb carbon dioxide from the air, thereby producing bicarbonate during the titration, with the effect of lowering the apparent alkalinity of the standard alkali solution and apparently increasing the acidity of the vinegar.

Examinations of standard acid furnished these vinegar dealers by certain chemists have shown that it is not unusual for such standardizing acid to be stronger than it should be, and a person using such acid in making a standard alkali would make it too strong and his product would be too weak.

The chart shows the variation in acidity of 407 samples collected between December, 1920, and April, 1921. It is significant that the largest "block" is just under the standard of 4 per cent.

One of the laws relating to the sale of cider vinegar requires this Department to adopt methods of analyses which shall be those of the Association of Official Agricultural Chemists, and to publish these in the bulletin of the Department. This law has been inoperative for a number of years on account of its wording. It required the Department to adopt the methods published by the association. While these methods have been published, they were published by the Secretary of Agriculture, and not by the association. During the revision of the laws, the words "published by" were changed to the words "adopted by." It seems, however, desirable that this law should be repealed. It takes about three years for a method to be adopted by the association and it does not seem fair to the people of this Com-



monwealth to prohibit the use of a method which can detect adulteration because of the fact that the method has not been adopted by a certain association, over which the Commonwealth has no control.

Miscellaneous samples examined are as follows:—

	Samples.
Cider preserved with sodium benzoate	7
Cocoa, advertised to contain 50 per cent of fat, actually containing but 25 per cent of fat	1
Deliseo, a mixture of coffee, cereal and chicory, advertised as a substitute for coffee, and not properly labeled	2
Condensed milk incorrectly labeled as to the dilution	3
Imitation vanilla	2
Hen feed containing arsenic, submitted by police authorities	1

DRUGS.

There were 615 samples of drugs examined, 138 of which were found to be adulterated.

It was formerly quite common to find adulterated camphorated oil, olive oil, spirit of camphor, spirit of peppermint, tincture of iodine and zinc oxide ointment because of the fact that these articles were prepared by retail druggists. At present they are prepared by large wholesale houses, and it is unusual to find such articles adulterated. Of the samples examined, lime water and sweet spirit of niter represented practically the only preparations collected by this Department and actually made by the majority of the retail druggists. Forty-five per cent of the sweet spirit of niter and 17 per cent of lime water were found to be adulterated because of deficiency in the active ingredient. Either of these preparations can be accurately made and so kept that they can be dispensed the full U. S. P. strength. All druggists should realize the importance of keeping sweet spirit of niter as described in the Pharmacopœia, namely, in amber colored bottles, tightly stoppered, in a cool place. Investigations made some years ago in this Department showed that this drug may be kept for a period of more than one year in the ice chest without any deterioration.

A complaint was received from a citizen that a certain druggist was not furnishing proper lime water. The complainant went to the druggist and stated that she knew the lime water was not right because the baby had not been acting properly. The druggist thereupon informed her the lime water was all right; took it back; and threw it away. The complainant then sent another person to the

store to purchase some lime water, and brought it to the Department to be examined. It was found to be practically free from lime. An inspector of the Department then visited the drug store, purchased a sample, which was found practically free from lime, and the druggist was prosecuted and convicted.

As a result of this complaint, other samples were collected throughout the State, and in many instances the retail druggist was very lax in preparing this drug so necessary for bottle-fed babies. The error on the part of the druggist was undoubtedly due to repeatedly using the old lime left in the bottle after the lime water was decanted. After a reasonable time this deposit becomes transformed into calcium carbonate, which is insoluble in water, and the druggist against whom the original complaint was made could very probably have been using the same "lime" for years and would always have as much left at the end of each operation as at the beginning.

Because of the increased production of pharmacopœial drugs by the wholesale houses, the adulteration of drugs in the State has been cut down to practically a minimum.

LIQUOR.

The liquor samples have greatly increased in number over those of previous years. One hundred and twenty-six cities and towns submitted in all 3,831 samples of liquor, of which 2,356 were distilled liquors; 87 of these localities submitted less than 10 samples per locality during the year, representing in all, 283 samples. The other 39 localities submitted more than 10 samples per locality. The city of Boston submitted 1,823 samples, the largest number from any locality. Cambridge submitted 336 samples; Fall River submitted 155 samples; Springfield submitted 134 samples; Lawrence submitted 122 samples; and Marlborough submitted 113 samples. The other localities each submitted less than 100 samples.

There has been naturally an increase in the attendance of the chemists in the courts on account of the increase in the number of samples submitted. One of the chemists spent nearly two months in the Superior Court of Essex County, pending the trials of these cases, and a large number of calls have been made for the attendance of the chemist at the Superior Court in the Suffolk and Middlesex districts. The certificates, however, are used in the majority of the cases, but if the defence objects to the introduction of the certificate, it is necessary to summon the chemist to testify because of the unconstitutionality of such evidence.

COLD STORAGE.

The amounts of goods on hand in the storage warehouses are apparently lower than those of any year since 1914, owing, in part, to the cessation of hostilities, and consequent reduction of the exports of meat and fish. The statistics of the holdings of food in this State go back only to August, 1920.

There have been granted an unusual number of extensions of time in cold storage. It appeared during the early part of 1921 that there would be a surplus of butter in storage at the end of the twelve months' storage permitted by law, because of the unusual importation of Danish butter into the United States. This butter usually goes to England, but the British Food Ministry kept an import embargo upon butter until the early spring. The rate of outgo of butter indicated that there would be about 1,150,000 pounds of storage butter unconsumed, upon which the time of storage would expire between June and August. This was so unusual that the matter was referred to the Council, resulting in a vote that extensions should be granted on such butter as was in proper shape for the extension. Owing to the removal of the import embargo by England, the Danish butter went to its natural market, and the amount of extensions actually granted was on 99 lots, representing a little less than 500,000 pounds.

Another unusual condition occurred relative to storage fish. The winter of 1920 was unusually mild, plenty of fresh fish was on the market, and no opportunity occurred for the sale of considerable of the frozen fish. When the fishing season began in 1921, the amount of fish caught was less than usual. The owners of the frozen fish then asked for extensions upon this fish, which requests were granted on nearly 2,500,000 pounds of fish. About 2,000,000 pounds of this fish was whiting, all of which is exported to other States. Notwithstanding these unusual extensions, the fish holdings this year are less than those of last year, and a number of fish freezers which were running during the past five years are now closed.

The next largest item of extension is pork, — extension granted for nearly 1,000,000 pounds. This pork was practically all export pork, being cuts not sold in this country, and held in Massachusetts pending foreign shipment, which was delayed by certain import embargoes imposed by the countries to which the material was to be shipped. The total amount of extensions represented 1.85 per cent of the total amount of food placed in storage during the year. The average length of time for the extensions was less than three months.

The following table gives a summary of these extensions:—

	Lots.	Pounds.
Frozen eggs	4	27,730
Butter	99	489,882
Venison	3	162
Reindeer	1	16,779
Poultry (broilers)	2	1,804
Beef and beef products	11	87,853
Pork	17	937,443
Lamb and mutton	10	60,270
Veal	1	1,260
Fish	86	2,493,169
	234	4,116,352

There were 102 requests for extension refused; 1 request for permission to remove after the expiration of a year's storage was granted; and 139 lots were ordered removed from storage at the end of twelve months, upon which lots no request for extension had been made.

BAKERIES.

The bakery law, passed in 1920, was amended during the 1921 legislative session by excluding stores from the requirement of registering as bakeries. The inspections made by this Department have been done by one inspector, who has inspected 701 manufacturing bakeries located in 27 cities and towns of this State. In carrying out this work, the inspector examines all the bakeries in each city or town he visits, in company with the agent of the local board of health, when such person can be persuaded to go with him. After the inspections are made, the delinquencies of each bakery are written, and a list of these delinquencies is sent to the local board of health with the request that the board see that the violations are corrected.

On account of the time consumed in making the first inspections, practically no follow-up work has been done, except in three localities. In a few instances there seemed to be little inclination on the part of the local authorities to see that the cleaning up work was done. In one case, a bakery was ordered closed and the local board of health then permitted a change to be made in the registration of this place, and a bakery was operated in the same place under the same conditions at the time our inspector made his second visit to this locality

some months later. A meeting of the director of this Division, the inspector who made the inspection, and the District Health Officer with the local board of health convinced the board that they must get busy and clean up the dirty conditions which the inspector of this Department discovered.

Of the 701 bakeries inspected, 57 per cent did not properly protect the products from contamination as provided by the law; 46 per cent had no garbage can, as provided by the regulations; in 38 per cent the apparatus and floors were not properly constructed and maintained as provided in the regulations; 33 per cent did not properly protect the products, as provided by law; and 30 per cent did not have adequate toilets, as provided by the law. Only 18 per cent of the bakeries were found to have cats in violation of the law. The number of domestic rooms connected with bakeries was much less than was anticipated, there being but six such instances, which seems an unusually small number of violations, considering the numerous other violations noted, with all the powers given to local boards of health before and after the present law went into effect. It seems that one of the greatest difficulties encountered in the enforcement of this law is the insufficient appropriation of local boards of health.

SLAUGHTERING.

There has been no change in procedure or the policy of the Division relative to slaughtering inspection. The veterinary inspectors have acted as instructors of local inspectors when necessary; they have investigated the qualifications of nominees for the position of inspector of slaughtering; and when violations of the law have occurred, have presented the evidence to the courts.

The reports of local inspectors to this Department have indicated in nearly all instances that the inspectors are not only properly qualified to make post-mortem examinations, but are doing so in a satisfactory manner. A summary of these reports shows a phenomenal increase in the confiscation of cattle by reason of generalized tuberculosis. In 1915, 1916 and 1917, the confiscations of cattle for all causes were 2.29, 2.29 and 2.08 per cent, respectively, of which 86 to 87 per cent were for tuberculosis. In 1921 there were inspected 21,748 carcasses of cattle, of which 667, or 3.07 per cent, were confiscated, 610 of which, or 2.82 per cent of the total number, were confiscated for generalized tuberculosis. Since the larger part of these cattle are dairy cows, it is significant of a decided increase of tuberculosis in such cattle in this State.

The following table gives a summary of the slaughtering inspectors' report for the year: —

	Number inspected.	Number confiscated.	NUMBER CONFISCATED FOR —		Hog Cholera.
			Tuber- culosis.	Im- maturity.	
Cattle	21,748	667	610	-	-
Calves	98,782	1,145	12	863	-
Hogs	79,271	680	140	-	273

ARSPHENAMINE.

The arsphenamine production has been greater than at any other time since the work began. The Division has been able to produce a sufficient quantity of non-toxic arsphenamine to supply the needs of the Department. The amount distributed was 37,117 doses computed as of 0.6 gram per dose, which was 12,145 more such doses than was distributed during 1920, or an increase of 48.4 per cent. The drug has been put out in ampoules containing 0.4 gram, 0.6 gram, 1.8 grams and 3.0 grams, and occasionally in smaller quantities.

At the present rate of increase, the yearly distribution in twelve months will be in the neighborhood of 50,000 doses. The Division has practically reached its maximum capacity with the present apparatus. Should there be any marked increase in the demand for this drug, it will be essential to install larger units, which can be done without wasting the present units now used, as they can be utilized for other purposes in connection with the work.

The percentage of toxic batches has been continually decreasing during the past three years, and the toxicity tolerance of our product has been increasing. The product made during the present year shows a decided improvement in purity over that made in 1920.

The following tables are herewith submitted: —

List of prosecutions.

Summary of milk samples examined.

Summary of food samples examined.

Summary of drug samples examined.

Summary of liquor samples examined.

List of articles, other than fish, placed in cold storage.

List of fish placed in cold storage.

List of articles, other than fish, on hand in storage on the first day of each month.

List of fish on hand on the fifteenth day of each month.

List of extensions of time in storage granted.

List of extensions of time in storage refused.

List of requests for permission to remove from storage granted.

List of articles removed from storage, upon which no request for extension was made.

TABLE NO. 1. — *List of Prosecutions.*

For Sale of Milk not of Good Standard Quality.

NAME.	Address.	Court.	Date.	Result.
Albriegen, John	Springfield	Springfield	Feb. 16, 1921	Conviction.
Avezzi, Charles	West Springfield	Springfield	Nov. 7, 1921	Conviction.
Chong, Harry	Springfield	Springfield	Nov. 7, 1921	Conviction.
Cochiafis, Jas. C. . . .	Springfield	Springfield	Nov. 7, 1921	Conviction.
Couchiaftis, James	Springfield	Springfield	Feb. 16, 1921	Conviction.
Giarskahis, Christ	Springfield	Springfield	Dec. 16, 1920	Conviction.
Hindakis, Christus	Springfield	Springfield	Nov. 7, 1921	Conviction.
Lampros, Samuel	Springfield	Springfield	Nov. 7, 1921	Conviction.
Lemnolis, Peter	Springfield	Springfield	Nov. 7, 1921	Conviction.
Palmer, George H. . . .	Springfield	Springfield	Nov. 7, 1921	Conviction.
Papas, Andrew	Springfield	Springfield	Feb. 16, 1921	Conviction.
Rech, Frank	Springfield	Springfield	Dec. 16, 1920	Conviction.
Robbins, Edwin G. . . .	Springfield	Springfield	Feb. 16, 1921	Conviction.
Stathis, Nicholas	Springfield	Springfield	Feb. 16, 1921	Conviction.
Truman, Samuel	Springfield	Springfield	Nov. 7, 1921	Conviction.
Young, Charles	Springfield	Springfield	Dec. 16, 1920	Conviction.

For Sale of Milk from which a Portion of the Cream had been removed.

Goodman, Israel	Pittsfield	Pittsfield	Aug. 5, 1921	Conviction.
Mozara, Michael	Millis	Franklin	May 19, 1921	Conviction.
Noons, Joseph K. . . .	North Truro	Provincetown	Aug. 17, 1921	Conviction.
Supernent, Calvin	Groton	Ayer	Dec. 13, 1920	Conviction.

For Sale of Milk containing Added Water.

Adamson, Charles ¹	West Rutland	Worcester	Jan. 25, 1921	Conviction. ²
Adler, Samuel	Medway	Franklin	Sept. 15, 1921	Conviction.
Bailey, John	Pelham, N. H. . . .	Dracut	Oct. 7, 1921	Conviction.

¹ Evidence furnished by Mr. George D. Melican, milk inspector of Worcester; analysis made by this Department.

² Appealed.

For Sale of Milk containing Added Water — Concluded.

NAME.	Address.	Court.	Date.	Result.
Boyden, Almon F.	Walpole . . .	Walpole . . .	May 6, 1921	Conviction.
Burke, John . . .	Westwood . . .	Dedham . . .	May 9, 1921	Conviction.
Carr, John J. . . .	Pepperell . . .	Ayer	Dec. 13, 1920	Conviction.
Davis, Robert B. . . .	Wayland . . .	Framingham . . .	Nov. 4, 1921	Discharged.
Dicenso, Tony	Medway	Franklin	May 28, 1921	Conviction.
Driscoll, John A. . . .	Lexington . . .	Concord	July 11, 1921	Conviction.
Fecteau, Aldie	Carlisle	Concord	Aug. 22, 1921	Conviction.
Fine, Simon	Malden	Malden	Mar. 31, 1921	Discharged.
Fisher, Lewis G. C. . . .	Peabody	Peabody	June 8, 1921	Conviction.
Gear, Joseph	South Dartmouth .	New Bedford . . .	Feb. 11, 1921	Conviction.
Goss, Albert L.	West Windham, N. H.	Methuen	May 25, 1921	Conviction.
Grouard, John S.	Nantucket	Nantucket	Dec. 2, 1920	Conviction.
Jannino, Joseph	Revere	Chelsea	Mar. 24, 1921	Conviction.
Martin, John K.	Stoughton	Stoughton	Dec. 17, 1920	Conviction. ¹
McHugh, Omer	Harvard	Clinton	Mar. 21, 1921	Conviction.
Mederos, Manuel ²	Fall River	Fall River	Sept. 13, 1921	Conviction.
Mulvey, Patriek	Lexington	Concord	July 20, 1921	Conviction.
Proctor, Warren	Lunenburg	Leominster	Aug. 13, 1920	Conviction.
Shattuck, Willie	Ayer	Ayer	Apr. 15, 1921	Conviction.
Shinost, Louis	West Springfield . .	Springfield	Nov. 30, 1921	Conviction.
Siegmund, Joseph	Walpole	Walpole	May 23, 1921	Conviction.
Sutton, Frank A. ³	West Rutland	Worcester	Jan. 24, 1921	Conviction. ¹
Terzian, Samuel	Whitman	Abington	Feb. 14, 1921	Conviction.
Turner, John Wesley	Salem	Salem	Dec. 21, 1920	Conviction.
Vaughan, J. Ernest	Whitman	Abington	Feb. 14, 1921	Conviction.

Misuse of Milk Bottles.

Agnas, James	Springfield	Springfield	June 7, 1921	Conviction.
Bidsacos, Costos	Springfield	Springfield	June 7, 1921	Conviction.
Demetropoulos, Costos	Springfield	Springfield	June 7, 1921	Conviction.
Kaleos, Daniel	Springfield	Springfield	June 7, 1921	Conviction.
Nicolaon, Andrew	Springfield	Springfield	June 7, 1921	Conviction.

¹ Appealed.² Sample submitted by Mr. Boisseau, milk inspector of Fall River; analysis made by this Department.³ Evidence furnished by Mr. George D. Melican, milk inspector of Worcester; analysis made by this Department.

For Sale of Adulterated Foods Other than Milk and Milk Products.

COCOA.

[False advertising.]

NAME.	Address.	Court.	Date.	Result.
Zimmerman, Morris . . .	Boston	Boston	Mar. 8, 1921	Conviction.

COMPOUND OIL.

[Misbranding.]

Marcaroni, Alfio	Lawrence	Lawrence	June 28, 1921	Conviction.
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EXTRACT OF VANILLA.

[Contained coumarin.]

Peck, Edgar M.	Whitman	Abington	Jan. 20, 1921	Conviction.
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GRAPE JUICE.

[Contained 90 per cent sugar syrup with coloring matter.]

Chmielnicki, John	South Boston	South Boston	May 16, 1921	Conviction. ¹
Chmielnicki, John	South Boston	South Boston	May 16, 1921	Conviction. ¹

MAPLE SUGAR.

[Contained cane sugar.]

Chansky, Louis	Boston	Boston	Mar. 28, 1921	Conviction. ¹
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OLIVE OIL.

[Adulterated with foreign oil.]

Alban, Inc., John A.	New York City	United States District Court for New York.	Nov. 2, 1921	Conviction.
Armenis, George (2 counts)	Boston	Boston	July 28, 1921	Conviction.
Armenis, Peter	Boston	Boston	Dec. 1, 1920	Discharged.
Armenis, Peter	Boston	Newburyport	Apr. 20, 1921	Conviction.
Armenis, Peter	Boston	Boston	June 9, 1921	Discharged.
Armenis, Peter	Boston	Boston	June 10, 1921	Conviction. ¹
Armenis, Peter	Boston	Boston	June 10, 1921	Conviction. ¹
Cotsis, George (8 counts)	Boston	Boston	Dec. 1, 1920	Conviction.

¹ Appealed.

For Sale of Adulterated Foods Other than Milk and Milk Products — Continued.

OLIVE OIL — Concluded.

[Adulterated with foreign oil.]

NAME.	Address.	Court.	Date.	Result.
Cotsis, George . . .	Boston . . .	New Bedford .	May 10, 1921	Dismissed.
Crespe, Joseph . . .	New Bedford . .	New Bedford .	Mar. 29, 1921	Conviction.
DeMauro, Joseph . .	Lawrence . . .	Lawrence . . .	June 28, 1921	Conviction. ¹
Gracia, John . . .	New Bedford . .	New Bedford .	May 10, 1921	Conviction.
Leonardi, Santo . . .	Lawrence . . .	Haverhill . . .	July 13, 1921	Conviction. ¹
Mihalopos, Anastasias L. .	Boston . . .	Boston . . .	Dec. 1, 1920	Conviction.
Moustos, Louis (8 counts) .	Boston . . .	Boston . . .	Dec. 1, 1920	Conviction.
Moustos, Louis, and George Cotsis.	Boston . . .	Boston . . .	Mar. 15, 1921	Conviction.
Moustos, Louis . . .	Boston . . .	New Bedford .	May 10, 1921	Dismissed.
Papoulas, Theodore . . .	New Bedford . .	New Bedford .	Dec. 7, 1920	Conviction.
Rodigue, Antonio . . .	New Bedford . .	New Bedford .	Apr. 5, 1921	Conviction.

OLIVE OIL.

[False advertising.]

Gonnella, Oreste . . .	Springfield . . .	Springfield .	Mar. 31, 1921	Conviction.
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OLIVE OIL.

[Misbranded.]

Alban, Inc., John A. . . .	New York City . .	United States District Court for New York.	Nov. 2, 1921	Conviction.
Armenis, Kostas . . .	Boston . . .	Boston . . .	Dec. 17, 1920	Conviction.
Armenis, Peter . . .	Boston . . .	Boston . . .	June 10, 1921	Conviction. ¹
Armenis, Peter . . .	Boston . . .	Boston . . .	June 10, 1921	Conviction. ¹
Gotsis, Aristedes . . .	Boston . . .	Boston . . .	Dec. 17, 1920	Conviction.
Leonardi, Santo . . .	Lawrence . . .	Haverhill . . .	July 13, 1921	Conviction. ¹

SAUSAGE.

[Contained starch in excess of 2 per cent.]

Baldau, Frederick W. . . .	Boston . . .	Boston . . .	Mar. 8, 1921	Conviction.
Baldau, Frederick W. . . .	Boston . . .	Boston . . .	Mar. 8, 1921	Conviction.
Balkus, Andrew . . .	Lynn . . .	Haverhill . . .	May 4, 1921	Conviction.
Balkus, Andrew . . .	Lynn . . .	Haverhill . . .	May 4, 1921	Conviction.

¹ Appealed.

For Sale of Adulterated Foods Other than Milk and Milk Products — Continued.

SAUSAGE — Concluded.

[Contained starch in excess of 2 per cent.]

NAME.	Address.	Court.	Date.	Result.
Boston Sausage and Provision Company.	Boston . . .	Lowell . . .	Jan. 18, 1921	Conviction.
Boston Sausage and Provision Company.	Boston . . .	Lawrence . . .	Feb. 15, 1921	Conviction.
Boston Sausage and Provision Company.	Boston . . .	Lawrence . . .	Feb. 15, 1921	Conviction.
Boston Sausage and Provision Company.	Worcester . . .	Worcester . . .	Mar. 10, 1921	Conviction.
Briggs, Harry M. . . .	Methuen . . .	Lawrence . . .	Feb. 15, 1921	Conviction.
Ferneaux, Henry J. . . .	Lawrence . . .	Lawrence . . .	Feb. 15, 1921	Conviction.
Gritz, Michael	Adams	Adams	Mar. 4, 1921	Conviction. ¹
Maguy, Gideon	Fitchburg . . .	Fitchburg . . .	May 13, 1921	Conviction.
Parks Sausage and Provision Company.	Boston	Lowell	Feb. 4, 1921	Conviction.
Vonbank, Carl	New Bedford . .	New Bedford . .	June 27, 1921	Conviction.
Vonbank, George	New Bedford . .	New Bedford . .	June 27, 1921	Conviction.
Wilkinson, Wilfred A. . . .	Lawrence	Lawrence	Feb. 15, 1921	Conviction.

SAUSAGE.

[Contained coloring matter.]

Boepple, George, Company	Worcester . . .	Worcester . . .	Mar. 10, 1921	Conviction.
Costelow, Anthony	Brockton	Brockton	Dec. 22, 1920	Conviction.
Darling, L. B., Company . . .	Worcester	Worcester	Mar. 10, 1921	Discharged.
Ferneaux, Henry J. . . .	Lawrence	Lawrence	Feb. 15, 1921	Conviction. ²

SOFT DRINKS.

[Contained saccharine.]

Barboza, John M. . . .	New Bedford . . .	New Bedford . . .	June 27, 1921	Conviction.
Campione, Cirino	Lawrence	Lawrence	June 3, 1921	Conviction. ²
Catachio, Tommaso	Worcester	Worcester	May 26, 1921	- ³
Glinski, Frank	Chicopee	Chicopee	Nov. 3, 1921	Discharged.
Kelley, James H. . . .	Worcester	Worcester	May 26, 1921	- ³
Kline, Charles	Fall River	Fall River	July 1, 1921	Conviction.
Liofsky, Max	Springfield . . .	Springfield . . .	June 16, 1921	Conviction. ⁴
Lozoraitis, Peter	Worcester	Worcester	May 26, 1921	- ³
Lumenello, Anthony	New Bedford . . .	New Bedford . . .	June 27, 1921	Conviction.
Machaj, John	Ipswich	Ipswich	Oct. 4, 1921	Conviction.

¹ Fined \$10; sentence suspended.² Continued for sentence.³ On file, without plea.⁴ Appealed.

For Sale of Adulterated Foods Other than Milk and Milk Products — Concluded.

SOFT DRINKS — Concluded.

[Containing saccharine.]

NAME.	Address.	Court.	Date.	Result.
Melinsky, John . . .	Cambridge . . .	Cambridge . . .	June 23, 1921	Conviction.
Neves, Joseph . . .	New Bedford . . .	New Bedford . . .	June 27, 1921	Conviction.
Puzine, Jacob . . .	Lawrence . . .	Lawrence . . .	July 8, 1921	Conviction.
Quitadamo, Michael A. . .	Worcester . . .	Worcester . . .	May 26, 1921	- ¹
Rapolus, Stanislaw . . .	Indian Orchard . . .	Springfield . . .	Nov. 4, 1921	Conviction.
Robins, Harris . . .	Worcester . . .	Worcester . . .	May 26, 1921	- ¹
Roscoe, Sylvester . . .	Worcester . . .	Worcester . . .	May 26, 1921	- ¹
Royal Bottling Company, Inc.	Worcester . . .	Worcester . . .	May 26, 1921	- ¹
Shapiro, Nathan E. . . .	New Bedford . . .	New Bedford . . .	June 27, 1921	Conviction.
Stanieri, Vincent . . .	Worcester . . .	Worcester . . .	May 26, 1921	- ¹
Stashis, Roman . . .	Cambridge . . .	Cambridge . . .	July 25, 1921	Conviction.
Tater, Israel . . .	Fitchburg . . .	Fitchburg . . .	July 19, 1921	Conviction.
Tinkoll, Morris . . .	Fall River . . .	Fall River . . .	July 1, 1921	Conviction.
Tsolakos, Peter . . .	Cambridge . . .	Cambridge . . .	July 18, 1921	Conviction.
Wheeler Bottling Company	Lynn . . .	Lynn . . .	Dec. 7, 1920	Conviction.
Wilben Bottling Company . .	Worcester . . .	Worcester . . .	May 26, 1921	- ¹
Wincko, Peter . . .	Cambridge . . .	Cambridge . . .	Dec. 10, 1920	Conviction.
York, Morton E. . . .	Lynn . . .	Lynn . . .	Dec. 7, 1920	Conviction.

VINEGAR.

[Low in acid.]

Archambault, Arthur . . .	New Bedford . . .	New Bedford . . .	June 14, 1921	Conviction.
Dwyer, Michael J. . . .	Fall River . . .	Fall River . . .	Apr. 22, 1921	Conviction.
Fomberstein, Myer . . .	Fall River . . .	Fall River . . .	May 24, 1921	Conviction.
Marra, William H. . . .	Pittsfield . . .	Pittsfield . . .	May 27, 1921	Discharged.
Monast, Claxite . . .	Fall River . . .	Fall River . . .	Apr. 22, 1921	Conviction.
Stampel, Morris . . .	Taunton . . .	Taunton . . .	May 17, 1921	Conviction.
Whitcher, Frank . . .	Ayer . . .	Salem . . .	Mar. 2, 1921	Conviction.

Eggs.

DECOMPOSED; UNFIT FOR FOOD.

Harrington, Daniel J. . . .	Springfield . . .	Springfield . . .	Dec. 16, 1920	Conviction.
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¹ On file, without plea.

Eggs — Continued.

FALSE ADVERTISING — SALE OF STALE EGGS AS FRESH EGGS.

NAME.	Address.	Court.	Date.	Result.
Bremner, Leon H. . . .	Taunton	Taunton	Dec. 10, 1920	Conviction.
Great Atlantic and Pacific Tea Company, The.	Newton	Newton	Nov. 2, 1921	Conviction. ¹
Kushner, Joseph	Springfield	Springfield	Oct. 28, 1921	Conviction.
Levine, Louis	Newton	Newton	Nov. 2, 1921	Conviction.
Mailman, Charles A. . . .	Boston	Newton	Nov. 2, 1921	Dismissed.
Shepard, Ralph	Newton	Newton	Nov. 2, 1921	Conviction.
Tillman, Thomas	Springfield	Springfield	Oct. 28, 1921	Conviction.
Wychnnas, Peter	Brockton	Brockton	Dec. 22, 1920	Conviction.

MISBRANDED.

Branard, Harry H. . . .	Springfield	Springfield	Jan. 12, 1921	Conviction.
Flood, Nathan B. . . .	North Adams	North Adams	Jan. 27, 1921	Conviction.
National Butter Company	Springfield	Springfield	Jan. 12, 1921	Conviction.

SELLING COLD-STORAGE EGGS WITHOUT MARKING THE CONTAINER.

Altman, Max	Holyoke	Holyoke	Dec. 31, 1920	Conviction. ¹
Anglim Market Company, Inc.	Brockton	Brockton	Dec. 22, 1920	Conviction.
Armon, Peter	Brockton	Brockton	Dec. 22, 1920	Conviction.
Balchnas, Stanislav P. . . .	Brockton	Brockton	Dec. 22, 1920	Conviction.
Balestri, Joseph	West Springfield	Springfield	Dec. 31, 1920	Conviction.
Barkoniecz, Benjamin	Boston	Boston	Dec. 28, 1920	Conviction.
Barnes, William E. . . .	Brockton	Brockton	Jan. 10, 1921	Discharged.
Beauchemin, Albert	North Adams	North Adams	Jan. 27, 1921	Conviction.
Beaudry, Alexander	Lowell	Lowell	Nov. 18, 1921	Conviction.
Bechick, Isaac	Lowell	Lowell	Dec. 20, 1920	Conviction.
Benoit, Edgar H. . . .	Springfield	Springfield	Dec. 31, 1920	Conviction.
Besbris, Abraham	Taunton	Taunton	Dec. 10, 1920	Conviction.
Bigns, Walter	Brockton	Brockton	Dec. 22, 1920	Conviction.
Birstine, Morris	Beverly	Salem	Jan. 21, 1921	Conviction.
Bousquet, Levi O. . . .	Taunton	Taunton	Dec. 10, 1920	Conviction.
Bresnahan, Patrick J. . . .	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Broudy, Isaac	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Brown, Mortimer	Marblehead	Marblehead	Jan. 17, 1921	Conviction.
Burgess, Eugene S. . . .	Nantucket	Nantucket	Dec. 2, 1920	Conviction. ²

¹ Appealed.² Fined \$10; sentence suspended.

*Eggs — Continued.*SELLING COLD-STORAGE EGGS WITHOUT MARKING THE CONTAINER — *Continued.*

NAME.	Address.	Court.	Date.	Result.
Buslewich, Hipolata . . .	Lowell	Lowell	Nov. 18, 1921	Conviction.
Callivan, William	Beverly	Salem	Jan. 21, 1921	Conviction.
Carbone, Andrew	Beverly	Salem	Jan. 21, 1921	Conviction.
Carey, Arthur C.	Nantucket	Nantucket	Dec. 2, 1920	Conviction. ¹
Catheart, William R. . . .	Nantucket	Nantucket	Dec. 2, 1920	Conviction. ¹
Cetlin, Charles	Newburyport	Newburyport	Jan. 14, 1921	Conviction.
Chain, Henry	North Adams	North Adams	Jan. 27, 1921	Conviction.
Clo, John	West Springfield	Springfield	Dec. 31, 1920	Conviction.
Czerwonka, Antoni	Holyoke	Holyoke	Dec. 31, 1920	Conviction.
Deftos, Peter	Brockton	Brockton	Dec. 22, 1920	Conviction.
Denisevitch, Zachary	Forge Village	Ayer	Dec. 13, 1920	Discharged.
Dusseault, Isala	Taunton	Taunton	Dec. 10, 1920	Conviction.
Frye, Edmund R.	Nantucket	Nantucket	Dec. 2, 1920	Conviction. ¹
Golden, Julius	Boston	Boston	Dec. 28, 1920	Conviction.
Gomes, Charles	Taunton	Taunton	Dec. 10, 1920	Conviction.
Haley, Edward T.	Marblehead	Marblehead	Jan. 17, 1921	Conviction.
Holland, William	Nantucket	Nantucket	Dec. 2, 1920	Conviction. ¹
Hooper, Lewis B.	Marblehead	Marblehead	Jan. 17, 1921	Conviction.
Jacques, Kostan	Taunton	Taunton	Dec. 10, 1920	Conviction.
Janigan, John	Brockton	Brockton	Dec. 22, 1920	Conviction.
Koplovitz, Barnett	Boston	Boston	Feb. 9, 1921	Conviction.
Korontjis, Andrew	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Kronich, William E.	Springfield	Springfield	Jan. 13, 1921	Conviction.
Lappin, Harry J.	Lowell	Lowell	Nov. 18, 1921	Conviction.
Lipshitz, Jacob	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Madey, Frank	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Marra, Timothy C.	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Menard, Adlard C.	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Morin, Mizael	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Nathan, Julius	Springfield	Springfield	Dec. 31, 1920	Conviction.
Ostrowsky, John	Holyoke	Holyoke	Dec. 30, 1920	Conviction.
Pagliaruli, Vitto	Beverly	Salem	Jan. 21, 1921	Conviction.
Passlacque, John B.	Boston	Boston	Dec. 28, 1920	Conviction.
Pouoplis, Stephen	Springfield	Springfield	Oct. 28, 1921	Conviction.
Renzi, Antoni F.	Beverly	Salem	Jan. 21, 1921	Conviction.

¹ Fined \$10; sentence suspended.

*Eggs — Concluded.*SELLING COLD-STORAGE EGGS WITHOUT MARKING THE CONTAINER — *Concluded.*

NAME.	Address.	Court.	Date.	Result.
Ricci, Michael . . .	Beverly . . .	Salem . . .	Jan. 21, 1921	Conviction.
Richard, Conrad . . .	Graniteville . . .	Ayer . . .	Dec. 13, 1920	Conviction.
Roberts, John F. . . .	Nantucket . . .	Nantucket . . .	Dec. 2, 1920	Discharged.
Saladaka, Joseph . . .	Brockton . . .	Brockton . . .	Dec. 22, 1920	Conviction.
Sanka, Anthamas . . .	Brockton . . .	Brockton . . .	Dec. 22, 1920	Conviction.
Santospirito, Manuel . . .	Beverly . . .	Salem . . .	Jan. 21, 1921	Conviction.
Scibella, Andrew P. . . .	Springfield . . .	Springfield . . .	Dec. 31, 1920	Conviction.
Shapiro, Morris J. . . .	Lowell . . .	Lowell . . .	Dec. 20, 1920	Conviction.
Sigda, Wojciech	Holyoke . . .	Holyoke . . .	Dec. 30, 1920	Conviction.
Solin, William	Springfield . . .	Springfield . . .	Jan. 12, 1921	Conviction.
Sousini, James	Pittsfield . . .	Pittsfield . . .	Aug. 26, 1921	Conviction.
Springer, Jacob	Boston . . .	Boston . . .	Dec. 28, 1920	Conviction. ¹
Springer, Louis	Boston . . .	Boston . . .	Dec. 28, 1920	Conviction. ¹
Stasz, Frank	Holyoke . . .	Holyoke . . .	Dec. 30, 1920	Conviction.
Sternberg, Benjamin	Springfield . . .	Springfield . . .	Oct. 28, 1921	Conviction.
Suchocki, Anthony	Holyoke . . .	Holyoke . . .	Dec. 30, 1920	Conviction.
Szewczuk, Stanley	Holyoke . . .	Holyoke . . .	Dec. 30, 1920	Conviction.
Tarvis, William	Provincetown . . .	Provincetown . . .	Aug. 17, 1921	Conviction.
Terry, Herbert	Nantucket . . .	Nantucket . . .	Dec. 2, 1920	Conviction. ²
Tousignant, Angelo	Lowell . . .	Lowell . . .	Nov. 18, 1921	Conviction.
Vicivi, Carlo	Beverly . . .	Salem . . .	Jan. 21, 1921	Conviction.
Wilson, Jos. M. . . .	Lowell . . .	Lowell . . .	Dec. 20, 1920	Conviction.
Wisberg, Isaac	Fall River . . .	Fall River . . .	Feb. 18, 1921	Conviction.
Wozdanowicz, Joseph	Holyoke . . .	Holyoke . . .	Dec. 30, 1920	Conviction. ¹
Ziter, Edward	North Adams . . .	North Adams . . .	Jan. 27, 1921	Conviction.

ABSENCE OF SIGN "COLD STORAGE EGGS."

Hahn, Jacob	Fall River . . .	Fall River . . .	Feb. 18, 1921	Conviction.
Zucca, Frank	Springfield . . .	Springfield . . .	Nov. 7, 1921	Conviction.

For Sale of Decomposed Food.

BUTTER.

Mills Tea and Butter Corporation.	Boston . . .	Malden . . .	Jan. 6, 1921	Conviction.
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¹ Appealed.² Fined \$10; sentence suspended.

For Sale of Decomposed Food — Concluded.

CANNED SWEET CORN.

NAME.	Address.	Court.	Date.	Result.
Rosenbloom, Samuel . . .	Revere . . .	Charlestown . . .	Sept. 13, 1921	Conviction. ¹

KREAM KRIST.

Terruso, Angelo	Dorchester	Dorchester	Nov. 18, 1921	Conviction.
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SHRIMP.

Hyland, Thomas D.	Taunton	Taunton	Feb. 10, 1921	Conviction.
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SELLING DECOMPOSED FOOD.

Spellman, Louis	New Bedford	New Bedford	Mar. 29, 1921	Conviction.
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For Sale of Drugs deficient in Strength.

LIME WATER.

Donovan, Thomas J.	Salem	Salem	Aug. 15, 1921	Conviction.
Gould & Co., James E.	Malden	Malden	Aug. 15, 1921	Conviction.
Kelley, Albert B.	Lawrence	Lawrence	Aug. 19, 1921	Conviction.
Ropes Drug Company	Salem	Salem	Aug. 13, 1921	Conviction.
Western Refining Company	Lowell	Lowell	Aug. 18, 1921	Conviction.

MAGNESIUM CITRATE.

Lowe, Charles W.	Charlestown	Charlestown	Feb. 28, 1921	Conviction.
Nobile, Giovanni H.	Revere	Chelsea	Apr. 12, 1921	Conviction.
Smanai, Rudolph	Springfield	Springfield	June 16, 1921	Conviction. ¹

EXTRACT OF PEPPERMINT.

Leonard, Willie J.	Brockton	Brockton	Apr. 21, 1921	Conviction.
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¹ Appealed.

For Violation of the Laws relative to Cold Storage.

HOLDING ARTICLES OF FOOD IN COLD STORAGE FOR A PERIOD LONGER THAN TWELVE MONTHS WITHOUT THE CONSENT OF THE DEPARTMENT OF PUBLIC HEALTH.

NAME.	Address.	Court.	Date.	Result.
Cannizzo, Joseph . . .	Boston	South Boston . .	Oct. 21, 1921	Conviction.
Corso, Santo	Boston	South Boston . .	Oct. 21, 1921	Conviction.

RETAILING COLD-STORAGE GOODS WITHOUT DISPLAYING A SIGN MARKED "COLD STORAGE GOODS SOLD HERE."

Besbris, Abraham . . .	Taunton	Taunton	Dec. 10, 1920	Conviction.
Bousquet, Levi O. . . .	Taunton	Taunton	Dec. 10, 1920	Conviction.
Gomes, Charles	Taunton	Taunton	Dec. 10, 1920	Conviction.
Jacques, Koston	Taunton	Taunton	Dec. 10, 1920	Conviction.
Kitas, Peter	Springfield . . .	Springfield . . .	Dec. 31, 1920	Conviction.
Lavin, David	Springfield . . .	Springfield . . .	Nov. 7, 1921	Conviction.
LaRoche, Omer	Springfield . . .	Springfield . . .	Dec. 31, 1920	Conviction.
Levesque, Ovide	Fall River	Fall River	Feb. 18, 1921	Conviction.
Phillips, A. H., Inc. . . .	Springfield . . .	Springfield . . .	Dec. 31, 1920	Conviction.
Phillips, A. H., Inc. . . .	Springfield . . .	Springfield . . .	Jan. 12, 1921	Conviction.
Starr, James J. . . .	Springfield . . .	Springfield . . .	Nov. 7, 1921	Conviction.

REPRESENTING COLD-STORAGE FOOD AS FRESH FOOD.

Bogdonoff, Morris H. . . .	Lowell	Lowell	Apr. 25, 1921	Conviction.
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OPERATING A REFRIGERATING WAREHOUSE WITHOUT A LICENSE ISSUED BY THE DEPARTMENT OF PUBLIC HEALTH.

Fairmont Creamery Company.	Boston	Boston	Apr. 29, 1921	Conviction.
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For Violation of the Laws relative to Slaughtering.

ILLEGAL USE OF STAMP.

Boutwell, Flint H. . . .	Fitchburg	Fitchburg	Jan. 13, 1921	Conviction.
Geissler, Jacob	Sharon	Stoughton	Jan. 21, 1921	Conviction.
Smith, Sylvester	Belchertown . . .	Northampton . .	Jan. 5, 1921	Discharged.

For Violation of the Laws relative to Slaughtering — Concluded.

SLAUGHTERING OR AUTHORIZING SLAUGHTERING IN THE ABSENCE OF INSPECTOR.

NAME.	Address.	Court.	Date.	Result.
Albert, Phillip . . .	New Bedford . . .	New Bedford . . .	June 28, 1921	Conviction.
Allyn, Edgar . . .	Westfield . . .	Westfield . . .	Jan. 27, 1921	Conviction.
Cohen, Morris . . .	New Bedford . . .	New Bedford . . .	June 28, 1921	Conviction.
Fredette, William . . .	New Bedford . . .	New Bedford . . .	June 28, 1921	Conviction.
Grasso, Andrew . . .	Agawam . . .	Springfield . . .	Mar. 31, 1921	Conviction.
Huntington, Edward . . .	Amherst . . .	Northampton . . .	Feb. 16, 1921	- ¹
Margolis, Simon . . .	New Bedford . . .	New Bedford . . .	June 28, 1921	Conviction.
McColgan, Robert . . .	Pittsfield . . .	Pittsfield . . .	Mar. 15, 1921	Conviction.
Wheeler, Perley . . .	Northampton . . .	Northampton . . .	Feb. 16, 1921	- ¹

SELLING, OFFERING FOR SALE, OR HAVING IN POSSESSION WITH INTENT TO SELL, UNSTAMPED MEAT.

Allyn, Edgar . . .	Westfield . . .	Westfield . . .	Jan. 27, 1921	Conviction.
Cohen, Tom . . .	Methuen . . .	Lawrence . . .	Mar. 17, 1921	Conviction.
Grasso, Andrew . . .	Agawam . . .	Springfield . . .	Mar. 31, 1921	Conviction.
McColgan, Robert . . .	Pittsfield . . .	Pittsfield . . .	Mar. 15, 1921	Conviction.

SALE OF DISEASED MEAT.

McFadden, James . . .	Athol . . .	Athol . . .	Jan. 8, 1921	Discharged.
Willard, Frank A. . . .	Leominster . . .	Leominster . . .	Jan. 4, 1921	Conviction. ²

AS INSPECTOR OF SLAUGHTERING FAILED TO CONDEMN DISEASED MEAT.

Swann, William L. . . .	Athol . . .	Athol . . .	Jan. 8, 1921	Discharged.
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SLAUGHTERING WITHOUT LICENSE.

Dixon, Ray O. . . .	Ware . . .	Ware . . .	Dec. 21, 1920	Discharged.
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¹ Filed on plea of "not guilty."² Appealed.

TABLE No. 2. — Summary of Milk Samples examined.

MONTH.	Above Standard.	Below Standard.	Total Samples.	Cream removed.	SKIMMED.		Watered Samples.	AVERAGE OF ALL SAMPLES.			Number of Samples.	AVERAGE OF GOOD SAMPLES.			
					Above Standard.	Below Standard.		Solids.	Fat.	Solids not Fat.		Solids.	Fat.	Solids not Fat.	
1920.															
December	522	99	621	7	-	4	3	12.59	3.82	8.77	607	12.64	3.86	8.78	
1921.															
January	434	103	537	23	-	-	18	12.55	3.81	8.74	496	12.64	3.86	8.78	
February	374	62	436	7	-	1	7	12.53	3.76	8.77	421	12.68	3.82	8.86	
March	592	237	829	17	1	1	40	12.32	3.68	8.64	776	12.57	3.77	8.74	
April	517	237	754	13	1	-	37	12.23	3.63	8.60	703	12.34	3.68	8.66	
May	355	78	433	7	-	-	1	12.40	3.70	8.70	425	12.43	3.73	8.70	
June	532	294	826	19	-	2	10	12.20	3.58	8.62	795	12.23	3.59	8.65	
July	402	210	612	21	-	-	3	12.39	3.74	8.65	588	12.41	3.79	8.62	
August	401	190	591	19	-	-	32	12.20	3.64	8.56	540	12.42	3.76	8.66	
September	237	129	366	19	-	-	39	12.13	3.63	8.50	308	12.38	3.63	8.62	
October	438	115	553	11	1	-	11	12.47	3.78	8.69	530	12.54	3.83	8.71	
November	302	42	344	2	-	-	7	12.57	3.82	8.75	335	12.66	3.82	8.84	
Totals	5,106	1,796	6,902	165	3	8	208	12.36	3.70	8.66	6,518	12.47	3.76	8.71	

TABLE NO. 3. — *Summary of Food Samples examined.*

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Butter	257	114	371
Canned goods	4	2	6
Cider	2	7	9
Clams	5	8	13
Cocoa	2	1	3
Coffee	12	—	12
Coffee substitutes	—	2	2
Condensed milk	—	3	3
Confectionery	13	3	16
Cream	24	2	26
Dried fruits	7	4	11
Eggs	139	280	419
Flavoring extracts	5	2	7
Grape juice	3	12	15
Ice cream	6	—	6
Maple sugar	8	1	9
Maple syrup	1	—	1
Meat and meat products:			
Bacon	—	2	2
Beef	2	—	2
Sausages	458	82	540
Miscellaneous	105	7	112
Nuts	1	1	2
Oleomargarine	8	—	8
Olive oil	142	86	228
Scallops	—	1	1
Shrimp	1	1	2
Soft drinks	220	66	286
Spices	8	—	8
Vinegar	346	94	440
Totals	1,779	781	2,560

TABLE NO. 4. — *Summary of Drug Samples examined.*

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Blue ointment	25	4	29
Camphorated oil	38	1	39
Hydrogen dioxide solution	14	—	14
Lime water	113	23	136
Lithia tablets	2	—	2
Liquor	4	—	4
Miscellaneous	33	1	34
Olive oil	9	—	9
Precipitated sulphur	25	4	29
Proprietary drugs	1	—	1
Solution of magnesium citrate	27	8	35
Spirits of camphor	27	1	28
Spirits of nitrous ether	114	93	207
Spirits of peppermint	1	1	2
Tincture of iodine	7	—	7
Zinc oxide ointment	37	2	39
Totals	477	138	615

TABLE NO. 5. — *Summary of Liquor Samples examined.*

	Beer.	Cider.	Wines.	Dis- tilled Liquors.	Flavor- ing Ex- tracts.	Alcohol.	Miscel- laneous.	Total.
Abington	—	—	—	6	—	3	1	10
Ayer	—	3	5	27	—	27	7	69
Berlin	—	8	2	—	—	—	—	10
BEVERLY	—	1	7	4	—	—	—	12
BOSTON	51	5	76	1,372	105	100	114	1,823
Brookline	11	2	3	19	—	—	10	45
CAMBRIDGE	65	9	32	137	19	11	63	336
CHELSEA	—	—	1	69	11	1	4	86
Dedham	—	—	7	6	—	1	—	14
EVERETT	—	—	2	8	—	2	—	12
FALL RIVER	13	6	2	112	5	2	15	155
FITCHBURG	—	3	16	8	4	1	6	38
GLOUCESTER	—	11	1	10	—	1	7	30
Hudson	4	1	1	8	1	2	5	22

TABLE NO. 5. — *Summary of Liquor Samples examined* — Concluded.

	Beer.	Cider.	Wines.	Dis- tilled Liquors.	Flavor- ing Ex- tracts.	Alcohol.	Miscel- laneous.	Total.
Ipswich	2	—	—	10	1	—	—	13
LAWRENCE	63	9	1	35	—	3	11	122
LOWELL	5	1	4	53	3	15	2	83
LYNN	10	—	13	52	9	2	3	89
MALDEN	—	—	2	26	—	—	1	29
MARLBOROUGH	48	10	22	28	—	—	5	113
Milford	5	—	1	4	—	—	1	11
NEWTON	—	—	—	16	1	1	—	18
NORTH ADAMS	—	10	—	1	—	—	9	20
Orange	—	10	—	—	—	—	—	10
PEABODY	1	—	2	7	1	—	1	12
QUINCY	—	—	—	11	2	1	—	14
REVERE	2	1	1	29	2	—	—	35
Rowley	2	4	4	1	—	—	—	11
Shrewsbury	4	—	—	6	—	—	—	10
SOMERVILLE	—	—	4	27	1	—	2	34
Southbridge	6	—	1	7	1	—	1	16
SPRINGFIELD	8	2	1	78	10	35	—	134
Stow	2	—	6	8	—	—	2	18
TAUNTON	5	—	—	19	—	—	1	25
Townsend	—	—	—	11	—	—	1	12
Wakefield	—	—	—	10	3	—	1	14
Westford	6	—	3	4	6	—	2	21
Winchendon	1	6	5	—	—	—	—	12
Woburn	—	—	—	9	—	1	—	10
Miscellaneous ¹	42	42	33	121	15	11	19	283
Totals	356	144	258	2,356	202	221	294	3,831

¹ From 87 cities and towns submitting less than 10 samples during the year.

TABLE No. 6. — *Articles, other than Fish, placed in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921.*

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscella- neous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscella- neous Meats (Pounds).
December	691,502	346,290	236,144	145,114	1,549,277	1,007,161	813,149	376,206	1,680,160	3,673,379	1,524,231	4,248,938
January	779,893½	186,450	180,738	52,888	683,627	335,542	101,596	224,652	667,464	5,426,527	1,177,124	3,957,696
February	867,718	74,520	176,430	49,902	280,376½	139,704	127,375	260,197	1,666,169	3,528,888	48,664	3,334,406
March	1,145,902	2,652,000	327,041	34,012	131,169½	158,163	169,760	197,277	824,013	2,325,959	189,115	2,320,887
April	355,939	7,833,270	299,526	36,690	196,535	87,637	70,358	117,585	897,841	1,208,699	133,448	1,866,637
May	1,971,153	5,884,920	447,191	48,166	104,226	97,152	66,889	155,492	1,758,838	1,648,924	148,335	2,258,465
June	7,444,761	2,203,620	371,071	40,719	151,637	176,760	48,710	332,570	1,038,316	3,089,187	339,073	3,056,677
July	5,705,611	1,280,160	371,986	20,325	56,480	87,056	55,753	136,302	1,591,978	3,210,395	169,414	2,636,069
August	5,230,023	1,195,260	393,586	135,223	63,057	117,661	21,281	83,808	1,214,420	2,762,502	88,923	2,751,041
September	3,974,366	794,790	288,516	282,989½	221,997	126,024	32,040	121,480	532,355	1,707,231	102,708	2,052,682
October	2,476,929	498,330	237,094	128,886	381,018	73,261	62,381	228,516	1,330,422	1,247,933	297,072	2,162,758
November	1,547,933	539,700	234,890	106,048	792,802	249,962	251,589½	530,047	1,305,384	526,033	176,848	2,384,442

TABLE No. 7. — Fish placed in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921.

	Bluesh (Pounds).	Butterfish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pol- lock and Had- dock (Pounds).	Hallbut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall Salmon (Pounds).	Silver Salmon (Pounds).	Salmon (Sockeye, Chinook, Steel- head Trout, etc.) (Pounds).	Shad (Pounds).	Smelts, Eulachon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).
December	.	33,005	25,235	118,581	311,840	325,448	154,788	68,560	21,240	39,700	-	12,909	101,941	21,222	36,762
January	.	160	48,090	60,859	310,797	238,560	74,659	55,940	35,513	47,198	165	85,771	115,240	8,575	17,194
February	.	426	65	58,357	145,810	216,100	145,619	7,070	8,180	19,487	825	56,760	142,710	-	17,128
March	.	-	141,032	91,291	80,277	311,840	29,139	32,939	210	9,145	11,424	13,409	121,295	125	12,138
April	.	1,821	105	35,135	33,297	421,069	16,058	24,775	408	15,912	-	2,599	472,952	77	2,614
May	.	333	120	38,531	109,882	560,017	590,101	1,575	10,170	21,062	1,700	-	1,409,019	-	333,880
June	.	-	5,300	72,608	164,503	823,401	72,858	2,873	14,495	84,090	3,025	-	178,883	4,861	1,922,055
July	.	8,095	9,500	62,148	88,078	480,446	183,713	1,227	25,365	31,762	16,090	-	192,487	12,365	660,715
August	.	7,052	-	41,391	168,753	170,640	40,259	-	22,596	44,209	28,400	-	52,649	8,590	462,355
September	.	12,997	109,181	579,020	518,255	3,288,608	941,286	19,523	90,631	230,051	49,149	16,890	2,655,632	39,102	4,830,750
October	.	12,188	128,143	777,875	1,085,120	3,612,231	1,012,186	30,401	167,502	266,668	61,399	17,900	2,618,237	47,607	4,953,463
November	.	9,579	164,448	922,857	1,389,075	2,995,505	957,558	30,871	191,396	311,534	36,899	50,765	2,350,740	54,024	4,695,284

TABLE No. 8. — *Articles, other than Fish, on Hand in Cold Storage on the First Day of the Month from Jan. 1, 1920, through Dec. 1, 1921.*

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscella- neous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscella- neous Meats (Pounds).
January	10,439,854	1,502,940	503,184	899,232	2,381,569	1,125,032	464,933	733,406	5,484,206	10,986,682	10,631,963	2,003,233
February	7,135,880	83,460	385,183	882,562	2,807,980	1,276,091	418,141	847,234	5,082,417	15,278,328	10,832,096 ¹ / ₂	3,006,432
March	4,962,403	7,170	310,899	851,167	2,643,094 ¹ / ₂	1,143,255	454,743	944,840	5,608,901	17,712,617	10,000,750 ¹ / ₂	3,650,721
April	3,154,998	2,556,630	351,302	769,852	2,027,110	679,670	546,626	774,513	5,061,781	17,631,864	6,263,110 ¹ / ₂	3,554,806
May	1,006,544	10,070,580	394,751	674,330	1,505,677	320,693	559,355	666,565	4,815,233	16,088,637	2,011,741 ¹ / ₂	2,958,771
June	2,188,522	15,656,070	496,052	511,500	948,957	169,341	569,475	531,781	4,964,942	15,623,972	1,495,674	2,831,500
July	8,283,527	16,997,340	491,014	403,254	552,674	205,831	488,499	622,439	4,612,195 ¹ / ₂	16,157,864	1,305,262	3,220,140
August	11,668,807	16,461,210	591,890	223,622	134,198 ¹ / ₂	143,530	423,085	497,101	5,038,414	16,813,625	998,495	2,885,221
September	13,887,219	15,352,140	689,211	180,607	72,590	80,956	240,224	302,387	4,299,020	13,605,683	826,662	2,424,200
October	14,834,325	13,140,765	692,360	441,905	154,881	82,069	177,996	327,445	3,795,012	10,699,940	807,126	1,674,460
November	14,221,288	9,946,170	619,486	516,926	453,423	75,728	176,574	502,516	4,216,824	8,548,309	976,085	1,263,969
December	12,003,215	6,101,850	602,192	582,313	1,172,711	271,230	250,867 ³ / ₄	934,931	4,724,879	8,297,448	1,057,332	1,439,620

TABLE No. 9. — Fish on Hand in Cold Storage on the Fifteenth Day of the Month from Jan. 15, 1920, through Dec. 15, 1921.

	Bluefish (Pounds).	Butterfish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock (Pounds).	Halibut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall Salmon (Pounds).	Silver Salmon (Pounds).	Salmon (Sockeye, Chinook, Steelhead Trout, etc.) (Pounds).	Shad (Pounds).	Smelts, Eulachon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).
January	45,911	160,135	158,668	1,426,835	414,918	1,095,147	926,284	166,541	64,328	132,274	27,907	8,589	1,428,924	20,697	4,403,627
February	5,263	94,749	123,860	1,111,586	482,973	864,598	583,110	138,799	63,311	105,955	20,555	64,043	1,258,514	22,115	3,124,366
March	5,414	42,530	102,373	951,173	452,275	849,070	445,397	87,498	38,626	59,786	401	85,109	911,410	-	2,175,781
April	4,880	15,540	153,720	612,447	342,406	559,055	227,850	47,737	14,886	6,539	825	19,136	738,909	125	2,137,417
May	2,621	12,927	113,469	429,856	314,622	419,814	140,857	30,814	11,289	10,163	495	16,243	1,162,900	-	1,692,635
June	2,181	12,797	108,791	377,107	342,740	660,173	705,011	19,266	17,311	21,055	1,700	-	2,534,597	-	1,410,030
July	1,314	20,809	104,668	490,160	401,141	1,218,167	711,705	16,333	27,065	75,459	4,725	15,856	2,801,543	4,829	3,573,942
August	8,092	43,887	111,003	518,916	447,735	1,417,913	791,494	15,317	36,094	87,510	20,815	15,835	2,273,885	15,091	3,510,851
September	12,510	137,180	108,688	549,969	498,997	1,292,842	774,705	14,503	43,629	115,547	49,149	15,835	2,642,095	18,782	4,628,287
October	12,188	217,177	104,613	556,567	464,620	2,801,339	758,477	17,384	86,428	210,498	49,149	16,227	2,548,605	34,807	4,562,497
November	9,579	244,757	123,668	733,846	930,193	2,819,389	816,453	29,658	159,178	281,528	36,899	15,460	2,332,201	33,977	4,632,339
December	6,688	206,918	160,449	842,018	1,281,273	2,121,613	723,017	21,098	116,224	250,035	36,587	34,628	1,715,318	41,324	3,851,181

Summary.

Requests for extension of time granted	236
Eggs	4
Butter	99
Poultry	2
Game	4
Meat	41
Fish	86
Requests for extension of time not granted	102
Butter	59
Poultry	1
Game	1
Meat	31
Fish	10
Requests for permission to remove granted	1
Meat	1
Articles ordered removed from storage (no requests made)	139
Eggs	6
Butter	11
Poultry	15
Game	11
Meat	46
Fish	50

TABLE NO. 10. — *Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921.*

[Reason for such extension being that goods were in proper condition for further storage.]

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Eggs, frozen	1,140	Aug. 2, 1920	Jan. 1, 1922	Armour & Co.
Egg whites	190	Jan. 8, 1920	Oct. 8, 1921	Bigelow, H. J.
Egg whites	13,024	Aug., 1920	Dec. 1, 1921	Layton, John, Company.
Egg yolks	13,376	Aug., 1920	Dec. 1, 1921	Layton, John, Company.
Butter	1,200	June 16, 1920	Sept. 16, 1921	Boyle, D. A., & Co.
Butter	2,666	July 16, 1920	Oct. 16, 1921	Farnsworth, Benjamin & Mills.
Butter	17,200	Aug. 12, 1920	Sept. 30, 1921	Farnsworth, Benjamin & Mills.
Butter	480	June 16, 1920	Sept. 16, 1921	Goldsmith-Stockwell Company.
Butter	960	June 17, 1920	Sept. 16, 1921	Goldsmith-Stockwell Company.

TABLE NO. 10. — *Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Butter	1,320	June 20, 1920	Sept. 22, 1921	Goldsmith-Stockwell Company.
Butter	600	June 21, 1920	Sept. 21, 1921	Goldsmith-Stockwell Company.
Butter	1,170	July 1, 1920	Oct. 1, 1921	Goldsmith-Stockwell Company.
Butter	1,200	July 1, 1920	Aug. 1, 1921	Goldsmith-Stockwell Company.
Butter	480	July 9, 1920	Oct. 7, 1921	Goldsmith-Stockwell Company.
Butter	1,740	July 14, 1920	Oct. 14, 1921	Goldsmith-Stockwell Company.
Butter	2,100	July 14, 1920	Oct. 14, 1921	Goldsmith-Stockwell Company.
Butter	2,640	July 14, 1920	Oct. 14, 1921	Goldsmith-Stockwell Company.
Butter	3,780	July 28, 1920	Oct. 28, 1921	Goldsmith-Stockwell Company.
Butter	3,240	July 29, 1920	Oct. 29, 1921	Goldsmith-Stockwell Company.
Butter	2,268	July 30, 1920	Oct. 30, 1921	Goldsmith-Stockwell Company.
Butter	3,100	July 30, 1920	Oct. 30, 1921	Goldsmith-Stockwell Company.
Butter	480	Sept. 18, 1920	Dec. 18, 1921	Goldsmith-Stockwell Company.
Butter	945	Sept. 23, 1920	Dec. 23, 1921	Goldsmith-Stockwell Company.
Butter	660	Oct. 25, 1920	Jan. 1, 1922	Goldsmith-Stockwell Company.
Butter	1,320	Nov. 1, 1920	Jan. 1, 1922	Goldsmith-Stockwell Company.
Butter	248	July 2, 1920	Oct. 2, 1921	Haire, William J., Company.
Butter	186	July 2, 1920	Jan. 2, 1922	Haire, William J., Company.
Butter	18,476	July 15, 1920	Jan. 15, 1922	Haire, William J., Company.
Butter	1,046	June 5, 1920	Sept. 5, 1921	Lamson & Co.
Butter	21,210	Apr. 25, 1920	Nov. 26, 1921	Lewis, Mears Company.
Butter	4,640	May 3, 1920	Dec. 5, 1921	Lewis, Mears Company.
Butter	1,281	May 3, 1920	Dec. 5, 1921	Lewis, Mears Company.
Butter	3,155	May 4, 1920	Dec. 5, 1921	Lewis, Mears Company.
Butter	21,290	May 26, 1920	Aug. 26, 1921	Lewis, Mears Company.
Butter	1,281	June 4, 1920	Sept. 4, 1921	Lewis, Mears Company.
Butter	4,640	June 4, 1920	Sept. 4, 1921	Lewis, Mears Company.
Butter	3,155	June 5, 1920	Sept. 5, 1921	Lewis, Mears Company.
Butter	18,538	July 7, 1920	Jan. 7, 1922	Lewis, Mears Company.
Butter	2,100	July 8, 1920	Jan. 8, 1922	Lewis, Mears Company.
Butter	8,722	July 10, 1920	Oct. 10, 1921	Lewis, Mears Company.
Butter	3,000	July 12, 1920	Jan. 12, 1922	Lewis, Mears Company.
Butter	775	June 14, 1920	Sept. 14, 1921	Lewis, Mears Company.
Butter	17,504	June 14, 1920	Sept. 14, 1921	Lewis, Mears Company.
Butter	1,770	July 15, 1920	Jan. 12, 1922	Lewis, Mears Company.
Butter	1,234	July 17, 1920	Jan. 19, 1922	Lewis, Mears Company.

TABLE NO. 10. — *Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921* — Continued.

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Butter	1,230	July 19, 1920	Jan. 19, 1922	Lewis, Mears Company.
Butter	3,000	July 19, 1920	Oct. 19, 1921	Lewis, Mears Company.
Butter	5,612	July 20, 1920	Jan. 20, 1922	Lewis, Mears Company.
Butter	3,024	July 24, 1920	Oct. 24, 1921	Lewis, Mears Company.
Butter	1,648	July 30, 1920	Jan. 30, 1922	Lewis, Mears Company.
Butter	2,245	July 30, 1920	Jan. 30, 1922	Lewis, Mears Company.
Butter	3,960	Aug. 2, 1920	Feb. 2, 1922	Lewis, Mears Company.
Butter	1,950	Aug. 5, 1920	Feb. 5, 1922	Lewis, Mears Company.
Butter	958	Aug. 6, 1920	Nov. 6, 1921	Lewis, Mears Company.
Butter	1,111	Aug. 6, 1920	Nov. 6, 1921	Lewis, Mears Company.
Butter	1,286	Aug. 6, 1920	Nov. 6, 1921	Lewis, Mears Company.
Butter	1,335	Aug. 6, 1920	Nov. 6, 1921	Lewis, Mears Company.
Butter	6,146	Aug. 6, 1920	Nov. 6, 1921	Lewis, Mears Company.
Butter	7,035	Aug. 6, 1920	Nov. 6, 1921	Lewis, Mears Company.
Butter	1,680	Aug. 17, 1920	Nov. 17, 1921	Lewis, Mears Company.
Butter	10,354	Aug. 19, 1920	Sept. 19, 1921	Lewis, Mears Company.
Butter	4,164	Aug. 27, 1920	Nov. 27, 1921	Lewis, Mears Company.
Butter	2,850	Aug. 30, 1920	Nov. 30, 1921	Lewis, Mears Company.
Butter	816	Sept. 1, 1920	Dec. 1, 1921	Lewis, Mears Company.
Butter	1,282	Oct. 6, 1920	Jan. 5, 1921	Lewis, Mears Company.
Butter	1,320	June 19, 1920	Jan. 1, 1922	St. John's Preparatory School.
Butter	2,867	June 4, 1920	Dec. 4, 1921	Slayton & Boynton.
Butter	3,850	June 9, 1920	Sept. 9, 1921	Slayton & Boynton.
Butter	9,900	June 12, 1920	Dec. 12, 1921	Slayton & Boynton.
Butter	14,213	June 28, 1920	Sept. 28, 1921	Slayton & Boynton.
Butter	4,500	July 2, 1920	Oct. 2, 1921	Slayton & Boynton.
Butter	17,019	July 6, 1920	Jan. 6, 1922	Slayton & Boynton.
Butter	2,180	July 7, 1920	Sept. 7, 1921	Slayton & Boynton.
Butter	4,514	July 15, 1920	Sept. 15, 1921	Slayton & Boynton.
Butter	4,575	July 15, 1920	Sept. 15, 1921	Slayton & Boynton.
Butter	13,969	July 15, 1920	Jan. 15, 1922	Slayton & Boynton.
Butter	3,024	July 22, 1920	Oct. 22, 1921	Slayton & Boynton.
Butter	7,440	July 22, 1920	Oct. 22, 1921	Slayton & Boynton.
Butter	5,455	July 24, 1920	Jan. 24, 1922	Slayton & Boynton.
Butter	6,820	July 24, 1920	Jan. 24, 1922	Slayton & Boynton.
Butter	12,810	July 28, 1920	Jan. 28, 1922	Slayton & Boynton.

TABLE No. 10.—*Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921*—Continued.

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to—	Name.
Butter	13,330	July 28, 1920	Oct. 28, 1921	Slayton & Boynton.
Butter	4,650	July 29, 1920	Oct. 29, 1921	Slayton & Boynton.
Butter	5,922	July 29, 1920	Jan. 29, 1922	Slayton & Boynton.
Butter	7,200	Aug. 2, 1920	Feb. 2, 1922	Slayton & Boynton.
Butter	9,858	Aug. 2, 1920	Nov. 2, 1921	Slayton & Boynton.
Butter	6,820	Aug. 10, 1920	Nov. 10, 1921	Slayton & Boynton.
Butter	6,867	Aug. 10, 1920	Feb. 10, 1922	Slayton & Boynton.
Butter	7,440	Aug. 11, 1920	Nov. 11, 1921	Slayton & Boynton.
Butter	15,958	Aug. 12, 1920	Feb. 12, 1922	Slayton & Boynton.
Butter	5,000	Aug. 16, 1920	Feb. 16, 1922	Slayton & Boynton.
Butter	5,980	Aug. 20, 1920	Feb. 20, 1922	Slayton & Boynton.
Butter	11,594	Aug. 24, 1920	Feb. 24, 1922	Slayton & Boynton.
Butter	620	Aug. 26, 1920	Nov. 26, 1921	Slayton & Boynton.
Butter	1,456	Aug. 26, 1920	Feb. 26, 1922	Slayton & Boynton.
Butter	2,961	Aug. 31, 1920	Nov. 31, 1921	Slayton & Boynton.
Butter	620	Sept. 7, 1920	Dec. 7, 1921	Slayton & Boynton.
Butter	3,720	Sept. 7, 1920	Mar. 7, 1922	Slayton & Boynton.
Butter	6,760	Sept. 21, 1920	Feb. 21, 1922	Slayton & Boynton.
Butter	2,496	Sept. 22, 1920	Mar. 23, 1922	Slayton & Boynton.
Butter	7,740	Sept. 27, 1920	Mar. 27, 1922	Slayton & Boynton.
Butter	2,898	July 26, 1920	Oct. 15, 1921	Winer, M., Company.
Butter	40	July 1, 1920	Nov. 22, 1921	Worthern, G. V.
Broilers	984	June 29, 1920	July 29, 1921	Eastman, Frank B.
Broilers	820	Aug. 12, 1920	Sept. 12, 1921	Eastman, Frank B.
Venison	60	Dec. 7, 1920	Feb. 1, 1922	Hills, Edmund E.
Venison	92	Oct. 8, 1920	Jan. 8, 1922	Keating, J. J.
Venison	10	Nov. 19, 1919	Jan. 31, 1922	Smith, Stedman.
Reindeer	16,779	Oct. 25, 1920	Jan. 25, 1922	Batchelder & Snyder Company.
Beef	9,734	Dec. 2, 1919	Feb. 6, 1921	Morris & Co.
Beef	36,364	Dec. 5, 1919	Feb. 6, 1921	Morris & Co.
Beef	1,920	Apr. 6, 1920	June 4, 1921	Swift & Co.
Beef	10,200	May 6, 1920	July 1, 1921	Swift & Co.
Beef	5,600	June 1, 1920	Aug. 1, 1921	Swift & Co.
Beef	7,000	July 1, 1920	Sept. 1, 1921	Swift & Co.
Beef	2,500	Aug. 21, 1920	Oct. 21, 1921	Swift & Co.
Beef	3,100	Nov. 26, 1920	Dec. 26, 1921	Swift & Co.

TABLE NO. 10.—*Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921*—Continued.

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to—	Name.
Beef	6,135	July 20, 1920	Oct. 20, 1921	Dorr, Arthur E., & Co., Inc.
Beef shoulder clods ¹	-	Sept. 10, 1920	Jan. 15, 1922	Handy, H. L., Company.
Lamb	590	Nov. 20, 1920	Jan. 20, 1922	Dorr, Arthur E., & Co., Inc.
Lamb	-	-	May 22, 1921	Hudner Markets.
Lamb	24,500	Oct. 20, 1920	Jan. 15, 1922	Freund, Simon.
Lamb fores	1,454	Nov. 1, 1920	Feb. 1, 1922	Dorr, Arthur E., & Co., Inc.
Lamb fores	885	June 8, 1920	July 8, 1921	Whitecomb, Frank S.
Mutton	20,000	Aug. 3, 1920	Dec. 1, 1921	Harris Abbatoir Co.
Mutton	3,538	July 14, 1920	Sept. 14, 1921	Dorr, Arthur E., & Co., Inc.
Mutton	5,628	Aug. 18, 1920	Oct. 18, 1921	Dorr, Arthur E., & Co., Inc.
Mutton	630	Nov. 30, 1920	Jan. 30, 1922	Dorr, Arthur E., & Co., Inc.
Mutton	2,222	Nov. 30, 1920	Jan. 30, 1922	Dorr, Arthur E., & Co., Inc.
Ox tails	3,000	Aug. 18, 1920	Oct. 1, 1921	Swift & Co.
Ox tails	2,000	Sept., 1920	Nov. 1, 1921	Swift & Co.
Pork	97	Mar. 25, 1920	May 25, 1921	Farnsworth, R. S.
Pork	83,212	Jan. 7, 1920	Mar. 7, 1921	North Packing and Provision Company.
Pork	83,539	Jan. 8, 1920	Mar. 8, 1921	North Packing and Provision Company.
Pork	82,518	Jan. 10, 1920	Mar. 10, 1921	North Packing and Provision Company.
Pork	83,916	Jan. 14, 1920	Mar. 14, 1921	North Packing and Provision Company.
Pork	36,488	Jan. 19, 1920	Mar. 19, 1921	North Packing and Provision Company.
Pork	63,333	Jan. 21, 1920	Mar. 21, 1921	North Packing and Provision Company.
Pork	159,899	Feb. 10, 1920	Apr. 10, 1921	North Packing and Provision Company.
Pork	49,869	Feb. 5, 1920	Apr. 5, 1921	Squire, J. P., & Co.
Pork	125,183	Feb. 6, 1920	Apr. 6, 1921	Squire, J. P., & Co.
Pork	85,855	Feb. 7, 1920	Apr. 7, 1921	Squire, J. P., & Co.
Pork	1,130	May 13, 1920	Oct. 1, 1921	State Industrial School for Girls.
Pork	592	May 14, 1920	Oct. 1, 1921	State Industrial School for Girls.
Pork butts	12,051	Dec., 1919	Dec. 1, 1921	Weeeler, T. H., Company.
Pork butts	12,629	Dec., 1919	Dec. 1, 1921	Wheeler, T. H., Company.
Pork butts	13,327	Dec., 1919	Dec. 1, 1921	Wheeler, T. H., Company.
Pork butts	17,501	Dec., 1919	Dec. 1, 1921	Wheeler, T. H., Company.
Pork trimmings	26,401	June 18, 1920	Aug. 29, 1921	Batchelder & Snyder Company.
Veal	1,260	Nov. 20, 1920	Jan. 20, 1922	Dorr, Arthur E., & Co., Inc.
Butterfish	1,870	Oct. 20, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Butterfish	2,200	Oct. 27, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Butterfish	3,300	Nov. 23, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.

¹ Part of a lot only; weight unknown.

TABLE NO. 10. — *Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921* — Continued.

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Cod	10,500	Jan. 15, 1920	Mar. 15, 1921	Furness, J. C., Company.
Cod	2,200	May 5, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	4,176	May 7, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	3,257	May 13, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	2,095	May 14, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	4,718	May 17, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	5,093	May 17, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	925	May 19, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	3,035	May 19, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	6,191	May 22, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	1,925	June 4, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	4,780	June 12, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	4,494	July 15, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	1,882	June 16, 1920	Jan. 1, 1922	Hunt, Cassius, & Co.
Cod	5,525	Oct. 21, 1920	Jan. 21, 1922	Hunt, Cassius, & Co.
Cod	5,019	Oct. 30, 1920	Feb. 28, 1922	Interstate Fish Corporation.
Haddock	5,000	Aug. 26, 1920	Nov. 15, 1921	Batchelder & Snyder Company.
Haddock	2,225	Aug. 27, 1920	Nov. 15, 1921	Batchelder & Snyder Company.
Herring	3,200	Dec. 16, 1919	Feb. 16, 1921	Mantia, G.
Herring	33,000	Jan. 12, 1920	Mar. 12, 1921	Mantia, J.
Herring ¹	36,800	Dec. 20, 1920	Jan. 20, 1921	O'Hara Brothers.
Herring	15,200	Jan. 12, 1920	Mar. 12, 1921	Russo & Sons.
Herring	2,400	Aug. 5, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Herring ¹	600	Aug. 6, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Herring ¹	400	Aug. 7, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Herring ¹	800	Aug. 9, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Herring ¹	3,400	Aug. 11, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Herring ¹	2,400	Aug. 13, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Herring, sardine	4,849	Dec. 9, 1919	Feb. 9, 1921	Commonwealth Ice and Cold Storage Company.
Herring, sardine ¹	12,000	Jan. 12, 1920	June 12, 1921	Mantia, G., & Sons.
Mackerel	1,400	July 3, 1920	Aug. 3, 1921	Atlantic and Pacific Fish Company.
Mackerel	4,595	June 26, 1920	Sept. 30, 1921	Batchelder & Snyder Company.
Mackerel	280	June 25, 1920	Aug. 1, 1921	Cann's Sea Grill.
Mackerel	2,408	June 26, 1920	Aug. 1, 1921	Cann's Sea Grill.
Mackerel	800	June 23, 1920	Aug. 1, 1921	Clouter, Jesse.

¹ To be used for bait.

TABLE NO. 10. — *Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921* — Continued.

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Mackerel . . .	1,792	June 15, 1920	Dec. 13, 1921	Commonwealth Ice and Cold Storage Company.
Mackerel . . .	500	June 12, 1920	Sept. 24, 1921	Flint Fish Company.
Mackerel . . .	650	June 30, 1920	Sept. 30, 1921	Ingalls, George M.
Mackerel . . .	1,310	July 3, 1920	Oct. 3, 1921	Ingalls, George M.
Mackerel . . .	555	July 15, 1920	Oct. 15, 1921	Ingalls, George M.
Mackerel . . .	900	July 26, 1920	Sept. 26, 1921	Poole, J. R., Company.
Mackerel . . .	2,500	July 26, 1920	Sept. 26, 1921	Poole, J. R., Company.
Mackerel . . .	14,000	July 26, 1920	Sept. 26, 1921	Poole, J. R., Company.
Mackerel . . .	269	July 8, 1920	Jan. 8, 1922	Rich, H. A.
Mackerel . . .	1,600	July 8, 1920	Jan. 8, 1922	Rich, H. A.
Pollock . . .	93,666	Oct. 20, 1920	Jan. 1, 1922	Colonial Cold Storage Company.
Pollock . . .	40,000	Oct. 19, 1920	Mar. 19, 1922	Consolidated Weir Company.
Pollock . . .	73,402	Oct. 15, 1920	Mar. 1, 1922	Interstate Fish Corporation.
Pollock . . .	66,500	Nov. 15, 1920	Feb. 15, 1922	Interstate Fish Corporation.
Pollock . . .	33,800	Mar. 11, 1920	May 11, 1921	Leach, Frank J., & Co.
Pollock . . .	1,430	Mar. 22, 1920	May 22, 1921	Leach, Frank J., & Co.
Pollock . . .	1,620	Mar. 22, 1920	May 22, 1921	Leach, Frank J., & Co.
Pollock . . .	3,600	Mar. 11, 1920	May 11, 1921	Prior & Mahoney Company.
Pollock . . .	10,125	Mar. 11, 1920	May 11, 1921	Prior & Mahoney Company.
Pollock . . .	2,143	July 29, 1920	Jan. 15, 1922	Quincy Market Cold Storage and Warehouse Company.
Pollock . . .	900	Aug. 18, 1920	Jan. 15, 1922	Quincy Market Cold Storage and Warehouse Company.
Pollock . . .	950	Sept. 7, 1920	Jan. 15, 1922	Quincy Market Cold Storage and Warehouse Company.
Pollock . . .	2,250	Sept. 10, 1920	Jan. 15, 1922	Quincy Market Cold Storage and Warehouse Company.
Pollock . . .	3,000	Sept. 11, 1920	Jan. 15, 1922	Quincy Market Cold Storage and Warehouse Company.
Pollock . . .	2,100	Sept. 27, 1920	Jan. 15, 1922	Quincy Market Cold Storage and Warehouse Company.
Pollock . . .	2,500	Sept. 27, 1920	Jan. 15, 1922	Quincy Market Cold Storage and Warehouse Company.
Pollock . . .	2,000	Sept. 29, 1920	Jan. 15, 1922	Quincy Market Cold Storage and Warehouse Company.
Salmon . . .	3,890	Feb. 13, 1920	Apr. 1, 1921	Batchelder & Snyder Company.
Scup . . .	19,685	July 2, 1920	Dec. 2, 1921	Busalacchi Brothers.
Squid ¹ . . .	160,000	Aug. 25, 1920	Jan. 1, 1922	Cape Fish Products Company, Inc.
Squid . . .	200,000	Aug. 1, 1920	Apr. 17, 1922	Consolidated Weir Company.
Squid . . .	291,600	Sept. 1, 1920	Apr. 1, 1922	North Truro Cold Storage Company.
Squid . . .	7,800	Aug. 25, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Squid . . .	8,200	Aug. 28, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Squid . . .	3,600	Aug. 30, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.

¹ To be used for bait.

TABLE NO. 10. — *Requests for Extension of Time granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Swordfish	600	Aug. 6, 1920	Sept. 1, 1921	Cann's Sea Grill.
Whiting	300,000	Nov., 1920	Feb. 28, 1922	Cape Cod Cold Storage Com- pany.
Whiting	50,000	Nov., 1919	Feb. 1, 1921	Consolidated Weir Company.
Whiting	400,000	Aug., 1920	Jan. 31, 1921	Consolidated Weir Company.
Whiting	425,814	June 15, 1920	Dec. 15, 1921	Interstate Fish Corporation.
Whiting	1,300	Nov., 1919	Feb. 1, 1921	Mantia Brothers.
Whiting	1,950	Nov., 1919	Feb. 1, 1921	Mantia Brothers.
Whiting	5,000	Aug. 9, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Whiting	5,600	Aug. 5, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Whiting	7,200	Aug. 6, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Whiting	6,000	Aug. 7, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Whiting	8,000	Aug. 11, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.
Whiting	17,800	Aug. 13, 1920	Jan. 31, 1922	Sesuit Fish Freezing Company.

TABLE NO. 11. — *Requests for Extension of Time not granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Butter	1,037	June 8, 1920	Alpine Chocolate Company.
Butter	20,140	June 23, 1920	Boston Ice Cream Company.
Butter	2,304	June 10, 1920	Covitz, M., & Son.
Butter	11,340	July 10, 1920	Covitz, M., & Son.
Butter	610	June 16, 1920	Fowle, Hibbard & Co.
Butter	120	June 1, 1920	Goldsmith-Stockwell Company.
Butter	330	June 2, 1920	Goldsmith-Stockwell Company.
Butter	1,500	June 3, 1920	Goldsmith-Stockwell Company.
Butter	1,620	June 3, 1920	Goldsmith-Stockwell Company.
Butter	720	July 1, 1920	Goldsmith-Stockwell Company.
Butter	360	July 7, 1920	Goldsmith-Stockwell Company.
Butter	1,488	July 9, 1920	Goldsmith-Stockwell Company.
Butter	600	July 10, 1920	Goldsmith-Stockwell Company.
Butter	1,080	July 14, 1920	Goldsmith-Stockwell Company.
Butter	600	July 18, 1920	Goldsmith-Stockwell Company.

TABLE NO. 11. — *Requests for Extension of Time not granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Butter	3,087	July 18, 1920	Goldsmith-Stockwell Company.
Butter	1,200	July 19, 1920	Goldsmith-Stockwell Company.
Butter	2,898	Aug. 8, 1920	Goldsmith-Stockwell Company.
Butter	3,000	Aug. 8, 1920	Goldsmith-Stockwell Company.
Butter	300	Aug. 19, 1920	Goldsmith-Stockwell Company.
Butter	240	Aug. 25, 1920	Goldsmith-Stockwell Company.
Butter	1,323	Oct. 11, 1920	Goldsmith-Stockwell Company.
Butter	1,124	Oct. 17, 1920	Goldsmith-Stockwell Company.
Butter	693	Nov. 1, 1920	Goldsmith-Stockwell Company.
Butter	3,224	Sept. 30, 1920	Haire, William J., Company.
Butter	5,766	Oct. 6, 1920	Haire, William J., Company.
Butter	2,274	July 10, 1920	Lewis, Mears Company.
Butter	450	June 8, 1920	Samoset Chocolate Company.
Butter	4,800	June 10, 1920	Slayton & Boynton.
Butter	6,741	June 14, 1920	Slayton & Boynton.
Butter	17,400	June 15, 1920	Slayton & Boynton.
Butter	5,246	July 2, 1920	Slayton & Boynton.
Butter	5,340	July 7, 1920	Slayton & Boynton.
Butter	610	July 10, 1920	Slayton & Boynton.
Butter	6,060	July 10, 1920	Slayton & Boynton.
Butter	3,840	July 15, 1920	Slayton & Boynton.
Butter	8,160	July 15, 1920	Slayton & Boynton.
Butter	12,852	July 23, 1920	Slayton & Boynton.
Butter	11,403	July 28, 1920	Slayton & Boynton.
Butter	2,016	Aug. 11, 1920	Slayton & Boynton.
Butter	10,206	Aug. 12, 1920	Slayton & Boynton.
Butter	10,395	Aug. 18, 1920	Slayton & Boynton.
Butter	11,718	Aug. 18, 1920	Slayton & Boynton.
Butter	1,612	Aug. 20, 1920	Slayton & Boynton.
Butter	7,623	Aug. 20, 1920	Slayton & Boynton.
Butter	600	Aug. 24, 1920	Slayton & Boynton.
Butter	7,421	Aug. 24, 1920	Slayton & Boynton.
Butter	6,100	Aug. 26, 1920	Slayton & Boynton.
Butter	840	Aug. 31, 1920	Slayton & Boynton.
Butter	9,639	Sept. 4, 1920	Slayton & Boynton.
Butter	5,040	Sept. 7, 1920	Slayton & Boynton.

TABLE NO. 11. — *Requests for Extension of Time not granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Butter	840	Sept. 15, 1920	Slayton & Boynton.
Butter	3,360	Sept. 15, 1920	Slayton & Boynton.
Butter	3,780	Sept. 16, 1920	Slayton & Boynton.
Butter	5,940	Sept. 22, 1920	Slayton & Boynton.
Butter	8,700	Sept. 23, 1920	Slayton & Boynton.
Butter	12,960	Oct. 5, 1920	Slayton & Boynton.
Butter	11,780	July 30, 1920	Weiner, M.
Butter	1,000	June 19, 1920	Westwood Farm Milk Company.
Chickens	60	Dec. 18, 1921	Stevens, Genery, Company.
Pigeons	1,530	Oct. 12, 1919	Borst, Pierce Company.
Beef	5,845	Oct. 2, 1920	Armour & Co.
Beef	75	Jan. 24, 1921	Stevens, Genery, Company.
Beef	125	Jan. 29, 1921	Stevens, Genery, Company.
Beef	68	Feb. 25, 1921	Stevens, Genery, Company.
Beef	133	Apr. 12, 1921	Stevens, Genery, Company.
Beef	1,858	May 20, 1920	Sears, Alfred, Company.
Beef	1,982	May 20, 1920	Sears, Alfred, Company.
Beef	2,862	May 20, 1920	Sears, Alfred, Company.
Beef	22,648	Nov. 6, 1919	Wilson & Co.
Beef	27,129	Nov. 6, 1919	Wilson & Co.
Beef	27,437	Nov. 6, 1919	Wilson & Co.
Beef	30,876	Nov. 8, 1919	Wilson & Co.
Beef	21,110	Nov. 13, 1919	Wilson & Co.
Beef	21,310	Nov. 13, 1919	Wilson & Co.
Beef	21,797	Nov. 13, 1919	Wilson & Co.
Beef	23,227	Nov. 13, 1919	Wilson & Co.
Beef	29,118	Nov. 13, 1919	Wilson & Co.
Beef	31,066	Nov. 28, 1919	Wilson & Co.
Beef	28,426	Dec. 1, 1919	Wilson & Co.
Beef	30,364	Dec. 1, 1919	Wilson & Co.
Beef	27,637	Dec. 10, 1919	Wilson & Co.
Beef	31,393	Dec. 10, 1919	Wilson & Co.
Beef	16,926	Dec. 17, 1919	Wilson & Co.
Beef	32,112	Dec. 26, 1919	Wilson & Co.
Beef	32,427	Dec. 27, 1919	Wilson & Co.
Beef	21,544	Dec. 30, 1919	Wilson & Co.

TABLE NO. 11. — *Requests for Extension of Time not granted on Goods in Cold Storage from Dec. 1, 1920, to Dec. 1, 1921 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Beef	32,154	Dec. 30, 1919	Wilson & Co.
Lamb	691	Nov. 2, 1920	Dorr, Arthur E., & Co., Inc.
Lamb	75	Apr. 12, 1921	Stevens, Genery, Company.
Lamb fores	145	Dec. 24, 1921	Stevens, Genery, Company.
Lamb fores	3,000	Oct. 27, 1920	Nakashian, Charles.
Halibut	9,600	Nov. 27, 1920	Batchelder & Snyder Company.
Halibut	300	Sept. 11, 1920	Ocean Fish Company.
Mackerel	3,720	July 28, 1920	Atwood & Co.
Mackerel	325	Oct. 11, 1920	Poole, J. R., Company.
Mackerel	3,000	Oct. 11, 1920	Poole, J. R., Company.
Mackerel	3,600	Oct. 11, 1920	Poole, J. R., Company.
Mackerel	10,000	Oct. 11, 1920	Poole, J. R., Company.
Mackerel	347	Oct. 13, 1920	Poole, J. R., Company.
Salmon	2,650	July 23, 1920	Atlantic & Pacific Fish Company.
Whiting	399	June 12, 1919	Mantia, G.

TABLE NO. 12. — *Requests granted for Permission to remove Articles which had been in Cold Storage longer than Twelve Months from Dec. 1, 1920, to Dec. 1, 1921.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Beef	190	Jan. 20, 1919	Swift & Co.

TABLE NO. 13. — *Articles which had been in Cold Storage longer than Twelve Months, and on which No Requests for Extension had been made, ordered removed, from Dec. 1, 1920, to Dec. 1, 1921.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Eggs	2,610	Aug. 13, 1920	Alley, Green & Pipe.
Eggs (mixed)	60	May 17, 1919	Goldsmith-Stockwell Company.
Egg whites	60	June 25, 1919	Goldsmith-Stockwell Company.
Egg yolks	330	May 31, 1919	Goldsmith-Stockwell Company.
Egg yolks	60	June 3, 1919	Goldsmith-Stockwell Company.

TABLE NO. 13. — *Articles which had been in Cold Storage longer than Twelve Months, and on which No Requests for Extension had been made, ordered removed, from Dec. 1, 1920, to Dec. 1, 1921 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Egg yolks	20	July 2, 1919	Goldsmith-Stockwell Company.
Butter	110	July 8, 1920	Andrews, C. W.
Butter	200	Apr. 4, 1920	Eingold, Harold B.
Butter	30	June 25, 1920	Green & Co. '
Butter	30	July 7, 1920	Horan, G. F.
Butter	30	July 27, 1920	Horan, G. F.
Butter	660	July 9, 1920	Legg, G. M. D.
Butter	6,300	Aug. 18, 1920	Slayton & Boynton.
Butter	10,395	Aug. 18, 1920	Slayton & Boynton.
Butter	20	June 12, 1920	Smith, C. W., Company.
Butter	290	July 9, 1920	Stone, C. H.
Butter	11,867	July 12, 1920	Weiner, M., Company.
Broilers	165	Aug. 10, 1920	Cann's Sea Grill.
Broilers	1,764	May 10, 1920	Eastman, F. B.
Broilers	45	Sept. 15, 1920	Strong, Marson Company.
Broilers	77	Oct. 19, 1920	Strong, Marson Company.
Chickens	87	Oct. 11, 1920	Genoa Café.
Chickens	592	Oct. 11, 1920	Genoa Café.
Chickens	198	Oct. 26, 1920	Genoa Café.
Chickens	53	Oct. 21, 1920	Gordon, Walter.
Chickens	140	Oct. 26, 1920	Gordon, Walter.
Chickens	145	Sept. 23, 1920	King Joy Company.
Chickens, Guinea	135	Jan. 26, 1920	Hosmer, F. H.
Poultry	1,233	June 9, 1920	Dorr, Arthur E., & Co., Inc.
Gizzards	200	Sept. 28, 1920	Libby & Libby Company.
Gizzards	155	Oct. 14, 1920	Libby & Libby Company.
Turkey	10	Jan. 12, 1920	McDonald, F. W.
Duck	3	May 25, 1920	Shattuck, Dr.
Moose	19	Oct. 22, 1919	Chapin, Harry.
Pheasants	445	Nov. 18, 1920	Batchelder & Snyder Company.
Raccoon	8	Oct. 6, 1919	Beniman, W. H.
Venison	25	Oct. 28, 1920	Dunbar, P. W.
Venison	20	Oct. 20, 1919	Hoyt, C. L.
Venison	22	Oct. 20, 1919	Lasbury, J. F.
Venison	20	Jan. 12, 1920	McDonald, F. W.
Venison	20	Nov. 15, 1919	Richards, C. W.

TABLE NO. 13. — *Articles which had been in Cold Storage longer than Twelve Months, and on which No Requests for Extension had been made, ordered removed, from Dec. 1, 1920, to Dec. 1, 1921 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Venison	18	Dec. 19, 1919	Woodward, A. H.
Game (miscellaneous)	15	Nov. 15, 1919	Dolittle, Charles.
Beef	1,500	Jan. 26, 1920	Boston Beef Company.
Beef	773	Mar. 12, 1920	Brighton Dressed Meat Com- pany.
Beef	1,469	Apr. 2, 1920	Brighton Dressed Meat Com- pany.
Beef	1,394	May 15, 1920	Brighton Dressed Meat Com- pany.
Beef	2,578	Nov. 20, 1920	Brighton Dressed Meat Com- pany.
Beef	5,281	July 12, 1920	Libby & Libby Company.
Beef	3,136	Aug. 20, 1920	Libby & Libby Company.
Beef	2,100	Oct. 19, 1920	Lipsky, Louis.
Beef	1,160	Nov. 23, 1920	Lyman School for Boys.
Beef	1,299	Apr. 9, 1920	Mindick, M., Company.
Beef butts	325	Oct. 22, 1920	Strong, Marson Company.
Beef loins	45	Aug. 13, 1920	Hodder, W. W.
Beef loins	55	Aug. 24, 1920	Hodder, W. W.
Beef shanks	2,335	Aug. 22, 1920	Libby & Libby.
Beef trimmings	2,281	Aug. 19, 1920	Libby & Libby.
⁵ Calves' heads	15	Nov. 13, 1920	Strong, Marson Company.
Ox tails	100	July 23, 1920	Hodder, W. W.
Sweetbreads	122	Oct. 9, 1920	Dorr, Arthur E., & Co., Inc.
Sweetbreads	222	Oct. 23, 1920	Dorr, Arthur E., & Co., Inc.
Lamb	43	June 2, 1920	Burns Brothers.
Lamb	70	May 18, 1920	Burns Brothers.
Lamb	45	June 21, 1920	John, Peter.
Lamb	210	Oct. 5, 1920	John, Peter.
Lamb	180	July 31, 1920	Krantzman, Samuel.
Lamb	200	Aug. 31, 1920	Krantzman, Samuel.
Lamb	100	Aug. 17, 1920	Libby & Libby.
Lamb	1,465	Aug. 20, 1920	Libby & Libby.
Lamb	445	Aug. 24, 1920	Libby & Libby.
Lamb	85	Aug. 21, 1920	Stevens, C. F.
Lamb	150	Aug. 17, 1920	Thompson's Express.
Lamb	150	Oct. 28, 1920	Turco, George.
Lamb chops	66	Sept. 20, 1920	Brown, C. H.
Lamb fores	800	Aug. 13, 1920	State Industrial School for Girls.

TABLE NO. 13.— *Articles which had been in Cold Storage longer than Twelve Months, and on which No Requests for Extension had been made, ordered removed, from Dec. 1, 1920, to Dec. 1, 1921 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Mutton	2,040	Sept. 9, 1920	Batchelder & Snyder Company.
Mutton	3,000	June 15, 1920	Blackstone Supply Company.
Mutton	215	June 7, 1920	Gaffney, James.
Mutton	40	June 8, 1920	John, Peter.
Pork hearts	1,900	July 29, 1920	Rounsvell, P. W.
Pork kidneys	500	July 7, 1920	Independent Beef Company.
Pork loins	75	Dec. 16, 1919	Tumavicus, B. A.
Pork trimmings	290	Aug. 6, 1920	Maggioli, N.
Pork trimmings	1,400	June 3, 1920	Maggioli, N.
Pigs' feet	6,600	Aug. 3, 1920	Batchelder & Snyder Company.
Hogs' plucks	607	Oct. 28, 1920	Cunningham, A. J.
Sweetbreads	40	Sept. 8, 1920	Strong, Marson Company.
Sweetbreads	510	Nov. 1, 1920	Strong, Marson Company.
Bass, sea	20	May 15, 1920	Foley, M. F.
Bluebacks	1,066	Aug. 14, 1920	Tallman & Mack.
Bluefish	840	Oct. 8, 1920	Batchelder & Snyder Company.
Bonita	186	Oct. 17, 1920	Globe Fish Company.
Bonita	150	Sept. 12, 1920	Mantia, S., & Co.
Cod	732	Mar. 31, 1920	Powers, P. H.
Crab meat	400	July 10, 1920	Nickerson, W. H.
Crab meat	382	July 16, 1920	Nickerson, W. H.
Crab meat	200	July 28, 1920	Nickerson, W. H.
Crab meat	120	Aug. 28, 1920	Nickerson, W. H.
Eels, sand	1,190	Aug. 4, 1919	Globe Fish Company.
Eels, sand	175	Aug. 20, 1920	Globe Fish Company.
Eels, sand	175	Oct. 21, 1920	Globe Fish Company.
Flounders	2,173	May 18, 1920	Hunt, Cassius, & Co.
Herring	18,600	Jan. 2, 1920	Mantia, S., & Co.
Herring	525	Nov. 16, 1920	Russo & Sons.
Herring, sardine	105	Nov. 25, 1919	Cefalu, Joseph.
Herring, sardine	440	May 1, 1920	Mantia, S., & Co.
Herring, sardine	1,000	Dec. 16, 1920	Mantia, S., & Co.
Lobster	25	May 12, 1920	Apollo Sea Grill.
Lobster	100	May 24, 1920	Apollo Sea Grill.
Mackerel	339	July 28, 1920	Calnan, E. C.

TABLE NO. 13. — *Articles which had been in Cold Storage longer than Twelve Months, and on which No Requests for Extension had been made, ordered removed, from Dec. 1, 1920, to Dec. 1, 1921 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Mackerel	2,895	July 2, 1920	Star Fish Company.
Pollock	2,473	July 29, 1920	Shaw, H. C.
Pollock	450	Aug. 18, 1920	Shaw, H. C.
Salmon	91	July 8, 1920	Clouter, Jesse.
Salmon	53	Oct. 7, 1920	Pappalardo Brothers.
Scup	6,300	July 1, 1920	Corso & Connanzo.
Scup	315	July 14, 1920	Globe Fish Company.
Scup	1,700	May 20, 1920	Mantia, S., & Co.
Scup	95	May 28, 1920	Mantia, S., & Co.
Scup	2,660	June 6, 1920	Mantia, S., & Co.
Scup	1,700	June 11, 1920	Mantia, S., & Co.
Scup	5,560	July 10, 1920	Tocco, Joseph.
Shark	115	June 23, 1920	Mantia, G.
Shark	540	June 29, 1920	Russo & Sons.
Shark	225	Oct. 15, 1920	Russo & Sons.
Skatefish	490	Nov. 19, 1919	Corso & Cannizzo.
Skatefish	420	Nov. 26, 1919	Corso & Cannizzo.
Sole	700	July 20, 1920	Story, Simmons Company.
Squid	660	July 3, 1920	Fisherman's Fish Company.
Squid	1,050	Aug. 19, 1920	Globe Fish Company.
Squid	685	Oct. 17, 1920	Globe Fish Company.
Squid	900	Sept. 20, 1920	Mantia, S., & Co.
Squid	440	Oct. 7, 1920	Mantia, S., & Co.
Squid	400	Sept. 19, 1920	Russo & Sons.
Squid	360	Sept. 24, 1920	Russo & Sons.
Tuna fish	324	Aug. 10, 1920	Dondis, P.
Whiting	960	Nov. 25, 1919	Mantia, S., & Co.
Whiting	1,600	Dec. 3, 1920	Mantia, S., & Co.

DIVISION OF COMMUNICABLE DISEASES

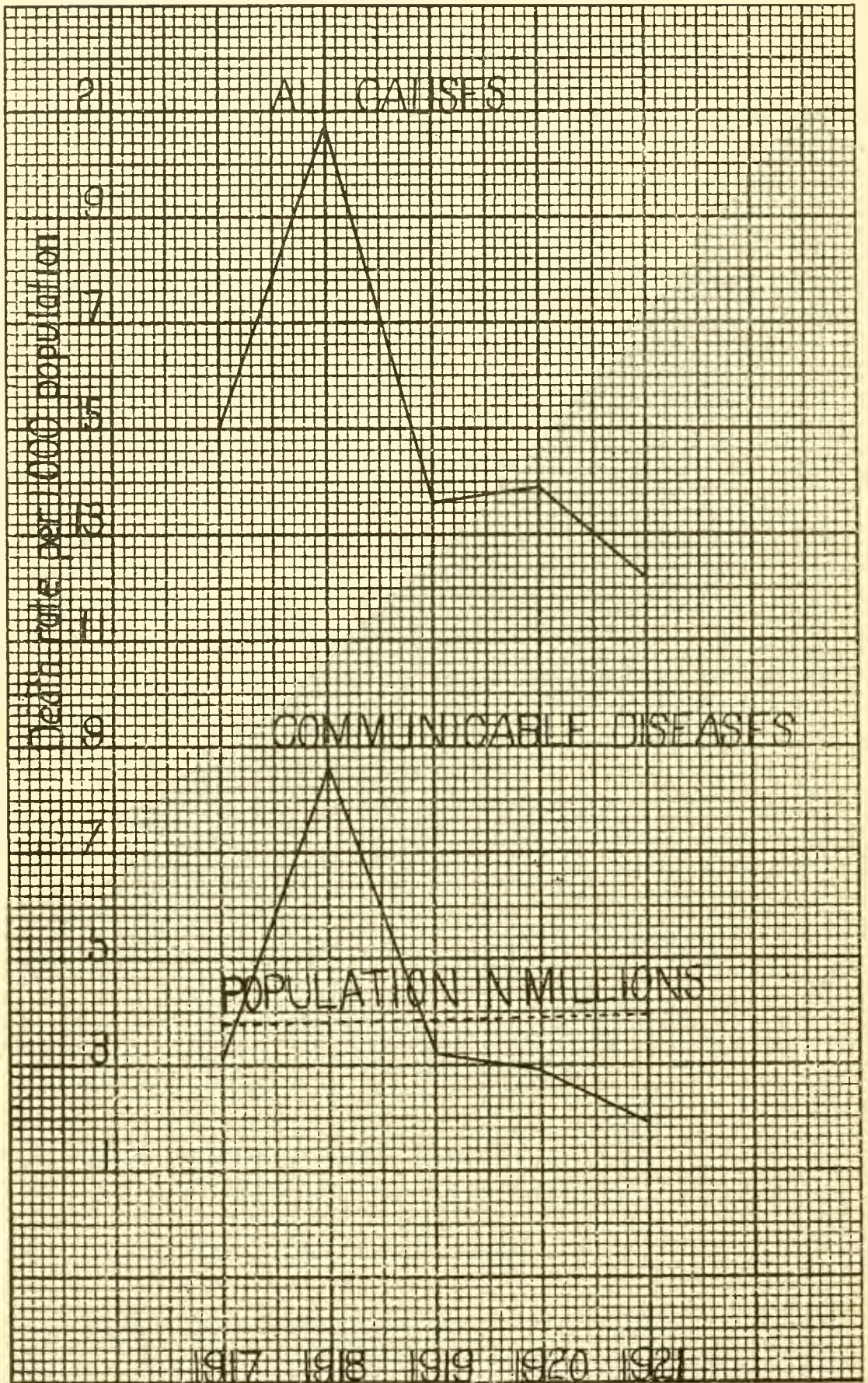
BERNARD W. CAREY, *Director*

REPORT OF DIVISION OF COMMUNICABLE DISEASES.

The total reported incidence and mortality from diseases declared dangerous to the public health shows a remarkable decrease from that reported annually during the past five years. A saving of over 3,600 lives of our people is to be seen from the mortality rate of 1921 as compared with the rate for 1920, for which the efforts of those engaged in the control of communicable disease may rightly be credited with a large share. The accompanying table shows the deaths from communicable diseases reported, as well as the total deaths from all causes for the past five years, and it is to be noted that the decrease in the deaths from communicable diseases plays no small part in the very creditable rate of 12.23, the rate for deaths from all causes per 1,000 population.

YEAR.	COMMUNICABLE DISEASES (RATE PER 1,000 POPULATION).		ALL CAUSES (RATE PER 1,000 POPULATION).	
	Number.	Per Cent.	Number.	Per Cent.
1917	11,627	3.08	56,628	15.01
1918	32,945	8.65	78,842	20.72
1919	12,342	3.22	52,345	13.64
1920	11,277	2.92	53,632	13.86
1921	7,619	1.95	47,748	12.23

The control of communicable disease must be divided and subdivided into the various factors which have made this control possible. There can be no doubt that the attention paid to procuring safe water supplies, adequate disposal of sewage, increased space for living, the better understanding and employment of personal hygiene, have all contributed their share to this problem. The direct influences, however, have reached beyond this in effectiveness, and the efforts of the local boards of health and local physicians in bringing about and enforcing local regulations for quarantine, and the immunization for those conditions for which specific immunity is to be had, are contributing very largely to the present-day success.



The year has been remarkably free from any outbreak of any magnitude nor, with the exception of diphtheria and scarlet fever, has there appeared to be any marked undue prevalence. The total number of cases from all of the communicable diseases was 77,309, with a mortality of 7,621. Seven reportable diseases have furnished 79 per cent of the total cases reported. These were chicken pox, diphtheria, gonorrhoea, measles, scarlet fever, pulmonary tuberculosis and whooping cough, and 59 per cent of deaths are found accredited to these same diseases.

Diphtheria with 9,100 cases and 603 deaths continues to be one of our major problems. There can be no doubt that the increased interest that public health workers are taking in diphtheria has resulted in a very considerable number of cases being properly diagnosed which in former years were classified as merely having infections from other sources. An increase of culturing of over 132 per cent in the past six years; the adoption in many of the smaller communities of a requirement for the taking of cultures for release; the search for the carrier and the missed case in school outbreaks; the increasing demand for toxin-antitoxin mixture for immunization; and the larger dosage of antitoxin for treatment, together with an increasing demand for lectures by organizations interested in public health activity, hold out hope for a material reduction in the incidence of this disease throughout the State. For the first time in our history a slight decrease in the fatality rate has been noted.

The program developed and administered throughout the State by the Department for the detection of those susceptible to diphtheria by the use of the Schick test and their subsequent immunization by the use of the toxin-antitoxin mixture deserves some mention. A definite program has been arranged whereby through the District Health Officer communities have called to their attention the advantages of inaugurating and carrying on a clinic at which children of school age may receive the benefits of this test. Upon request of the local board of health, and in certain instances the school authorities, we have arranged for a demonstration to which the local physicians, nurses and others interested in this work are invited. A few days prior to the appointed time the District Health Officer goes to the community, performs the test on a certain number of children and then at the conference reads the reactions which these children may give, and performs further tests on other children to demonstrate the exact technique to be used in carrying out the Schick test. This is augmented by a lecture on the need of intensive effort by local authorities if diphtheria is to be eradicated. Information is given as to

the manufacture of the Schick material and the toxin-antitoxin mixture and a careful discussion of the various reactions which will be found in any large group of children. Effort is made to have the local physicians take up this procedure and in particular to have some physician either associated with the board of health or the school department undertake to carry it out among the school children. All of this work is done upon a voluntary basis, and only those children bearing a proper authorization from their parents or guardians are allowed to receive the test. There are at present nine clinics in operation in the following places: —

BOSTON.	LAWRENCE.	NORTHAMPTON.
BROCKTON.	LYNN.	WALTHAM.
Clinton.	NEWTON.	Winchendon.

Certain hospitals are performing the test and immunization as a routine procedure for nurses and attendants, and in some instances inmates also are protected. Demonstrations have been held in many cities and towns.

It must be remembered that if diphtheria control measures are to be efficacious the Schick test with the subsequent immunization of those found to be susceptible by the toxin-antitoxin mixture must be augmented by culturing for the diagnosis and release of diphtheria. More attention must be paid to the possibility of sources of infection arising in neighborhood contact and the elimination of the secondary case within the household already infected by the use of immunizing doses of antitoxin. The importance of this assertion is borne out by a glance at the fifty instances in the following table where secondary infection has occurred which might have been prevented if proper culturing for release had been done or if passive immunization had been given to other members of an infected household.

LOCATION.	Population.	DATE OF REPORT.	
		First Case.	Secondary Cases.
A	43,100	Jan. 6 Apr. 26 Nov. 3	Jan. 11 Apr. 28, Apr. 28, May 3 Nov. 10
B	41,500	May 3 May 3 June 30 June 2 Sept. 6, Sept. 6 Oct. 27	May 23, June 10 June 16 July 6 Aug. 17, Sept. 3 Sept. 14 Nov. 7

LOCATION.	Population.	DATE OF REPORT.	
		First Case.	Secondary Cases.
C	40,900	Jan. 26 Feb. 21 July 1 Mar. 8 Feb. 15 Aug. 7 Aug. 23 Nov. 23 Nov. 23	Feb. 14 June 4 July 6 July 15 July 15 Aug. 17 Nov. 21 Nov. 29 Nov. 29
D	39,000	Jan. 31 Apr. 5	Mar. 18 Nov. 4, Nov. 29
E	38,100	May 7 Oct. 18 Oct. 22 Nov. 8 Nov. 19	May 13 Oct. 22, Nov. 2, Nov. 4 Oct. 26, Oct. 26 Nov. 28 Nov. 29
F	19,800	Feb. 15 Mar. 15 June 4	Feb. 16, Feb. 19 Apr. 22 June 8
G	18,600	June 6 Sept. 30 Oct. 6 Nov. 29	June 23 Oct. 13, Oct. 18 Oct. 27 Dec. 7
H	18,600	Mar. 22 Nov. 2 July 7 Nov. 12 Nov. 18	Mar. 24, Dec. 7 Nov. 7 Nov. 8, Nov. 25 Dec. 14 Dec. 14
I	17,400	Feb. 15 Feb. 15 Feb. 16 May 2 Aug. 30 Feb. 24 Sept. 29 May 24	Feb. 23 Feb. 19, Feb. 19, Feb. 23 Mar. 12 June 23 Sept. 17 Feb. 28 Oct. 6, Oct. 6 Nov. 10
J	16,600	May 12 Sept. 17	May 23 Sept. 24
K	15,700	Sept. 30	Nov. 17
L	15,600	Jan. 25 Jan. 29	Feb. 4 May 9

There can be no doubt that a large proportion of the clinical cases of to-day have been due to the missed case or to the carrier, and it is becoming more and more evident that diligent search by culturing the pupils in the schoolroom from which the patient has come will show the infection to be from this source. Our experience during the year again emphasizes the vast amount of needless work in culturing whole buildings when the same results would have been obtained if but one or more rooms from which the cases had come were thoroughly done.

Typhoid fever, with 917 cases and 121 deaths, has received the same

intensive investigation as has been given to it in former years. There have been but three instances where typhoid fever showed an unusual prevalence: the Waltham outbreak, transmitted by milk, giving 135 cases and 6 deaths; Adams, 23 cases due to the contamination of drinking water by river water through a faulty system at one of the mills; and Milford with 14 cases, all of which occurred on one milk route, possibly transmitted through the return of infected milk bottles. Further mention of these is made in the report of the epidemiologist. Owing to the fact that a large percentage of our male population is still protected by the vaccination against typhoid fever received during their military service, the females in the age group 20 to 40 predominate, as was evidenced last year. The protection which was furnished by this vaccination is obviously becoming less and less as time goes on, and we must therefore not let the fact that previous vaccination has been performed lead us away from the possible diagnosis of typhoid fever. The necessity of blood cultures for diagnosis and for the examination of urine and stools for typhoid bacilli is present and this service is still available for diagnosis and should be used. Here and there it is noted that local boards of health are including in their regulations for the control of typhoid fever and its spread as a requisite for release from supervision of the board of health that there shall be made examinations of stools and urine until two negative results have been obtained. This without doubt is a necessary step because secondary cases within the household are occurring, and also it is known that for a period of three or four months the convalescent may excrete the organisms.

Lobar pneumonia continues to be one of our big problems and while there has been a decrease in the actual number of deaths from this condition it is to be noted that there were 4,080 cases with 1,818 deaths, a death rate of 46.6. It appears that our greatest hope in the reduction of deaths from this condition lies in the increased use of the laboratory for the type determination of the pneumococcus which may be in the sputum and in the subsequent use of the pneumonia serum which is available for cases of Type I. The early use of Type I serum appears to be efficacious and this serum should be used in all suitable cases.

The continuing interest in pulmonary tuberculosis with the declining mortality rate is a source of great satisfaction. If the rate of ten years ago had prevailed, we would have had for the past year at least 1,700 more deaths from this condition. These favorable results have been obtained by the conscientious application of well-tried principles and practices of treatment and prevention carried out by devoted public

health workers representing both official and nonofficial groups. The consultation clinic has in most sections of the State proved of tremendous value to the practicing physician, clearing up as it does the diagnosis of many doubtful cases. It furnishes as well added stimulus to the public health nurse and it is filling a gap in our program which has long been realized.

Special studies have been made in many communities of the State during the year with most beneficial results, clearly demonstrating, however, in the large majority of instances, that more complete returns are to be obtained by additional assistance and by the employment of more systematic methods in follow-up work of the reported case. We are not at all satisfied that the reported incidence represents the true picture of tuberculous infection in this State but feel that we are working gradually toward procuring better results in reporting each year. Of special interest is the attempt of the local groups to furnish, through luncheons, greater nutrition to all school children, correcting at the same time such physical defects as exist and which hold possibilities for the development of future tuberculosis.

The subject of tuberculosis in forms other than pulmonary has caused much concern. More and more is it evident that these conditions are not adequately treated except in one or two institutions of the State, and here facilities are sadly inadequate to meet the demand. With a mortality nearly equaling that occurring in diphtheria, our serious attention should be given to this condition. It would appear that future progress in treating this condition must depend upon procuring special hospital facilities where prolonged residence may be the rule and where the specialized knowledge of the orthopedic surgeon may be available, combining, of course, all of the specialized care and treatment which tuberculosis always needs.

The number of cases reported requiring antirabic treatment for the year 1921 has exceeded that of any year for which we have records. The increase over the preceding year has been 76 per cent. A brief review of the present methods employed for the prevention and control of this condition quickly leads one to the conclusion that they are most inadequate, and we would again urge at least a State-wide quarantine and the restraining of dogs for a period of ninety days rather than the sporadic quarantine which is now in effect in places where a rabid dog has been discovered. This Department believes that the experimental work done in conveying immunity to dogs through their vaccination is of sufficient value to have it a statutory requirement for the issuing of a dog license, for it appears that the vaccine is efficacious; further, that any one who can afford to own a

dog ought to be able to afford to procure this immunity; and that all dogs stray and unclaimed for a reasonable period of time should be forthwith destroyed.

In January the Department was notified by the United States Public Health Service that it would no longer be possible to supply the antirabic virus because of the reduction in the appropriation for the work of the Hygienic Laboratory. It has therefore been necessary to recommend to local boards of health that the virus be purchased for the treatment of such cases as may require it.

The scarlet fever which has been in evidence throughout the year, while fairly numerous in cases, has not been of a particularly severe type. In nearly all instances where a community has shown an undue prevalence, it has been found upon investigation to be due to the missed case in school and has been of an extremely mild character. Systematic school inspection through teachers and school nurses under the supervision of the school physician will lessen the opportunity for exposure to this infection from this source.

A remarkable decrease in both incidence and mortality rate for measles has been experienced over past years. It has been noted that several communities are apparently letting up on their quarantine measures for this condition because of their ineffectiveness. This is a mistake and we would urge the local boards of health to persistently place cases of measles in quarantine, placarding houses if for no other purpose than to give notice of the existence of this condition to other members of the community, and we would also reiterate the statement made many times that measles is not without danger and steps should be taken to scrupulously guard young children from this sort of infection.

Smallpox with 37 cases and no deaths is indeed a glowing testimonial to the efficacy of vaccination, this being more remarkable when other States of the country have shown an increasing incidence, of a more virulent type in many instances, during the year.

Encephalitis lethargica was made reportable in March, 1921, and each case as it has been reported has been investigated in an attempt to establish some evidence of its mode of transmission, its communicability, and such other facts as would aid in the diagnosis and differentiation from simulating conditions. We have not been able to establish, with any degree of certainty, the position of encephalitis lethargica in its relation to diseases dangerous to the public health. We have found no evidence of secondary cases in the household or of association with a prior case and it appears that no great advancement

has been made except in the clarification of pathological lesions and possibly in the differentiation from other conditions.

In order that there might be uniform quarantine regulations adopted by local boards of health, our minimum rules and regulations have been revised so that at this time they represent the most accurate knowledge that we possess on this subject. All boards of health in the State have been circularized upon this subject and many have incorporated these regulations in regulations of their own and they appear to be working most satisfactorily. The passage of a recent act by the Legislature, which made it obligatory that all regulations passed by a local board of health bearing a penalty clause should be approved by the Attorney-General, was the occasion for which a set of standard regulations was prepared by this Division for the guidance of the local boards of health in formulating their own regulations. These have been adopted *in toto* by a number of communities and in part by many others. We hope eventually to have these regulations the basis of a standard sanitary code to which all of the communities of the State may subscribe and enforce as their own, augmented as local needs may require.

Under chapter 91, Resolves of 1920, the Massachusetts Department of Public Health was directed to investigate as to what measures, if any, were necessary for the prevention and control of bubonic plague, for which the sum of \$5,000 was appropriated. An investigation as to the physical conditions of water-front property was made in all of the seaport cities and towns of the Commonwealth. In conjunction with the Boston Department of Health a force of rat trappers was set to work in the city of Boston catching rats, which were examined in the bacteriological laboratory of the local health department. Over 6,000 rats were caught and examined and no rat infected with plague was found. A small number of rats was thought to be suspicious, but the suspicions were not confirmed by experts in other laboratories. Serious attempts were made to interest these seaport cities and towns in a local survey, and this bids fair to produce results in the near future. The complete report of this investigation is to be found in House Document No. 1360 of the year 1921, in which recommendations were made for an appropriation for the continuance of this work. This recommendation was received in the Legislature and referred to the next annual session.

A special resolve calling upon this Department to investigate as to the need of laboratory facilities for the western section of the State to be established in Springfield or some other central point was passed

by the Legislature during the year. It was thought that a great saving of time would be effected in the laboratory diagnosis of communicable disease; that a much earlier and wider distribution of our biologic products would result; and that an economy of administration in food and drug work for this section of the State might be made possible by the establishment of such a laboratory. Our investigation showed that the amount of time to be saved in the examination of laboratory specimens was practically negligible. Specimens were received at practically the same time from many of the extreme western cities and towns at the State House as at Springfield. The greatest saving of time varied from one-half hour to thirty hours. The use of the biologic products apparently depends on density of population rather than availability. It was our opinion that the saving of time to be gained was not sufficiently great to warrant the expenditure of the money necessary to establish the laboratory at this time.

In April, 1921, a community health bureau was established on the Cape, known as the Cape Cod Health Bureau, under the direction of a full-time health officer, with the United States Public Health Service and the Red Cross co-operating. This Bureau was formed by 11 towns joining together, appointing this full-time medical health officer to act as their agent, and in certain of the towns as school inspector as well. Assistance, as sanitary inspector, public health nurse and for office work, was furnished, together with transportation. Acting as agent for the local board of health and as school physician the health officer practically becomes the executive officer and carries out all of the public health activities in these communities. The work has been most successful. A very large number of carefully conducted examinations for physical defects among the school children has been carried out; notable work has been done in the study of the pollution of clams from this section; water supplies for schoolhouses have been carefully considered; and careful attention has been given to the problems of the control and prevention of communicable disease, with the result that it appears the communities participating in this experiment are well satisfied and that it bids fair to become a permanent organization for the betterment of public health for this section of the Commonwealth.

The work of the District Health Officers and their nursing assistants has proceeded along routine lines, and in the absence of an outbreak or undue incidence of communicable disease it has been possible that much time could be devoted to assisting in rounding out the programs of the local boards of health. Much time was spent in en-

deavoring to interest local health authorities in the Schick test and immunization by the use of the toxin-antitoxin mixture. Lecturing to nurses, to normal schools, parent-teacher associations and other groups interested in public health also took up considerable time. Consultation with physicians throughout the State is becoming more and more frequent and very material assistance has been given in this activity. By serving as director in many of the extra-governmental bodies interested and engaged in public health work, our District Health Officers are in a position to advise the proper direction of the activities of these bodies and prevent overlapping or duplication of effort in many instances.

The following tabulation shows the number of routine inspections made: —

Hospitals	125
Jails, lock-ups, etc.	148
Dispensaries	75

The work of the nursing assistants, by force of circumstances, is largely directed to the follow-up of the reported cases of tuberculosis, and frequent conferences with the local public health nurse, the inspection of records, and planning for special tuberculosis work in the various communities, such as tuberculosis surveys, consume most of her time and energy. This is somewhat of a deviation from the original plan, but appears to be unavoidable owing to the tremendous amount of time this work consumes and the very evident need which the local community presents.

The following changes in the personnel of the Division have taken place: —

- January 1. Dr. Mary R. Lakeman, epidemiologist, Subdivision of Venereal Diseases, transferred to the Division of Hygiene as assistant director.
- May 31. Dr. Jonathan E. Henry, epidemiologist, resigned.
- May 23. Dr. Leland M. French appointed as epidemiologist.
- June 30. Dr. Howard A. Streeter, chief of the Subdivision of Venereal Diseases, resigned.
- July 1. Dr. Albert Pfeiffer, epidemiologist, Subdivision of Venereal Diseases, promoted to position of chief of the subdivision.

The work of the Bacteriological Laboratory has continued along the same general lines as in past years, with a marked increase in the number of specimens examined over previous years. It is of special interest to note that of 5,597 cultures taken from school children, but 26 carriers were found. This low percentage is somewhat at variance

with that found by workers in other laboratories throughout the country, yet it appears to represent the true picture of the situation in this State as each positive carrier in this group possessed virulent organisms as proved by animal inoculation. Specimens of blood examined for the Widal reaction increased by 100 or more specimens, with approximately 200 fewer specimens of feces and urine examined. This decrease in the number of examinations of feces and urine appears to be a movement in the wrong direction, for it is our belief that there should be a steadily increasing number of specimens examined in order that the patients may be returned without danger to the community. Of the specimens examined for the type of pneumococcus, the results have been as follows:—

	Specimens.	Per Cent.
Type I	73	21.2
Type II	40	11.6
Type III	74	21.4
Group IV	158	45.8
No pneumococci	141	

It is to be noted that the high percentage in Group IV is due to the fact that physicians send specimens from cases suspected of being pneumonia rather than resulting from the examination of sputum from diagnosed lobar pneumonia cases.

The following table shows the total number of examinations made, with the results:—

	Positive.	Negative.	*Atypical.	Total.
Diphtheria (primary)	1,566	14,563		16,129
Diphtheria (release)	1,872	4,450		6,322
Tuberculosis	964	3,565		4,529
*Typhoid fever (Widal test)	351	1,260	60	1,671
Typhoid fever (culture test)	37	683		720
Gonorrhoea	255	2,246		2,501
Malaria	2	89		91
Miscellaneous				1,459 ¹
Total				33,422

¹ Including 486 pneumococcus type determinations, 23 diphtheria virulence tests, 60 animal inoculations for tubercle bacilli, 8 animal inoculations for anthrax bacilli, and 116 paratyphoid tests.

The following gives the total number of biologic products and diagnostic outfits distributed from the laboratory during the year ending Nov. 30, 1921: —

Biologic Products.

Diphtheria antitoxin:

9,342 bottles of 1,000 units each	9,342 1,000-unit doses
38,009 bottles of 3,000 units each	114,027 1,000-unit doses
12,239 bottles of 5,000 units each	61,195 1,000-unit doses
7,646 bottles of 10,000 units each	76,460 1,000-unit doses

Total	261,024 1,000-unit doses
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Antimeningococcic serum:

3,444 bottles of 15 cubic centimeters each	3,444 doses
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Antipneumococcic serum:

649 bottles of 100 cubic centimeters each, Type

I serum	649 doses
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Schick toxin:

1,095 outfits of 50 doses each	54,750 doses
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32 cubic centimeters (bulk)	32 cubic centimeters
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Toxin-antitoxin mixture:

9,414 cubic centimeters	9,414 doses
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Vaccine virus (smallpox)	197,733 doses
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Bacterial vaccine (typhoid-paratyphoid):

21,804 ampoules of 1 cubic centimeter each	21,804 doses
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340 bottles of 100 cubic centimeters each	34,000 doses
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Total	55,804 doses
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Normal serum	9,788 cubic centimeters
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Silver nitrate solution:

54,176 ampoules	54,176 doses
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Diagnostic Outfits.

Diphtheria culture outfits	28,417
Culture media	25
Tuberculosis sputum outfits	6,266
Pneumonia outfits	353
Widal outfits	2,321
Typhoid culture outfits	1,086
Malaria-gonorrhoea outfits	1,977

SUBDIVISION OF VENEREAL DISEASES.

The work of the Subdivision of Venereal Diseases has continued along the lines laid down for that of former years. Owing to the failure of Congress to appropriate the Kahn-Chamberlain fund, our appropriation became limited and it has been necessary to curtail our activities not only through the loss of several of the personnel but in reduction of the subsidy to the State-approved clinics as well.

There are now 20 State-approved clinics throughout the State, which it is believed are doing excellent work. There has been a decrease in the total of new cases at all clinics, there being 1,153 less cases than a year ago, yet the average monthly attendance has increased, being 1,915.7 more cases than of last year.

The morbidity reports have fallen off markedly in both gonorrhoea and syphilis. This reduction in the number of reported cases is due in a large measure we believe to the reduction in the actual number of cases. A second factor in the lessened number of reports is the fact that many physicians regarded the reporting of these conditions as a war measure and with the cessation of war have neglected to report the cases coming under their treatment. It is perfectly obvious that these cases are receiving more intensive and more adequate treatment than ever before. The demand for arsphenamine has increased during the year by 11,439 ampoules, and the Wassermann Laboratory examined 5,769 more specimens than the previous year.

A very much appreciated activity of the Subdivision of Venereal Diseases has been the quarterly meeting of the clinic officials generally held in Boston, at which addresses have been made by men of prominence in their chosen field. This has proved to be a source of great stimulation for the clinic chiefs in the State-approved clinics and to our own force as well. The following subjects have been treated during the year: —

“Neurosyphilis.” A clinical meeting held at the Boston Psychopathic Hospital.

“Arsphenamine and Pathology of Syphilis.”

“Gonorrhoea.” A clinical meeting held at the Massachusetts General Hospital.

“Syphilis.”

Our educational work and publicity is going along quietly and with a steady demand for our literature. Within 7,554 as many pamphlets were distributed as last year, when a special effort was made for distribution of literature in connection with the “Keeping Fit Exhibit.”

The following tables give a statistical summary of the work in this State: —

Jan. 1, 1921, to Dec. 31, 1921.

	Total New Patients.	Total Patients.	Monthly Average of Total Patients.	Total Treatments given.	Number of Doses of Arsphenamine.
Attleboro	38	201	16.7	517	296
Boston City Hospital	669	7,214	601.1	7,594	4,900
Boston Dispensary	1,433	23,499	1,958.2	51,360	15,079
Massachusetts General Hospital	2,021	35,672	2,972.6	28,988	8,758
Massachusetts Homœopathic Hospital	397	5,994	499.5	8,257	2,268
Brockton	87	917	76.4	2,136	735
Fall River	148	1,301	108.4	4,962	310
Fitchburg	57	276	23.0	915	203
Haverhill	44	226	18.8	661	193
Holyoke	46	428	35.6	464	228
Lawrence	140	1,827	152.2	1,805	530
Lowell	259	2,627	218.9	4,806	986
Lynn	119	2,137	178.0	2,474	563
New Bedford	283	3,924	327.0	4,099	970
Pittsfield	11	94	7.8	417	107
Salem	125	820	68.3	1,528	824
Springfield	180	3,415	284.5	3,182	1,287
Worcester	161	2,055	171.2	3,296	1,417
	6,218	92,627	7,718.2	127,461	39,654

Jan. 1, 1921, to Dec. 31, 1921.

Cases reported by number:

Gonorrhœa	5,563
Syphilis	2,497
Total	8,060
Cases reported by name (lapsed cases)	1,147
Lapsed cases returned to treatment	327
Ampoules of arsphenamine distributed	38,473
Wassermann examinations	42,957
Smear examinations ¹	2,478
Pamphlets distributed	37,802
Lectures	73
State-approved clinics	18
New cases admitted to clinics	6,218
Average monthly attendance at clinics	7,718.2
Total treatments given	127,461
Tin signs, about	8,000

¹ Refers only to smear examinations made in State laboratory. Each clinic examines smears also.

Comparison.

	MONTHLY AVERAGE OF NEW PATIENTS.			MONTHLY AVERAGE OF TOTAL PATIENTS.		
	1919.	1920.	1921.	1919.	1920.	1921.
Attleboro	2.8	2.6	3.1	11.5	13.0	16.7
Boston City Hospital	45.8	41.5	55.7	203.1	358.0	601.1
Boston Dispensary	149.3	201.7	119.4	2,132.6	2,382.9	1,958.2
Massachusetts General Hospital .	247.1	208.1	168.4	1,239.5	1,706.0	2,972.6
Massachusetts Homœopathic Hos- pital.	25.1	28.9	33.0	191.4	285.9	499.5
Brockton	4.0	8.1	7.2	11.3	29.7	76.4
Fall River	6.6	8.5	12.3	66.3	80.5	108.4
Fitchburg	5.6	3.7	4.7	10.3	11.0	23.0
Haverhill ¹	-	-	3.6	-	-	18.8
Holyoke ²	-	-	3.8	-	-	35.6
Lawrence	12.5	9.8	11.6	54.8	76.4	152.2
Lowell	7.0	21.6	21.5	88.6	106.4	218.9
Lynn	12.5	10.5	9.9	55.3	82.5	178.0
New Bedford	27.8	26.3	23.5	178.1	208.2	327.0
Pittsfield	1.5	1.4	.9	3.6	5.6	7.8
Salem	1.8	5.7	10.4	6.5	25.6	68.3
Springfield ³	-	29.6	15.0	-	171.8	284.5
Worcester	11.6	10.1	13.4	101.6	126.6	171.2
	561.0	618.1	517.4	4,354.5	5,670.1	7,718.2

¹ Clinic opened Nov. 1, 1920.² Clinic opened April, 1920.³ Clinic opened November, 1920.

The averages for 1919 are based on a six-month period, from June 1 to Dec. 1, 1919.

The averages for 1920 cover the year from Dec. 1, 1919, to Dec. 1, 1920.

The averages for 1921 cover the year from Jan. 1, 1921, to Dec. 31, 1921.

PENIKESE HOSPITAL.

Plans inaugurated some years ago by the Federal government to segregate in one institution in the United States all persons known to be suffering from leprosy have been finally completed. Federal enactment has been passed placing in the United States Public Health Service a hospital situated at Carville, La., for this purpose. On March 10, 1921, all of the lepers remaining at Penikese, 13 in number, were transferred to the care of the Federal authorities.

It is interesting to note that one of the two patients who were reported in 1920 as having improved sufficiently to be paroled has been released from the Carville institution.

Under authorization from the Governor and his Council, the Supervisor of Administration and the Commissioner of Public Health, acting jointly, have endeavored to sell Penikese Island, but to date the bids received have been considered inadequate and further attempts are to be made. Such material as was available for use in other State institutions has been removed to the mainland and so disposed of; miscellaneous supplies and household utensils have been disposed of locally; and a caretaker has been installed in order that the property remaining may be properly safeguarded.

REPORT OF EPIDEMIOLOGIST FOR 1921.

General. — The year 1921 has been marked by relatively few outbreaks. Anterior poliomyelitis returned again this year with a much lessened incidence than last year, yet with a much wider distribution of cases. The spot map, showing the incidence for the year, shows vividly how the disease has centered itself about four foci. The unusual occurrence of 6 cases at a boys' camp, after thorough investigation left us as much in the dark as to its exact spread and etiology as before.

The occurrence of smallpox at three different places at three different times served to bring before us the need for sustained provaccination work if we are to keep from this scourge.

Encephalitis lethargica was declared dangerous to public health and as such was made reportable March 1, 1921. Investigation of cases by the Department has so far brought out no new or unpublished facts on this disease.

The typhoid rate, which has been declining, narrowly escaped taking a sharp rise, due to three extensive outbreaks caused by milk contaminated with typhoid bacilli. Pasteurization plus proper handling would have prevented these 175 odd cases with 6 deaths.

Our nonpulmonary tuberculosis seems not to be getting the attention which is needful. With the reporting of 700 to 800 cases yearly and with 600 to 700 deaths, it is to be seen that the true incidence is far from being properly or completely reported.

Over 1 per cent of the total deaths from tuberculosis in adults is due to original infection by bovine bacilli and in children probably 10 per cent are due to the bovine type. The entrance of these germs into the body is probably almost always through the medium of milk. This does not take into consideration the harmful pathological conditions and undermining results caused by the presence of these germs in the body. Here, again, pasteurization of the milk supply

would render our child population safe from bovine tubercle bacilli and would also prevent the occasional occurrence of milk-borne outbreaks of scarlet fever and septic sore throat.

This year's total of dog bite requiring antirabic treatment marks the greatest number ever reported. When we consider that some countries never have a case of this condition within their confines, it would seem as if some further steps should be taken to combat this disease.

Measles and whooping cough must always remain in the foreground of our endeavors in our attempt to protect the preschool group of children while the very great majority of deaths occur at these ages.

With Schick work rapidly forging ahead, in another year the results of this work are bound to be apparent in a lessened number of cases of diphtheria.

Scarlet fever must be combated chiefly through our school inspectional work, with the early recognition of missed cases and proper daily inspection by the school nurse under close supervision of the school physician.

Influenza was not reported in large numbers this year. This would perhaps indicate that the supply of susceptibles has run out.

Diseases on the premises of milk handlers have received careful and thorough attention, and in no case has any outbreak resulted.

Interstate reciprocal notifications have been sent out as frequently as the opportunity presented itself; also, at frequent intervals, correspondence has taken place with the health representatives of neighboring States regarding pertinent matters which do not come under the scope of the interstate reciprocal notification.

Our search for typhoid bacilli carriers has been constant but with perhaps not the best of success; however, four carriers were discovered this year.

Actinomycosis. — There were 2 cases reported, — one at Boston and one at Cambridge.

Anterior Poliomyelitis. — There were 233 cases reported for the year. Since July 1, 193 of these reports were received. While this disease did not reach severe outbreak proportions in any locality, there has been a certain persistence in several centers. Thus from Boston, or its immediate neighborhood, 81 of the 193 cases were reported; 41 reports have come from in or around Lawrence and Haverhill; 22 have come from in or around Pittsfield and North Adams, and 14 have come from Springfield; therefore, it will be noticed that from four foci 158 of the 193 cases were reported. The remainder of the cases was pretty generally scattered throughout the State.

An unusual incident in the poliomyelitis history for this year was the occurrence of 6 cases during August at a boys' camp. The camp

had been visited two weeks previously by an outbreak of gastroenteritis. Whether this represented a form of poliomyelitis or somehow increased the susceptibility to poliomyelitis is a question impossible of answer.

In three other instances there were more than one case in a household. In two of the three the onsets were at the same time; in one the second case of the disease came twenty days after the first.

The seasonal, age and sex incidence maintained the same constancy as in former years.

Anthrax. — The anthrax cases have been reduced to relatively few in number. For the year there were reported 6 cases, with no deaths. This represents the least number of cases for ten years. Four cases were among workmen handling hides or hair, and 2 cases were traced to the use of new shaving brushes. The diagnosis of 4 cases was established by the Bacteriological Laboratory, while the diagnosis of 2 cases was based on the clinical findings alone.

Chicken Pox. — There were 8,324 cases reported; 270, or 3 per cent of the cases, were in adults twenty years and over. Chicken pox *per se* is of little import, but the danger of this disease being confounded with mild cases of smallpox must always be borne in mind. Of 8 deaths attributed to chicken pox for the year, 4 deaths were complicated by broncho-pneumonia and were in individuals mostly under one year of age.

Diphtheria still remains a tremendous problem. Although the number of cases reported this year is greater than last, the death rate has remained the same and the fatality rate has declined somewhat. School and playground contacts were the chief sources of spread during the past year. The work of Schick testing and subsequent immunization of those found to be susceptible has gained good headway, and it is to be expected that in another year the beneficial results of this work will be noted.

	Cases.	Deaths.	Case Rate per 100,000 Population.	Death Rate per 100,000 Population.	Fatality Rate.
1911-1919 median	6,998	629	203.1	16.8	8.1
1920, total	7,513	595	194.2	15.4	7.9
1921, total	9,100	603	233.2	15.4	6.6

Dog Bite requiring Antirabic Treatment. — There were 118 cases reported for the year. This is an exceedingly large number and is the largest yearly total ever reported. Out of this number 3 died, 2 of whom refused treatment and 1 died in spite of the early institution of

the Pasteur treatment. Approximately one-half of the cases requiring treatment has occurred in children fourteen years and under.

Dysentery. — There were 25 cases reported. It is extremely questionable how many of these were dysentery of amebic or bacillary origin.

Encephalitis Lethargica. — This disease was made reportable March 1, 1921. Previous to this time 59 cases had been reported voluntarily by physicians, for the first two months of the year. For the remainder of the year 117 cases were reported. There were 74 deaths reported during the entire year. Each case has been investigated by the District Health Officer with a view to bringing out, if possible, some common etiological factor. The investigations so far have not brought out anything new or important in this new disease, but they have revealed that a number of cases reported as encephalitis lethargica either have been later diagnosed as, or by sequellæ, have proved to have been, some other disease. In several instances laboratory tests have made necessary the change of diagnosis from encephalitis to tuberculous meningitis. It appears from the history alone of several cases that the diagnosis of encephalitis was incorrectly made. Furthermore, it is to be expected that confusion between this disease and anterior poliomyelitis and tuberculous meningitis will take place because of the similarity of symptoms. There was a single instance of multiple infection, two boys, aged three and six years. The onsets of these cases were simultaneous.

	1921.
Total cases	117
Total deaths	74
Case rate per 100,000 population	3.0
Death rate per 100,000 population	1.9
Fatality rate	63.2

Epidemic Cerebrospinal Meningitis. — There were 164 cases reported for the year, with 58 deaths. This represents our best record since the disease was made reportable. Its incidence has been widespread in character. An outbreak of 3 cases at an immigration station among natives of the Cape de Verde Islands took place with 100 per cent mortality in spite of early diagnosis and hospital treatment. Nasopharyngeal cultures were taken from 160 contacts with a view to locating, if possible, any carriers. None was found and no cases developed thereafter among that group. It would seem that the close housing necessary at quarantine played a major rôle in the spread of this disease. Epidemic cerebrospinal meningitis has been more or less of common occurrence at this immigration station.

	Cases.	Deaths.	Case Rate per 100,000 Population.	Death Rate per 100,000 Population.	Fatality Rate.
1911-1919, median	181	147	5.0	4.1	86.3
1920, total	182	129	4.7	3.3	70.8
1921, total	164	58	4.2	1.5	35.4

German Measles. — There were 649 cases and no deaths. This disease, not serious in itself, may occasionally be confounded with scarlet fever or perhaps measles and thus be the occasion of serious outbreaks.

Glanders. — There were no cases of human glanders reported for this year.

Gonorrhoea. — There were 5,563 cases of this disease reported.

Hookworm. — There was one case reported in a resident of Chelsea.

Influenza. — There were 735 cases reported for the year. For 1920 the deaths alone were three times this number.

Leprosy. — There was one case of the nodular type reported in a West Indian negro. He had lived in the United States for nearly five years and had worked at Cambridge for the last seven months of this time.

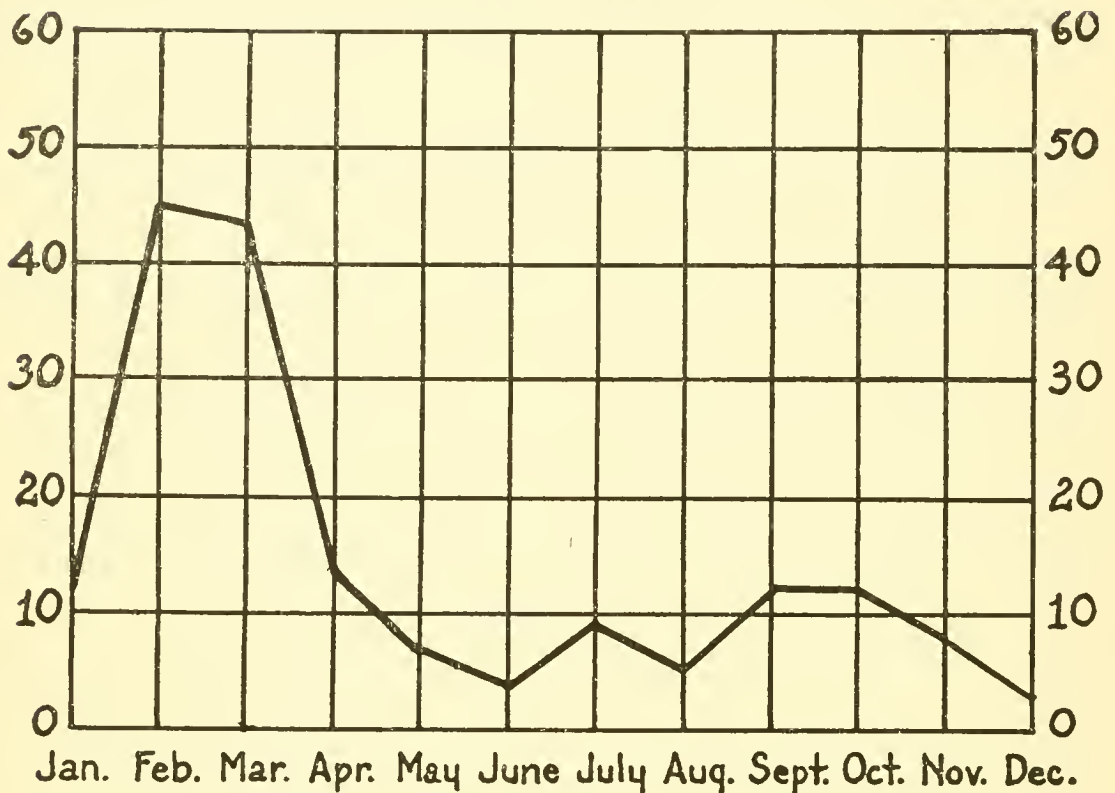
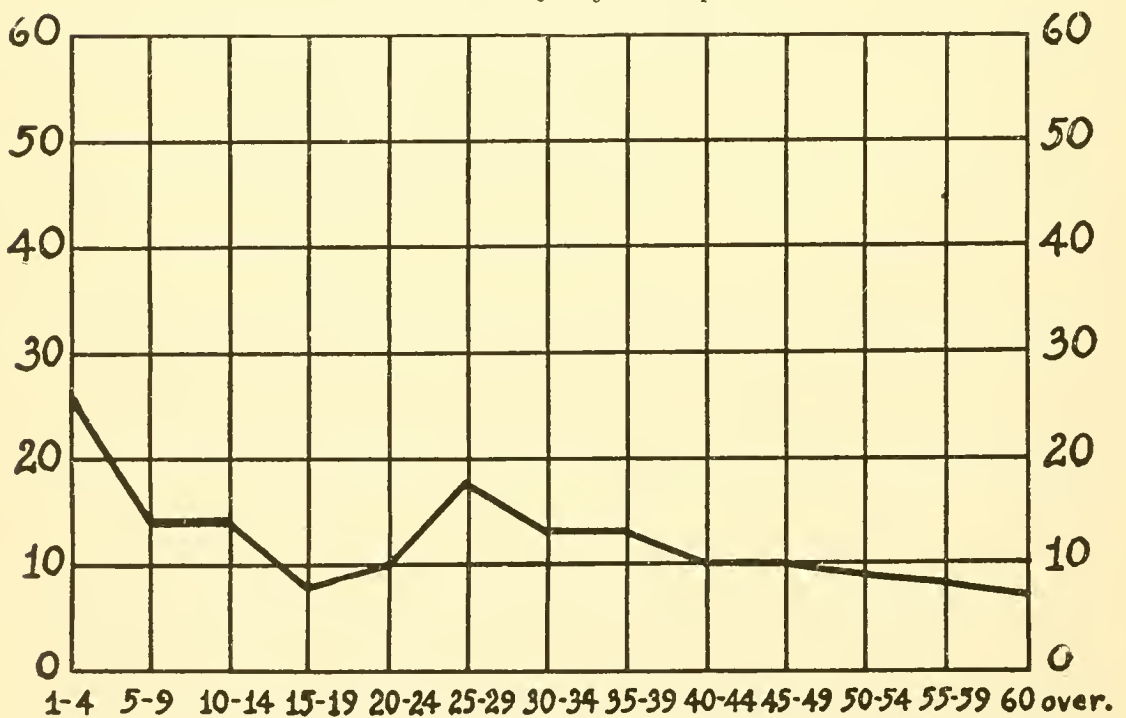
Malaria. — There were 49 cases reported for the year. It is felt that this disease is all too frequently diagnosed by clinical symptoms only and not confirmed by laboratory examinations of blood specimens. It would seem that investigation of these cases was indicated with a view to encouraging the use of the laboratory. In this way our malaria problem could be more definitely ascertained.

Measles. — There were 17,827 cases reported for the year. This is about one-half the number reported for last year and constitutes a report of moderate size. This disease represents one not easy of control, first, because of its extreme degree of infectiousness, and second, the idea prevailing among the laity that it is not serious and consequently preschool children are needlessly exposed to it. When parents are educated to its real dangers, then can we expect more satisfactory control of this disease. Our efforts are still aimed at the protection of the preschool children.

Mumps. — There were 3,952 cases of this disease reported for the year. This represents a report of moderate size. There were 6 deaths attributed to mumps, which is about the usual number.

Ophthalmia Neonatorum. — There were 1,573 cases reported for the year just past, many of which were reported because of a discharge

ENCEPHALITIS LETHARGICA, 1921.

Incidence by Months.*Incidence by Age Groups.*

due to silver nitrate which invariably cleared up in forty-eight hours; 81, however, were discharged from a hospital as uncured. Only 1 case was discharged with impaired vision. It would seem that a systematic follow-up of the cases discharged uncured was quite essential; even though only 1 case showed impaired vision during the past year, the potentialities are great.

Pellagra. — There were 14 cases of this disease reported for the year, 8 of which came from State institutions.

Pneumonia, Lobar. — There were 4,080 cases and 1,818 deaths reported for the year. According to the number of typings done by the laboratory, one case in nine has a pneumococcus typing done. It should be urged that this practice be more generally adopted. Cases due to Type I pneumococcus should be treated by the specific serum which has marked curative powers.

Scarlet fever totaled 8,331 cases for the year. When this assumes mild forms it is not easy of control. This has been true during the past year when the disease has been spread by contact with mild cases, generally through the medium of schools. It has not been uncommon to learn that children were kept in school or on the street almost throughout the attack, it being so mild that no physician was called. It is believed that with the more constant use of the school nurse seeking the missed case the figures for scarlet fever will decline. During an outbreak there should be systematic inspection of the school children. This should be done daily and should be thorough. This should consist of throat, tongue and body inspection, with the frequent use of the clinical thermometer. All suspects, or children suffering from catarrhal conditions of the nose or throat, should be excluded from the school until their exact condition can be determined.

Septic Sore Throat. — There were 140 cases reported and one outbreak of 32 cases at one of the State sanatoria. This was traced to the assistant baker who prepared the food eaten by those who developed this disease.

Smallpox. — During the year just ended 37 cases of smallpox were reported in this Commonwealth. For 1920, 29 cases came to the notice of the Department. The 37 cases reported represent 3 outbreaks and 12 scattered cases.

1. The Methuen outbreak totaled 25 cases, 13 of which were reported last year and 12 were reported during January, 1921. This outbreak was traced to a family that had just moved from Canada.

2. The second outbreak consisted of 9 cases, 7 at Salem and 2 at Gloucester. These cases were traced to a workman who returned to Salem from the Island of Jamaica and who was taken sick soon after

leaving the island. It is considered possible that these cases were Alastrim or Kaffir pox, as this disease was epidemic at Jamaica at that time and subsequent examination of the records shows that no cases of smallpox were reported during this period.

3. A Worcester outbreak consisted of 6 cases, which were traced, for the most part, to a person mildly sick with this disease who had traveled from the West coast to New York and thence to Massachusetts while in an infectious condition.

Syphilis. — There were 2,497 cases of syphilis reported for the year.

Tetanus was reported in 39 instances.

Trachoma was reported in 97 instances.

Trichinosis. — There were 10 cases reported for the year. Reports came from the following places: Boston, Winchester, Somerville, Maynard and Worcester.

Tuberculosis, Pulmonary. — There were 6,168 cases reported for the year. This constitutes a favorable report.

Tuberculosis, other forms, were reported in 827 instances.

	Cases.	Deaths.	Case Rate per 100,000 Population.	Death Rate per 100,000 Population.	Fatality Rate.
1911-1919, median	747	855	19.6	24.4	145.5
1920, total	800	639	20.7	16.5	79.9
1921, total	827	551	21.2	14.1	66.6

Typhoid Fever. — There were 917 cases of typhoid reported for the year. This number was slightly less than last year, and was the least number of cases ever reported. The preponderance of cases in the age group twenty to forty was formerly among the males, but this year again shows that females are in excess for that age group. This is the second year that this has held true. This is considered to be a direct result of immunization against typhoid which men of that age received while serving in the Army and Navy. Of these cases, 56 were imported, which constituted 6 per cent of the total number; 103, or 11 per cent, were traced to direct contact; 156, or 17 per cent, were caused by the use of unpasteurized milk contaminated with typhoid bacilli. Four names have been added to our typhoid bacilli carriers, making a total now of 59.

Last May Waltham was visited by a serious and widespread epidemic of typhoid fever due to the use of raw milk contaminated by typhoid bacilli. Prolonged search failed to reveal the source of the infecting organism. The occurrence was on a 200-customer milk route. The number of those infected amounted to 135, with 6 deaths.

Milford, like Waltham, suffered a milk-borne outbreak which was traced to an unrecognized case from whom bottles were collected during part of the illness. The possibility of a carrier was considered and several specimens from all milk handlers were examined. There were 12 cases on this 400-quart milk route. Here, again, proper handling would have prevented the outbreak.

Fitchburg, also, had 8 cases traced to a proved carrier whose milk was sold unpasteurized in that city.

In Sherborn several cases were traced to contaminated milk.

During July, August, September and October 23 cases of typhoid were reported from Adams. Careful investigation failed to reveal anything in common except the place of work. Examination of the water supply of this particular mill showed that polluted water was pumped through the mains about once a week. Steps were taken immediately to put an end to this.

	Cases.	Deaths.	Case Rate per 100,000 Population.	Death Rate per 100,000 Population.	Fatality Rate.
1911-1919, median	2,088	246	59.5	6.6	11.5
1920, total	935	96	24.2	2.5	10.3
1921, total	917	121	23.5	3.1	13.2

Whooping Cough. — There were 5,704 cases reported for the year. This disease is undoubtedly most infectious before the characteristic whoop appears and before its nature is known. Accordingly the non-immunes in a given neighborhood had contracted the disease before the original case was diagnosed. This disease, like measles, is serious to the preschool group and, therefore, our efforts should be directed toward protecting them.

Parents should be educated to the fact that the young child should be kept away from children having catarrhal conditions of the respiratory system, which are usually the only symptoms that mark the early and infectious stage of whooping cough.

CASES AND DEATHS FROM DISEASES DANGEROUS TO THE PUBLIC HEALTH, 1921.

Index to Line Numbers in the Table of Cases and Deaths from Diseases Dangerous to the Public Health, 1921.

Abington	110	Cheshire	227	Granville	305
Acton	195	Chester	246	Great Barrington	103
Acushnet	147	Chesterfield	327	Greenfield	49
Adams	63	CHICOPEE	30	Greenwich	330
Agawam	120	Chilmark	355	Groton	197
Alford	350	Clarksburg	264	Groveland	165
Amesbury	72	Clinton	62	Hadley	163
Amherst	116	Cohasset	171	Halifax	312
Andover	80	Colrain	221	Hamilton	220
Arlington	42	Concord	101	Hampden	307
Ashburnham	200	Conway	284	Hancock	319
Ashby	290	Cummington	321	Hanover	172
Ashfield	287	Dalton	139	Hanson	202
Ashland	183	Dana	309	Hardwick	159
Athol	76	Danvers	66	Harvard	154
ATTLEBORO	41	Dartmouth	96	Harwich	209
Auburn	130	Dedham	70	Hatfield	169
Avon	194	Deerfield	162	HAVERHILL	18
Ayer	151	Dennis	228	Hawley	331
Barnstable	123	Dighton	170	Heath	341
Barre	146	Douglas	193	Hingham	113
Becket	308	Dover	288	Hinsdale	274
Bedford	238	Draeut	114	Holbrook	149
Belchertown	198	Dudley	143	Holden	152
Bellingham	196	Dunstable	333	Holland	359
Belmont	65	Duxbury	230	Holliston	166
Berkley	282	East Bridgewater	144	HOLYOKE	17
Berlin	285	East Brookfield	283	Hopedale	164
Bernardston	297	East Longmeadow	179	Hopkinton	191
BEVERLY	37	Eastham	328	Hubbardston	272
Billerica	136	Easthampton	64	Hudson	85
Blackstone	135	Easton	121	Hull	217
Blandford	322	Edgartown	262	Huntington	231
Bolton	300	Egremont	329	Ipswich	104
BOSTON	3	Enfield	294	Kingston	180
Bourne	178	Erving	240	Lakeville	234
Boxborough	343	Essex	233	Lancaster	182
Boxford	311	EVERETT	28	Lanesborough	271
Boylston	292	Fairhaven	89	LAWRENCE	14
Braintree	68	FALL RIVER	9	Lee	133
Brewster	302	Falmouth	145	Leicester	137
Bridgewater	83	FITCHBURG	27	Lenox	173
Brimfield	299	Florida	348	LEOMINSTER	40
BROCKTON	16	Foxborough	126	Leverett	301
Brookfield	236	Framingham	46	Lexington	98
Brookline	29	Franklin	99	Leyden	338
Buckland	235	Freetown	225	Lincoln	280
Burlington	281	Gardner	47	Littleton	244
CAMBRIDGE	11	Gay Head	360	Longmeadow	160
Canton	106	Georgetown	201	LOWELL	10
Carlisle	318	Gill	286	Ludlow	86
Carver	304	GLOUCESTER	36	Lunenburg	216
Charlemont	298	Goshen	357	LYNN	12
Charlton	203	Gosnold	363	Lynnfield	259
Chatham	208	Grafton	94	MALDEN	21
Chelmsford	109	Granby	296	Manchester	185
CHELSEA	24				

Mansfield	100	Pelham	314	TAUNTON	31
Marblehead	91	Pembroke	237	Templeton	131
Marion	257	Pepperell	184	Tewksbury	128
MARLBOROUGH	54	Peru	362	Tisbury	255
Marshfield	252	Petersham	306	Tolland	358
Mashpee	351	Phillipston	334	Topsfield	289
Mattapoisett	256	PITTSFIELD	25	Townsend	223
Maynard	92	Plainfield	339	Truro	313
Medfield	141	Plainville	239	Tyngsborough	270
MEDFORD	26	Plymouth	61	Tyringham	349
Medway	155	Plympton	323		
MELROSE	45	Prescott	356	Upton	218
Mendon	278	Princeton	303	Uxbridge	117
Merrimac	192	Provincetown	127		
Methuen	52	QUINCY	19	Wakefield	60
Middleborough	79	Randolph	125	Wales	320
Middlefield	345	Raynham	215	Walpole	118
Middleton	263	Reading	88	WALTHAM	32
Milford	58	Rehoboth	199	Ware	82
Millbury	111	REVERE	33	Wareham	129
Millis	224	Richmond	310	Warren	150
Millville	187	Rochester	273	Warwick	344
Milton	77	Rockland	87	Washington	353
Monroe	361	Rockport	138	Watertown	35
Monson	124	Rowe	342	Wayland	204
Montague	90	Rowley	260	Webster	57
Monterey	347	Royalston	291	Wellesley	105
Montgomery	352	Russell	249	Wellfleet	293
Mount Washington	365	Rutland	214	Wendell	337
		SALEM	23	Wenham	267
Nahant	243	Salisbury	213	West Boylston	212
Nantucket	167	Sandisfield	324	West Bridgewater	156
Natick	69	Sandwich	229	West Brookfield	250
Needham	93	Saugus	67	West Newbury	226
New Ashford	364	Savoy	326	West Springfield	56
NEW BEDFORD	8	Scituate	177	West Stockbridge	276
New Braintree	332	Seekonk	157	West Tisbury	340
New Marlborough	275	Sharon	181	Westborough	112
New Salem	316	Sheffield	242	WESTFIELD	44
Newbury	258	Shelburne	232	Westford	148
NEWBURYPORT	51	Sherborn	222	Westhampton	346
NEWTON	22	Shirley	189	Westminster	254
Norfolk	266	Shrewsbury	132	Weston	190
NORTH ADAMS	38	Shutesbury	354	Westport	153
North Andover	102	Somerset	142	Westwood	241
North Attleborough	78	SOMERVILLE	15	Weymouth	53
North Brookfield	174	South Hadley	115	Whately	253
North Reading	247	Southampton	295	Whitman	95
NORTHAMPTON	39	Southborough	205	Wilbraham	161
Northborough	210	Southbridge	55	Williamsburg	206
Northbridge	73	Southwick	265	Williamstown	140
Northfield	207	Spencer	107	Wilmington	168
Norton	186	SPRINGFIELD	7	Winchendon	108
Norwell	248	Sterling	251	Winchester	71
Norwood	59	Stockbridge	211	Windsor	325
		Stoneham	84	Winthrop	50
Oak Bluffs	277	Stoughton	97	WOBURN	48
Oakham	317	Stow	269	WORCESTER	5
Orange	119	Sturbridge	219	Worthington	335
Orleans	279	Sudbury	268	Wrentham	158
Otis	336	Sunderland	245		
Oxford	134	Sutton	176	Yarmouth	261
		Swampscott	81		
Palmer	74	Swansea	188	Camp Devens	366
Paxton	315			Tewksbury State In-	
PEABODY	43			firmary	367

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1921.	22		25A		10		24		25B		40	
			An- terior Polio- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	Massachusetts	3,901,971	233	47	8324	8	9100	603	164	58	649	-	5563	5
2	CITIES OVER 500,000.													
3	Boston	748,888	47	12	2083	2	2718	148	49	27	268	-	2595	1
4	CITIES OVER 150,000.													
5	Worcester	185,140	1	-	212	-	332	29	4	3	19	-	269	-
6	CITIES, 100,000-150,000.	706,490	23	1	1347	1	1631	149	34	7	78	-	1022	1
7	Springfield	138,028	8	1	304	-	246	23	4	2	18	-	269	-
8	New Bedford	124,895	2	-	155	-	294	27	11	1	4	-	112	-
9	Fall River	119,126	2	-	99	1	219	23	5	2	9	-	160	1
10	Lowell	114,268	1	-	91	-	293	36	4	1	4	-	197	-
11	Cambridge	109,969	5	-	610	-	226	11	5	1	39	-	157	-
12	Lynn	100,204	5	-	88	-	353	29	5	-	4	-	127	-
13	CITIES, 50,000-100,000.	423,546	41	4	756	3	1068	74	10	5	28	-	471	2
14	Lawrence	95,536	15	3	148	-	157	19	3	2	3	-	138	-
15	Somerville	95,061	-	-	99	2	239	28	2	1	13	-	55	-
16	Brockton	67,506	-	-	139	-	254	7	1	-	2	-	28	-
17	Holyoke	60,009	2	-	57	1	51	7	1	-	4	-	52	2
18	Haverhill	55,284	20	1	213	-	248	10	2	1	4	-	161	-
19	Quincy	50,150	4	-	100	-	119	3	1	1	2	-	37	-
20	CITIES AND TOWNS, 25,000- 50,000.	525,784	32	7	1216	1	1260	80	18	6	60	-	514	-
21	Malden	49,165	-	-	66	-	171	15	2	2	4	-	38	-
22	Newton	46,983	4	1	234	-	150	10	1	-	13	-	22	-
23	Salem	44,212	4	1	142	1	77	3	4	2	2	-	63	-
24	Chelsea	43,108	2	-	82	-	77	6	-	-	6	-	87	-
25	Pittsfield	42,444	5	4	63	-	114	4	1	2	-	-	25	-
26	Medford	41,731	2	-	67	-	100	5	-	-	12	-	22	-
27	Fitchburg	41,463	1	-	25	-	98	5	-	-	1	-	57	-
28	Everett	40,879	6	-	193	-	133	3	4	-	10	-	34	-
29	Brookline	39,092	1	-	225	-	48	2	1	-	7	-	14	-
30	Chicopee	38,133	2	1	9	-	87	10	2	-	1	-	8	-
31	Taunton	37,445	-	-	10	-	60	5	-	-	2	-	88	-
32	Waltham	31,155	1	-	100	-	70	10	-	-	2	-	16	-
33	Revere	29,974	4	-	-	-	75	2	3	-	-	-	40	-
34	CITIES AND TOWNS, 10,000- 25,000.	615,335	53	13	1284	-	980	55	25	6	93	-	315	-
35	Watertown	23,017	1	-	52	-	53	3	-	-	4	-	11	-
36	Gloucester	22,464	-	-	7	-	45	4	-	-	-	-	8	-
37	Beverly	22,435	-	-	29	-	21	2	1	-	-	-	23	-
38	North Adams	22,360	10	2	8	-	16	-	2	-	1	-	1	-
39	Northampton	22,044	2	-	65	-	59	8	1	2	4	-	7	-
40	Leominster	20,407	2	2	65	-	25	3	1	-	1	-	17	-
41	Attleboro	20,126	1	1	16	-	37	2	-	-	3	-	8	-
42	Arlington	19,857	2	-	49	-	22	3	-	-	9	-	14	-
43	Peabody	19,845	-	-	25	-	39	5	4	1	1	-	41	-

to the Public Health, 1921.

Line No.	11		101		7		13		40A		8		38		31, 37, 37A, 37B		32-36E		1		9	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
735	155	4080	1818	17827	174	3952	6	1573	-	8331	189	2497	198	6168	3304	827	551	917	121	5703	197	1
																						2
150	22	1092	453	3373	38	682	-	491	-	1879	53	1186	61	1886	752	271	116	129	24	692	32	3
																						4
47	2	298	115	1156	17	63	1	222	-	437	13	135	15	247	149	39	41	33	6	183	10	5
79	22	762	276	2536	43	644	4	512	-	1157	9	421	24	1186	570	178	118	180	20	1139	63	6
-	7	159	59	148	3	148	1	67	-	347	3	111	8	169	80	27	24	22	6	110	3	7
3	2	75	28	35	-	73	1	178	-	226	1	37	7	291	127	41	27	20	4	144	9	8
13	5	167	52	396	23	102	-	175	-	120	2	45	3	193	93	33	22	77	3	373	30	9
2	2	92	48	737	11	6	-	43	-	51	-	129	-	213	67	26	26	27	16	17	6	10
39	3	149	44	895	4	175	-	35	-	255	2	49	2	193	127	33	11	14	-	403	11	11
22	3	120	45	315	2	140	2	14	-	158	1	50	4	127	76	18	8	20	1	92	4	12
98	17	454	185	1097	7	411	-	116	-	692	21	263	18	604	273	95	48	68	11	596	18	13
8	2	64	37	161	2	37	-	25	-	170	11	99	2	168	85	23	14	23	4	77	6	14
20	2	115	40	136	2	32	-	19	-	176	2	28	3	128	59	22	6	10	2	89	4	15
2	4	72	22	22	-	194	-	50	-	75	2	55	3	74	19	26	11	17	3	163	2	16
1	4	30	24	29	3	22	-	9	-	39	3	19	1	89	41	3	7	5	1	15	1	17
62	3	116	31	25	-	114	-	8	-	144	3	50	7	86	41	11	5	9	1	211	4	18
5	2	57	31	724	-	12	-	5	-	88	-	12	2	59	28	10	5	4	-	41	1	19
47	22	573	224	1992	21	152	1	98	-	1100	37	123	22	672	327	96	82	215	21	971	19	20
8	2	84	25	71	1	4	-	19	-	153	6	8	1	71	25	15	11	7	1	29	2	21
3	1	74	34	78	1	17	-	5	-	85	1	6	-	54	23	4	2	12	-	174	-	22
1	-	38	16	65	2	29	-	7	-	50	1	8	3	50	30	4	5	5	1	32	-	23
2	1	78	23	154	3	5	-	29	-	122	5	29	1	76	30	10	5	11	-	36	1	24
2	2	42	22	239	-	3	-	3	-	117	12	7	1	81	37	12	16	10	6	93	2	25
1	-	18	9	299	-	5	-	3	-	92	1	3	-	43	27	3	2	2	-	33	4	26
1	-	50	15	864	9	22	-	2	-	13	-	17	-	50	28	3	5	13	2	1	2	27
16	-	55	14	58	-	10	-	9	-	154	3	5	-	44	20	22	7	2	-	32	1	28
3	-	21	11	39	-	50	-	4	-	55	1	1	-	40	20	8	5	4	1	417	1	29
-	10	13	9	8	-	-	-	4	-	31	1	3	-	40	25	4	7	4	-	1	3	30
4	2	37	21	86	1	4	1	5	-	91	3	24	14	62	45	5	8	10	3	32	1	31
4	3	49	14	28	-	3	-	6	-	65	2	4	1	26	15	2	8	132	7	91	-	32
2	1	14	11	3	4	-	-	2	-	72	1	8	1	35	2	4	1	3	-	-	2	33
108	29	540	242	2927	21	735	-	78	-	1688	28	173	22	823	484	81	67	159	21	562	24	34
-	-	21	4	38	-	3	-	1	-	32	-	6	-	24	11	6	-	3	-	9	1	35
-	1	8	11	7	-	5	-	5	-	58	-	5	2	54	19	1	5	10	-	17	-	36
-	-	32	7	20	-	20	-	4	-	38	1	16	-	20	6	3	1	5	1	36	3	37
20	1	9	3	102	1	1	-	3	-	32	1	10	-	24	15	1	2	3	1	4	-	38
-	5	20	8	150	-	1	-	-	-	46	-	7	12	44	49	3	3	5	-	13	-	39
1	-	32	7	427	3	5	-	2	-	47	9	4	-	32	5	2	2	4	-	16	-	40
3	3	22	10	5	-	48	-	1	-	61	-	11	1	26	36	5	4	3	1	25	-	41
1	-	8	4	116	-	2	-	1	-	51	-	-	-	27	18	-	-	9	-	21	-	42
1	-	13	5	4	-	67	-	3	-	49	1	7	-	29	8	4	5	1	-	21	3	43

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1921.	22		25A		10		24		25B		40	
			Cases.	Deaths.	Chicken Pox.	Diph- theria.	Ep. Cere- bro- spinal Menin- gitis.	Ger- man Meas- les.	Gonor- rhea.	Cases.	Deaths.			
												Ante- rior Polio- mye- litis.	Cases.	Deaths.
44	Westfield	18,665	2	1	21	-	32	4	1	1	-	-	6	-
45	Melrose	18,622	3	-	33	-	68	2	-	-	8	-	7	-
46	Framingham	17,403	-	-	105	-	56	-	1	-	1	-	4	-
47	Gardner	17,159	-	-	70	-	19	-	-	-	-	-	-	-
48	Woburn	16,625	-	-	16	-	43	-	1	-	6	-	10	-
49	Greenfield	16,360	3	-	34	-	20	-	1	-	5	-	9	-
50	Winthrop	16,307	1	-	65	-	3	-	-	-	7	-	9	-
51	Newburyport	15,715	3	1	64	-	13	2	1	-	1	-	5	-
52	Methuen	15,562	2	1	110	-	26	2	-	-	2	-	6	-
53	Weymouth	15,401	2	-	10	-	11	-	1	-	3	-	1	-
54	Marlborough	14,958	-	-	13	-	10	2	1	-	-	-	1	-
55	Southbridge	14,254	1	1	9	-	2	-	2	1	-	-	4	-
56	West Springfield	14,107	-	-	3	-	12	-	-	-	-	-	7	-
57	Webster	13,477	-	-	6	-	7	1	-	-	-	-	9	-
58	Milford	13,404	-	-	41	-	8	-	1	-	4	-	2	-
59	Norwood	13,148	5	3	39	-	11	-	1	-	2	-	8	-
60	Wakefield	13,102	1	1	10	-	39	-	-	-	1	-	9	-
61	Plymouth	13,083	-	-	41	-	7	1	2	-	2	-	7	-
62	Clinton	12,912	-	-	13	-	7	-	1	-	-	-	12	-
63	Adams	12,888	4	-	6	-	15	3	-	-	-	-	6	-
64	Easthampton	11,708	-	-	5	-	70	2	-	-	-	-	8	-
65	Belmont	11,592	1	-	54	-	39	1	1	-	3	-	4	-
66	Danvers	11,087	2	-	11	-	47	1	-	-	2	-	13	-
67	Saugus	11,078	-	-	34	-	8	1	-	-	3	-	1	-
68	Braintree	10,970	1	-	51	-	16	-	-	-	16	-	9	-
69	Natick	10,840	-	-	2	-	5	-	-	-	-	-	4	-
70	Dedham	10,713	-	-	17	-	3	-	-	-	-	-	6	-
71	Winchester	10,637	1	-	71	-	23	1	-	-	4	-	1	-
72	Amesbury	10,507	1	-	7	-	31	2	-	-	-	-	10	-
73	Northbridge	10,465	-	-	2	-	3	-	-	-	-	-	5	-
74	Palmer	10,031	2	-	5	-	9	-	1	1	-	-	2	-
75	TOWNS, 5,000-10,000.	314,777	19	5	894	-	620	34	8	1	69	-	194	1
76	Athol	9,795	2	-	7	-	9	1	-	-	-	-	11	-
77	Milton	9,629	-	-	91	-	6	-	-	-	10	-	2	-
78	North Attleborough	9,187	1	1	3	-	36	3	-	-	-	-	5	-
79	Middleborough	8,397	-	-	23	-	3	-	-	-	-	-	5	-
80	Andover	8,360	3	-	25	-	20	-	-	-	-	-	1	-
81	Swampscott	8,340	4	-	26	-	8	-	1	1	-	-	4	-
82	Ware	8,266	-	-	1	-	2	1	-	-	-	-	-	-
83	Bridgewater	8,141	-	-	40	-	2	-	-	-	-	-	7	-
84	Stoneham	7,994	-	-	14	-	42	-	-	-	1	-	3	-
85	Hudson	7,875	-	-	2	-	5	1	-	-	-	-	4	-
86	Ludlow	7,855	1	1	21	-	27	-	-	-	-	-	3	-
87	Rockland	7,692	-	-	4	-	3	-	-	-	1	-	3	-
88	Reading	7,639	1	-	2	-	7	-	-	-	-	-	2	-
89	Fairhaven	7,611	-	-	28	-	21	4	1	-	-	-	-	-
90	Montague	7,596	1	1	2	-	61	8	-	-	1	-	1	-
91	Marblehead	7,235	1	-	9	-	4	-	-	-	-	-	7	-
92	Maynard	7,185	-	-	-	-	35	2	-	-	-	-	3	-
93	Needham	7,160	-	-	12	-	2	-	-	-	-	-	3	-
94	Grafton	7,088	1	-	-	-	1	-	-	-	-	-	6	-
95	Whitman	7,030	-	-	22	-	8	-	-	-	-	-	4	-
96	Dartmouth	6,860	-	-	9	-	14	1	-	-	-	-	-	-
97	Stoughton	6,828	-	-	1	-	48	2	-	-	4	-	2	-
98	Lexington	6,606	-	-	19	-	2	-	-	-	7	-	4	-
99	Franklin	6,515	-	-	18	-	11	-	-	-	1	-	2	-
100	Mansfield	6,408	1	1	32	-	-	-	-	-	1	-	8	-
101	Concord	6,392	-	-	15	-	5	-	2	-	5	-	53	-
102	North Andover	6,362	1	-	21	-	18	2	-	-	-	-	-	1
103	Great Barrington	6,216	-	-	29	-	2	-	-	-	1	-	14	-

to the Public Health, 1921 — Continued.

11		101		7		13		40A		8		38		31, 37, 37A, 37B		32-36E		1		9		Line No.
Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
-	-	10	8	5	-	5	-	3	-	5	-	2	-	15	41	-	3	1	-	10	-	44
-	1	10	8	27	-	30	-	17	-	45	-	3	-	14	12	3	1	4	1	1	-	45
1	1	14	14	343	1	2	-	-	-	22	-	5	1	25	5	4	2	5	3	35	1	46
-	-	10	4	278	4	5	-	-	-	55	-	5	-	49	28	2	2	5	5	12	1	47
1	2	38	9	39	1	-	-	2	-	81	-	-	-	16	10	2	2	1	-	-	-	48
-	1	11	7	34	1	4	-	2	-	127	-	8	-	13	4	1	-	7	1	-	-	49
5	-	23	8	42	-	9	-	-	-	31	-	9	-	11	9	2	2	2	1	9	-	50
-	-	7	5	19	-	35	-	2	-	45	2	5	-	12	3	1	-	8	1	15	1	51
-	-	10	4	15	-	29	-	2	-	113	1	1	-	27	11	5	2	3	1	45	-	52
1	-	7	14	33	-	2	-	1	-	42	2	5	1	11	5	3	2	1	1	14	-	53
-	2	8	7	270	1	-	-	-	-	19	-	4	1	29	12	2	1	2	-	1	-	54
-	-	24	5	140	1	2	-	6	-	48	-	1	-	13	5	3	3	3	1	1	-	55
5	-	15	4	103	2	4	-	43	4	4	1	-	-	13	6	1	1	1	9	1	1	56
-	-	14	4	17	-	176	-	12	-	4	-	1	-	14	5	5	1	3	-	-	-	57
-	1	6	8	64	-	2	-	2	-	15	-	-	-	21	11	3	2	14	2	3	-	58
-	-	19	4	65	-	97	-	2	-	11	1	-	-	27	4	1	2	-	39	-	-	59
2	-	22	7	87	1	1	-	-	-	50	1	1	-	14	9	5	4	3	-	6	-	60
1	1	5	5	12	1	3	-	-	-	177	2	4	-	23	3	3	5	3	1	20	2	61
-	-	30	12	67	2	-	-	1	-	26	-	2	-	13	14	3	4	5	-	4	-	62
-	-	9	4	1	-	3	-	-	-	66	-	2	-	34	10	-	-	27	2	-	-	63
1	-	27	6	7	-	1	-	1	-	12	-	-	-	21	8	1	1	-	1	-	-	64
-	-	8	4	16	-	35	-	1	-	14	-	-	-	11	3	1	-	-	93	1	1	65
-	1	9	6	24	-	39	-	-	-	31	-	30	2	41	26	2	3	2	-	1	1	66
62	2	6	2	151	-	46	-	-	-	37	1	1	1	10	4	2	1	3	-	22	3	67
-	-	7	4	23	-	4	-	-	-	48	1	2	-	9	42	-	-	1	1	5	-	68
-	1	1	2	96	1	2	-	-	-	39	-	4	-	10	3	-	-	2	-	12	-	69
1	1	1	4	7	-	11	-	-	-	10	-	2	-	6	4	4	1	-	12	-	-	70
-	-	3	4	47	1	2	-	-	-	17	-	2	1	6	4	1	2	2	1	24	-	71
-	-	15	3	3	-	24	-	-	-	18	-	3	-	11	6	-	-	-	1	1	1	72
-	3	3	5	6	-	1	-	1	-	14	2	1	-	13	3	-	1	5	1	-	-	73
-	-	3	2	17	-	9	-	1	-	9	-	3	-	11	7	-	-	3	1	-	5	74
63	18	167	132	2281	7	500	-	48	-	585	11	152	10	289	181	43	35	51	8	590	7	75
-	7	5	4	16	-	7	-	-	-	6	-	2	-	3	3	1	2	1	-	3	-	76
5	-	10	2	160	-	18	-	-	-	14	-	1	-	5	2	1	1	-	32	-	-	77
-	1	1	4	10	1	1	-	-	-	7	-	4	3	10	3	-	2	-	2	-	-	78
1	-	6	3	9	-	30	-	1	-	5	-	1	-	14	7	1	-	1	95	1	-	79
1	1	2	-	354	1	5	-	1	-	39	1	1	-	9	3	-	1	6	1	2	-	80
-	-	3	2	-	-	27	-	2	-	20	-	2	-	5	2	-	-	-	-	-	-	81
-	-	6	1	-	-	-	-	1	-	6	1	-	-	4	4	-	-	-	-	-	-	82
-	-	11	3	2	-	59	-	-	-	13	-	58	3	23	15	1	1	2	-	51	-	83
1	-	1	5	184	-	-	-	-	-	10	-	4	-	6	3	-	-	2	-	7	-	84
-	-	1	1	1	-	-	-	2	-	3	-	-	-	7	6	-	-	2	-	-	-	85
-	-	1	1	1	-	1	-	5	-	29	2	1	-	12	4	1	-	-	-	4	-	86
-	-	5	3	2	-	-	-	1	-	-	-	1	-	10	7	1	1	-	-	3	-	87
-	-	1	1	5	-	-	-	-	-	22	-	-	-	4	4	-	-	1	1	-	-	88
-	-	3	2	2	-	33	-	6	-	28	2	-	-	14	3	1	1	3	-	16	1	89
-	-	7	5	75	-	-	-	2	-	3	-	2	-	5	1	-	1	3	-	-	-	90
-	-	3	6	1	-	4	-	1	-	21	-	-	-	4	2	-	-	1	-	-	-	91
-	-	1	1	-	-	-	-	-	-	1	-	-	-	7	6	2	-	1	1	-	-	92
1	2	8	8	8	-	-	-	-	-	11	-	-	-	1	2	1	2	-	43	-	-	93
-	-	2	3	2	-	-	-	-	-	-	-	-	-	7	14	1	1	-	-	-	-	94
-	-	2	-	3	-	11	-	-	-	15	-	1	-	7	1	2	2	4	1	23	-	95
-	-	8	-	1	-	5	-	2	-	13	-	-	-	6	3	2	1	2	1	21	1	96
-	-	2	10	-	-	5	-	1	-	14	-	-	-	11	3	-	1	-	-	-	-	97
-	-	1	3	74	-	5	-	2	-	6	-	1	-	10	5	1	1	-	-	57	1	98
1	1	5	4	6	-	1	-	-	-	6	-	2	-	4	2	-	-	-	22	-	-	99
-	-	7	2	153	-	8	-	1	-	9	-	1	-	4	-	-	-	1	-	3	-	100
33	-	14	7	184	-	3	-	2	-	7	-	12	-	8	2	-	-	-	-	-	-	101
-	-	5	2	4	-	3	-	-	-	29	-	-	-	3	4	-	-	-	-	7	-	102
2	1	9	2	205	-	3	-	-	-	61	-	-	-	1	2	-	1	2	-	21	-	103

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1921.	22		25A		10		24		25B		40	
			An- terior Poli- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
104	Ipswich	6,179	-	-	5	-	11	-	-	-	-	-	4	-
105	Wellesley	6,156	-	-	74	-	39	-	-	-	13	-	3	-
106	Canton	6,047	-	-	40	-	13	2	-	-	4	-	4	-
107	Spencer	5,910	-	-	14	-	3	-	1	-	-	-	2	-
108	Winchendon	5,903	-	-	13	-	46	2	-	-	-	-	-	-
109	Chelmsford	5,840	-	-	6	-	11	1	-	-	-	-	1	-
110	Abington	5,832	-	-	-	-	3	-	-	-	-	-	-	-
111	Millbury	5,766	-	-	35	-	17	1	-	-	-	-	2	-
112	Westborough	5,746	-	-	20	-	13	-	-	-	1	-	5	-
113	Hingham	5,711	-	-	50	-	17	-	-	-	10	-	3	-
114	Dracut	5,677	-	-	37	-	6	-	1	-	-	-	-	-
115	South Hadley	5,637	1	-	22	-	9	1	-	-	1	-	1	-
116	Amherst	5,548	-	-	3	-	7	-	-	-	4	-	-	-
117	Uxbridge	5,530	-	-	11	-	7	1	-	-	-	-	2	-
118	Walpole	5,432	1	1	45	-	4	-	2	-	4	-	6	-
119	Orange	5,397	-	-	-	-	7	-	-	-	-	-	2	-
120	Agawam	5,170	-	-	-	-	2	-	-	-	-	-	2	-
121	Easton	5,034	-	-	43	-	3	1	-	-	-	-	-	-
122	TOWNS, 2,500-5,000.	174,761	8	2	195	1	223	18	8	1	5	-	61	-
123	Barnstable	4,786	1	1	8	-	-	-	-	-	-	-	10	-
124	Monson	4,770	-	-	2	-	-	-	-	-	-	-	-	-
125	Randolph	4,763	-	-	-	-	3	-	-	-	-	-	3	-
126	Foxborough	4,256	-	-	17	-	3	-	-	-	1	-	5	-
127	Provincetown	4,231	-	-	17	1	-	-	-	-	-	-	2	-
128	Tewksbury	4,193	-	-	3	-	2	-	1	-	-	-	-	-
129	Wareham	4,175	-	-	-	-	18	1	-	-	-	-	2	-
130	Auburn	4,083	-	-	-	-	2	-	-	-	-	-	-	-
131	Templeton	4,000	-	-	6	-	-	-	-	-	-	-	2	-
132	Shrewsbury	3,996	-	-	-	-	1	-	-	-	-	-	-	-
133	Lee	3,960	-	-	-	-	2	-	1	-	-	-	-	-
134	Oxford	3,928	-	-	12	-	10	1	-	-	1	-	-	-
135	Blackstone	3,860	-	-	-	-	34	3	1	-	-	-	-	-
136	Billerica	3,772	-	-	-	-	9	1	-	-	-	-	1	-
137	Leicester	3,734	-	-	2	-	-	-	-	-	-	-	-	-
138	Rockport	3,728	-	-	5	-	-	-	-	-	-	-	1	-
139	Dalton	3,719	2	-	3	-	1	-	1	-	-	-	2	-
140	Williamstown	3,620	-	-	4	-	9	-	-	-	-	-	-	-
141	Medfield	3,579	-	-	1	-	3	-	-	-	-	-	3	-
142	Somerset	3,565	-	-	1	-	2	-	-	-	-	-	1	-
143	Dudley	3,489	-	-	4	-	3	2	-	-	-	-	-	-
144	East Bridgewater	3,422	-	-	-	-	8	-	1	-	-	-	1	-
145	Falmouth	3,368	-	-	17	-	4	1	-	-	1	-	2	-
146	Barre	3,320	-	-	2	-	1	-	-	-	-	-	-	-
147	Acushnet	3,292	-	-	5	-	18	1	-	-	-	-	-	-
148	Westford	3,273	2	-	11	-	2	1	-	-	-	-	-	-
149	Holbrook	3,228	1	-	-	-	1	-	1	-	-	-	1	-
150	Warren	3,214	-	-	-	-	1	-	-	-	-	-	1	-
151	Ayer	3,138	1	1	-	-	3	-	-	-	-	-	1	-
152	Holden	3,114	-	-	5	-	4	-	-	-	-	-	6	-
153	Westport	3,069	-	-	6	-	12	1	-	-	-	-	-	-
154	Harvard	3,001	-	-	-	-	-	-	-	-	-	-	-	-
155	Medway	2,991	-	-	-	-	11	3	-	-	-	-	3	-
156	West Bridgewater	2,961	-	-	-	-	-	-	2	-	-	-	-	-
157	Seekonk	2,939	-	-	-	-	1	-	-	-	-	-	-	-
158	Wrentham	2,932	-	-	15	-	-	-	-	-	-	-	3	-
159	Hardwick	2,924	-	-	1	-	-	-	-	-	2	-	-	-
160	Longmeadow	2,882	-	-	1	-	4	-	-	-	-	-	-	-
161	Wilbraham	2,861	-	-	-	-	1	-	-	-	-	-	-	-
162	Deerfield	2,823	-	-	5	-	5	1	-	-	-	-	-	-
163	Hadley	2,821	-	-	1	-	6	1	-	-	-	-	1	-

to the Public Health, 1921 — Continued.

11		101		7		13		40A		8		38		31, 37, 37A, 37B		32-35E		1		9		Line No.
Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
-	-	-	1	2	-	-	-	-	-	37	1	2	-	9	2	2	2	6	6	1	1	104
12	-	6	3	139	1	46	-	8	-	26	-	-	-	6	-	2	1	16	-	-	-	105
-	-	1	3	12	-	93	-	-	-	8	2	1	1	7	10	20	2	34	-	-	-	106
-	-	2	2	2	-	3	-	-	-	1	1	-	-	2	6	-	4	-	-	-	-	107
-	-	1	1	179	2	-	-	-	-	40	-	-	-	2	1	-	40	-	-	-	-	108
3	-	1	3	25	-	-	-	-	-	3	-	-	-	2	3	-	-	-	-	-	-	109
-	2	6	3	-	-	-	-	-	-	13	-	-	-	6	2	-	-	-	-	-	-	110
1	-	1	3	17	-	5	-	3	-	5	-	1	-	1	4	1	1	47	1	-	-	111
-	-	3	8	2	-	28	-	-	-	9	-	48	2	7	10	-	-	-	-	-	-	112
1	-	5	1	166	-	1	-	1	-	6	-	3	-	3	3	1	-	1	-	-	-	113
-	-	1	2	-	-	-	-	-	-	1	-	-	-	5	2	1	-	-	-	-	-	114
1	-	4	3	91	-	12	-	1	-	1	-	-	-	5	2	-	2	-	-	-	1	115
-	1	3	1	79	-	7	-	4	-	7	-	-	-	7	1	-	1	-	-	21	2	116
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-	1	6	4	8	-	18	-	-	-	9	-	1	-	9	4	1	4	2	1	7	-	118
-	-	-	4	48	2	2	-	-	-	3	-	1	-	3	2	-	-	-	-	-	-	119
-	-	-	1	-	-	-	-	-	-	9	-	-	-	1	5	-	-	-	-	-	-	120
-	-	8	6	38	-	47	-	-	-	5	1	-	-	6	3	-	-	-	-	-	8	121
52	13	88	89	1079	7	272	-	2	-	372	5	22	8	188	135	10	27	33	6	434	11	122
-	2	9	7	207	-	-	-	1	-	7	-	-	-	12	4	-	-	1	-	22	1	123
-	-	1	3	118	-	-	-	-	-	15	-	7	-	8	7	-	-	1	-	-	-	124
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1	-	5	1	21	1	-	-	-	-	5	-	3	-	8	4	1	1	-	-	1	-	126
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-	-	1	1	30	-	-	-	-	-	1	-	-	-	2	3	-	1	-	-	-	-	128
-	-	4	1	10	-	2	-	-	-	2	-	1	-	12	5	1	-	1	-	13	1	129
-	-	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	130
50	3	2	-	10	-	-	-	-	-	7	1	-	-	2	3	-	-	4	-	-	-	131
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-	1	-	5	12	-	-	-	-	-	27	-	-	-	9	3	-	2	-	-	4	-	133
-	-	-	-	22	-	84	-	-	-	39	1	-	-	5	1	-	1	-	-	-	-	134
-	-	1	6	-	1	-	-	-	-	4	-	-	-	2	2	-	-	-	-	1	-	135
-	1	5	3	16	-	1	-	-	-	2	-	-	-	8	5	2	1	1	-	4	1	136
-	-	-	2	32	-	-	-	-	-	7	1	-	-	1	3	-	2	-	-	-	-	137
-	-	-	1	9	-	3	-	-	-	1	-	-	-	3	3	-	1	-	-	-	-	138
-	-	-	-	3	-	-	-	-	-	8	-	-	-	-	3	-	1	1	-	-	-	139
-	1	2	5	50	-	2	-	-	-	71	-	-	-	5	1	-	2	1	-	-	-	140
-	-	12	7	4	-	18	-	-	-	13	-	-	3	20	21	-	5	-	-	1	-	141
-	-	2	3	-	-	-	-	-	-	5	-	-	-	4	2	-	-	1	-	2	2	142
-	-	1	3	1	1	84	-	-	-	7	-	-	-	1	2	1	-	-	-	-	-	143
-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	8	-	-	-	-	-	-	144
-	1	-	-	9	-	6	-	-	-	1	-	1	1	7	1	1	1	-	-	36	1	145
-	-	-	-	6	-	-	-	-	-	5	-	-	-	5	5	-	-	-	-	25	4	146
-	-	-	-	6	-	1	-	-	-	2	1	-	-	1	-	-	-	-	-	4	-	147
-	-	3	1	71	1	2	-	-	-	11	-	-	-	2	4	-	-	1	-	69	1	148
-	-	-	-	-	-	-	-	-	-	2	-	1	-	2	2	-	-	1	-	-	-	149
-	1	-	3	65	1	-	-	-	-	4	-	-	-	9	6	-	1	-	-	1	-	150
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-	-	3	-	30	-	-	-	-	-	9	-	3	1	-	-	1	2	1	-	1	-	152
-	-	-	-	9	-	1	-	-	-	4	-	-	-	1	1	-	1	1	-	22	-	153
-	-	-	3	7	-	2	-	-	-	1	-	-	-	3	1	-	-	1	-	9	-	154
-	-	1	-	8	-	-	-	-	-	1	1	-	1	1	1	-	-	-	-	9	-	155
-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	1	-	-	1	-	5	-	156
-	-	3	3	3	1	-	-	-	-	1	-	-	1	4	2	-	-	-	-	-	-	157
-	1	-	3	2	-	-	-	-	-	16	-	-	-	6	6	1	-	-	-	2	-	158
-	-	1	3	1	-	-	-	-	-	1	-	-	-	5	1	-	1	-	-	-	-	159
-	-	1	1	3	-	1	-	-	-	11	-	-	-	1	-	-	-	-	-	-	-	160
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	161
-	-	1	2	3	-	21	-	-	-	1	-	-	-	2	2	-	2	-	-	-	-	162
-	2	1	27	-	-	1	-	-	-	11	-	-	-	3	1	-	-	-	-	19	-	163

to the Public Health, 1921 — Continued.

11		101		7		13		40A		8		38		31, 37, 37A, 37B		32-36E		1		9		Line No.
Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
-	1	-	3	4	-	18	-	-	-	2	-	-	-	2	2	-	-	1	-	1	-	164
-	-	7	1	6	-	17	-	-	-	5	-	-	-	2	2	-	-	-	-	7	-	165
-	1	1	1	61	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	166
-	-	1	2	2	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	23	-	167
-	-	-	-	3	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	168
-	-	4	1	24	-	-	-	-	-	10	-	-	-	2	1	-	-	-	-	1	-	169
-	-	1	2	-	-	-	-	-	-	6	-	1	-	3	1	-	1	-	-	6	-	170
-	-	4	-	3	-	-	-	-	-	12	-	1	-	1	-	-	-	-	-	4	-	171
-	-	3	3	-	-	-	-	-	-	1	-	-	-	2	2	-	-	-	-	-	-	172
-	1	-	-	101	-	-	-	-	-	8	-	1	-	2	-	-	1	-	-	19	-	173
-	-	-	3	1	-	-	-	-	-	5	-	-	-	1	2	-	1	2	-	-	-	174
55	10	83	94	1382	13	490	-	6	-	417	12	13	4	203	348	10	15	44	3	536	13	175
-	-	3	-	39	2	8	-	-	-	1	1	-	-	-	-	-	-	1	-	-	-	176
-	-	-	-	-	-	-	-	-	-	1	-	2	-	2	2	-	-	1	-	-	-	177
1	1	9	3	3	-	4	-	-	-	2	-	1	-	7	9	-	-	-	-	3	1	178
-	-	2	1	1	-	-	-	-	-	4	-	-	-	8	4	-	-	-	-	-	-	179
-	-	-	-	-	-	-	-	-	-	14	-	-	-	2	2	-	1	-	-	-	-	180
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3	-	1	-	15	-	-	-	-	-	6	-	-	-	1	-	-	-	-	-	-	-	182
-	1	1	-	11	-	6	-	-	-	2	-	-	-	3	-	-	-	-	-	3	-	183
-	-	-	4	134	2	2	-	-	-	9	1	-	-	1	2	-	-	1	-	1	-	184
1	-	-	1	1	-	-	-	-	-	2	-	1	-	1	3	-	-	-	-	-	-	185
-	-	-	1	2	-	2	-	1	-	3	-	-	-	3	1	-	-	-	-	-	-	186
-	-	-	-	-	-	-	-	-	-	2	-	-	-	2	-	-	-	-	-	-	-	187
3	-	7	1	7	-	-	-	-	-	5	1	-	-	1	-	-	-	1	-	3	1	188
-	-	3	-	7	-	-	-	-	-	40	-	1	-	2	-	1	1	-	-	9	-	189
1	-	9	1	2	-	2	-	-	-	2	-	-	-	-	-	-	-	-	-	8	-	190
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-	-	-	-	2	-	1	-	-	-	1	-	1	-	-	-	-	-	1	-	5	-	192
-	-	-	1	20	1	2	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	193
-	-	-	-	20	-	121	-	-	-	-	-	-	-	8	2	-	-	1	-	61	-	194
-	-	-	6	10	-	5	-	-	-	-	-	-	-	2	-	1	-	-	-	1	-	195
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	196
-	-	-	-	13	-	-	-	-	-	2	-	-	-	11	-	-	1	-	-	2	-	197
-	-	-	-	15	-	3	-	-	-	-	-	-	-	5	-	-	-	1	-	6	-	198
8	1	1	2	8	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	1	-	199
4	-	2	2	1	-	1	-	-	-	2	-	1	-	1	1	-	-	11	-	1	-	200
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-	1	-	2	-	-	-	-	-	-	2	-	1	-	16	37	-	-	-	-	4	-	202
-	-	-	-	6	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	4	-	203
-	-	1	1	1	1	-	-	-	-	2	-	-	-	2	1	-	-	2	-	-	-	204
-	-	-	-	1	-	-	-	-	-	6	3	-	-	2	1	-	-	-	-	-	-	205
-	-	1	1	18	-	-	-	-	-	22	-	-	-	3	2	-	-	-	-	-	-	206
-	-	-	-	5	-	4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	207
-	-	-	1	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	208
4	-	-	-	42	-	1	-	1	-	2	-	1	-	2	1	-	-	1	-	5	1	209
1	-	-	1	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	210
-	-	2	-	20	-	1	-	-	-	6	-	-	-	1	-	-	-	-	-	8	-	211
-	-	-	-	46	-	52	-	-	-	8	1	-	-	1	2	-	-	-	-	-	-	212
-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	213
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70	-	-	-	-	-	-	214
-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-	1	215
-	-	1	-	82	-	76	-	-	-	1	-	-	-	2	1	-	-	-	-	-	-	216
5	-	4	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	217
-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	18	-	218
1	-	-	1	3	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	219
-	-	-	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	220
-	-	-	1	-	-	-	-	-	-	4	-	-	-	3	-	-	-	-	-	-	2	221
-	-	-	1	-	-	-	-	-	-	9	1	-	-	-	5	-	-	-	-	-	1	222
1	1	1	-	28	1	32	-	-	-	2	-	-	-	3	1	-	-	-	-	48	-	223

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1921.	22		25A		10		24		25B		40	
			An- terio- polio- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
224	Millis	1,499	-	-	-	-	3	-	-	-	-	-	1	-
225	Freetown	1,491	-	-	-	-	1	-	-	-	-	-	-	-
226	West Newbury	1,480	-	-	-	-	3	-	-	-	-	-	-	-
227	Cheshire	1,458	-	-	-	-	-	-	-	-	-	-	2	-
228	Dennis	1,446	1	-	2	-	-	-	-	-	-	-	-	-
229	Sandwich	1,445	-	-	1	-	1	-	-	-	-	-	-	-
230	Duxbury	1,437	-	-	13	-	1	-	-	-	-	-	-	-
231	Huntington	1,425	-	-	-	-	1	-	-	-	-	-	1	-
232	Shelburne	1,421	-	-	3	-	1	-	-	-	-	-	-	-
233	Essex	1,415	-	-	-	-	4	-	-	-	-	-	-	-
234	Lakeville	1,397	-	-	1	-	2	-	-	-	-	-	1	-
235	Buckland	1,390	-	-	-	-	-	-	-	-	-	-	-	-
236	Brookfield	1,366	-	-	3	-	1	-	-	-	-	-	-	-
237	Pembroke	1,364	-	-	-	-	-	-	-	-	-	-	-	-
238	Bedford	1,361	-	-	2	-	-	-	-	-	-	-	3	-
239	Plainville	1,352	-	-	2	-	3	-	-	-	-	-	-	-
240	Erving	1,335	-	-	-	-	1	-	-	-	-	-	-	-
241	Westwood	1,330	-	-	-	-	-	-	-	-	-	-	-	-
242	Sheffield	1,300	-	-	-	-	-	-	-	-	-	-	1	-
243	Nahant	1,297	-	-	-	-	-	-	-	-	-	-	-	-
244	Littleton	1,292	-	-	-	-	10	1	-	-	-	-	5	-
245	Sunderland	1,292	-	-	-	-	-	-	-	-	-	-	-	-
246	Chester	1,289	-	-	-	-	-	-	-	-	-	-	-	-
247	North Reading	1,284	-	-	-	-	-	-	-	-	-	-	-	-
248	Norwell	1,280	-	-	1	-	-	-	-	-	-	-	-	-
249	Russell	1,279	-	-	-	-	2	-	-	-	-	-	-	-
250	West Brookfield	1,279	-	-	-	-	-	-	-	-	-	-	1	-
251	Sterling	1,274	-	-	2	-	-	-	-	4	-	-	-	-
252	Marshfield	1,270	-	-	3	-	2	-	-	-	-	-	-	-
253	Whately	1,270	-	-	-	-	2	-	-	-	-	-	-	-
254	Westminster	1,264	-	-	-	-	4	-	-	-	-	-	2	-
255	Tisbury	1,260	-	-	-	-	15	1	-	-	-	-	-	-
256	Mattapoisett	1,253	-	-	1	-	3	1	-	-	-	-	1	-
257	Marion	1,225	-	-	3	-	1	-	-	1	-	-	-	-
258	Newbury	1,213	-	-	-	-	1	-	-	-	-	-	-	-
259	Lynnfield	1,182	-	-	-	-	4	-	-	-	-	-	-	-
260	Rowley	1,177	-	-	-	-	-	-	-	-	-	-	-	-
261	Yarmouth	1,171	-	-	-	-	5	-	-	1	-	-	-	-
262	Edgartown	1,163	-	-	-	-	-	-	-	-	-	-	7	-
263	Middleton	1,159	-	-	-	-	2	-	-	2	-	-	-	-
264	Clarksburg	1,143	-	-	-	-	-	-	1	-	-	-	-	-
265	Southwick	1,140	-	-	-	-	-	-	-	-	-	-	-	-
266	Norfolk	1,125	-	-	-	-	-	-	-	-	-	-	-	-
267	Wenham	1,097	-	-	-	-	-	-	-	-	-	-	-	-
268	Sudbury	1,094	-	-	-	-	-	-	-	-	-	-	-	-
269	Stow	1,093	-	-	-	-	1	1	-	-	-	-	-	-
270	Tyngsborough	1,068	-	-	6	-	2	-	-	-	-	-	-	-
271	Lanesborough	1,043	-	-	-	-	-	-	-	-	-	-	-	-
272	Hubbardston	1,033	-	-	-	-	-	-	-	-	-	-	1	-
273	Rochester	1,011	-	-	2	-	9	-	-	1	-	-	-	-
274	Hinsdale	1,005	-	-	-	-	-	-	-	-	-	-	-	-
275	New Marlborough	1,004	-	-	1	-	-	-	-	1	-	-	-	-
276	West Stockbridge	989	-	-	-	-	-	-	-	-	-	-	-	-
277	Oak Bluffs	984	-	-	2	-	7	-	-	-	-	-	-	-
278	Mendon	970	-	-	1	-	-	-	-	-	-	-	-	-
279	Orleans	964	-	-	1	-	-	-	-	-	-	-	-	-
280	Lincoln	958	-	-	-	-	-	-	-	-	-	-	-	-
281	Burlington	927	-	-	-	-	-	-	-	-	-	-	-	-
282	Berkley	920	-	-	-	-	-	-	-	-	-	-	-	-
283	East Brookfield	900	-	-	-	-	-	-	-	-	-	-	-	-
284	Conway	880	-	-	-	-	-	-	-	-	-	-	-	-
285	Berlin	869	-	-	-	-	-	1	-	-	-	-	-	-
286	Gill	857	-	-	4	-	1	1	1	-	-	-	-	-

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1921.	22		25A		10		24		25B		40	
			An- terior Polio- mye- litis.		Chick- en Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Mea- sles.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
350	Alford	241	-	-	1	-	-	-	-	-	-	-	-	-
351	Mashpee	236	-	-	-	-	-	-	-	-	-	-	-	-
352	Montgomery	229	-	-	-	-	-	-	-	-	-	-	-	-
353	Washington	229	-	-	-	-	-	-	-	-	-	-	-	-
354	Shutesbury	227	-	-	-	-	-	-	-	-	-	-	-	-
355	Chilmark	225	-	-	-	-	-	-	-	-	-	-	-	-
356	Prescott	216	-	-	-	-	-	-	-	-	-	-	-	-
357	Goshen	203	-	-	-	-	-	-	-	-	-	-	-	-
358	Tolland	190	-	-	-	-	-	-	-	-	-	-	-	-
359	Holland	151	-	-	-	-	-	-	-	-	-	-	-	-
360	Gay Head	135	-	-	-	-	-	-	-	-	-	-	-	-
361	Monroe	134	-	-	-	-	-	-	-	-	-	-	-	-
362	Peru	134	-	-	-	-	-	-	-	-	-	-	-	-
363	Gosnold	124	-	-	-	-	-	-	-	-	-	-	-	-
364	New Ashford	124	-	-	-	-	-	-	-	-	-	-	-	-
365	Mount Washington	66	-	-	-	-	-	-	-	-	-	-	-	-
366	CAMP DEVENS	-	-	-	-	-	1	-	-	-	-	-	-	35
367	STATE INFIRMARY, TEWKSBURY	-	-	-	19	-	15	2	2	-	-	-	-	28

In addition to the above there occurred 2 cases of actinomycosis, with 1 death:—

	Cases.	Deaths.
Boston	1	-
Cambridge	1	1

6 cases of anthrax:—

	Cases.	Deaths.
Danvers	1	-
Deerfield	1	-
Haverhill	1	-
Lynn	1	-
Wayland	1	-
Worcester	1	-

118 cases of dog bite (requiring antirabic treatment):—

	Cases.	Deaths.
Arlington	1	-
Billerica	2	-
Boston	8	-
Braintree	1	-
Bridgewater	1	-
Brookline	4	-
Charlton	1	-
Chelmsford	6	-
Dighton	1	-
Everett	2	-
Fall River	16	-
Framingham	1	-
Freetown	1	-
Granby	1	-
Hingham	1	-
Holbrook	1	-
Holyoke	2	-
Lawrence	12	-
Lexington	2	-
Lowell	24	-
Lynn	5	-
Natick	1	-
New Bedford	1	-
Newton	1	-

	Cases.	Deaths.
North Adams	2	-
North Attleborough	1	-
Pittsfield	1	-
Plainville	1	-
Somerville	1	-
South Hadley	1	-
Springfield	1	-
Swansea	1	-
Taunton	3	-
Webster	1	-
Weymouth	1	-
Winthrop	4	-
Woburn	1	-
Worcester	1	-
Wrentham	2	-

25 cases of dysentery, with 23 deaths:—

	Cases.	Deaths.
Adams	1	-
Ayer	-	1
Bellingham	-	1
Beverly	-	1
Boston	5	-
Braintree	1	1
Cambridge	1	1
Clinton	-	1
Concord	1	-
Danvers	2	-
Everett	1	1
Fall River	-	2
Framingham	1	-
Great Barrington	1	1
Hardwick	-	1
Haverhill	2	-
Holden	1	-
Holyoke	-	1
Ipswich	1	-
Malden	1	-
Marshfield	-	1

to the Public Health, 1921 — Concluded.

11		101		7		13		40A		8		38		31, 37, 37A, 37B		32-36E		1		9		Line No.
Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	351
-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	352
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	353
-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	19	354
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	355
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	356
-	-	-	1	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	357
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	358
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	359
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	360
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	361
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	362
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	363
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	364
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	365
36	-	1	-	5	-	3	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	366
-	-	22	8	9	-	-	-	-	-	4	-	7	14	70	85	4	2	5	1	-	-	367

	Cases.	Deaths.		Cases.	Deaths.
Medford	-	1	Lowell	2	2
North Adams	-	1	Ludlow	1	2
Oxford	-	1	Lynn	7	2
Plainfield	5	-	Marlborough	-	1
Southbridge	-	1	Melrose	1	1
Sutton	-	1	Mendon	1	1
Warren	1	-	Milford	1	1
Watertown	-	1	Millbury	-	1
Woburn	-	1	Milton	1	-
Worcester	1	3	Newbury	1	-
			Newburyport	1	-
117 cases of encephalitis lethargica, with 74 deaths:—			Newton	4	1
Adams	1	1	North Adams	1	-
Arlington	1	-	Northampton	1	1
Attleboro	-	1	Norwood	1	-
Bedford	1	1	Peabody	-	1
Belmont	1	-	Quincy	2	1
Beverly	1	1	Salem	1	1
Boston	40	29	Somerset	1	1
Braintree	1	-	Somerville	1	1
Broekton	-	2	Springfield	4	3
Brookline	2	2	Swampscott	1	-
Cambridge	2	-	Wakefield	3	-
Chelsea	1	1	Waltham	1	-
Chicopee	1	-	Watertown	-	1
Danvers	1	1	Webster	2	1
Douglas	1	-	Weymouth	1	1
Dudley	1	-	Winchendon	1	-
Easthampton	1	-	Winthrop	1	1
Everett	3	1	Worcester	4	3
Fall River	2	2			
Fitchburg	1	1	1 case of hookworm:—		
Framingham	-	1	Boston	1	-
Gloucester	-	1			
Greenwich	1	-	1 case of leprosy, with 1 death:—		
Haverhill	3	-	Boston	1	1
Holyoke	3	1			
Lawrence	2	3			

49 cases of malaria, with 2 deaths:—		Cases.	Deaths.	37 cases of smallpox:—		Cases.	Deaths.
Boston		18	—	Boston		6	—
Brockton		2	—	Gloucester		2	—
Chelsea		4	—	Malden		3	—
Dedham		6	—	Methuen		12	—
Douglas		1	—	Salem		7	—
Dover		1	—	Tisbury		1	—
Fall River		3	—	Worcester		6	—
Fitchburg		1	—	39 cases of tetanus, with 25 deaths:—			
Framingham		1	—	Barnstable		1	1
Holyoke		1	—	Beverly		1	1
Methuen		1	—	Boston		9	6
Milford		2	—	Brockton		1	1
Newton		1	—	Brookline		—	1
Northampton		1	1	Cambridge		2	—
Northbridge		2	—	Chelsea		1	—
Taunton		1	—	Clinton		1	1
Westport		—	1	Dennis		1	—
Winthrop		1	—	Fall River		2	2
Worcester		2	—	Fitchburg		2	2
14 cases of pellagra, with 14 deaths:—				Haverhill		1	1
Boston		5	4	Leominster		1	1
Brockton		1	—	Lowell		1	—
Danvers		5	4	Lynn		1	1
Northampton		1	3	New Bedford		2	1
Salem		—	1	North Adams		1	1
Waltham		2	1	Oak Bluffs		—	1
Winchester		—	1	Peabody		1	—
1 case of rabies, with 3 deaths:—				Pittsfield		3	3
Boston		1	1	Salem		2	—
Lawrence		—	2	Shirley		1	—
140 cases of septic sore throat, with 42 deaths:—				Springfield		1	1
Arlington		1	—	Taunton		1	—
Ayer		1	—	Winchester		1	—
Belmont		1	—	Worcester		1	—
Berlin		—	1	97 cases of trachoma:—			
Boston		56	10	Arlington		1	—
Braintree		1	—	Boston		42	—
Bridgewater		1	1	Braintree		2	—
Brookton		2	1	Brockton		1	—
Brookline		1	—	Cambridge		3	—
Cambridge		7	—	Chelsea		4	—
Chicopee		2	—	Everett		1	—
Clinton		1	—	Fall River		1	—
Dracut		—	1	Fitchburg		3	—
Easthampton		—	1	Haverhill		1	—
Fairhaven		1	1	Holliston		1	—
Fall River		2	1	Lancaster		1	—
Fitchburg		1	—	Lawrence		2	—
Framingham		—	1	Lowell		2	—
Haverhill		1	—	Lynn		4	—
Holyoke		—	2	Medford		2	—
Lawrence		4	1	Methuen		1	—
Leominster		2	1	Needham		1	—
Lowell		7	6	Newton		1	—
Lynn		3	2	Northbridge		1	—
Malden		1	1	Norwood		1	—
Mansfield		1	—	Plymouth		1	—
Methuen		6	—	Somerville		5	—
Middleborough		1	—	Springfield		1	—
New Bedford		4	—	Taunton		1	—
Newburyport		7	4	Wakefield		1	—
Newton		3	1	Watertown		2	—
North Adams		—	1	West Springfield		1	—
Peabody		1	—	Whitman		1	—
Pittsfield		—	1	Worcester		8	—
Saugus		2	—	10 cases of trichinosis, with 1 death:—			
Somerset		1	—	Boston		1	—
Somerville		3	—	Maynard		1	—
Springfield		2	1	Somerville		1	—
Stoughton		2	—	Winchester		6	—
Sutton		1	—	Worcester		1	1
Taunton		1	1	2 cases of typhus fever, with 1 death:—			
Wakefield		2	—	Boston		1	—
Watertown		2	—	Gloucester		1	1
West Springfield		1	—				
Westford		1	—				
Westport		1	—				
Winthrop		1	—				
Worcester		1	1				

CASES AND DEATHS, WITH CASE AND DEATH RATES, PER 100,000 POPULATION
FOR ALL REPORTABLE DISEASES DURING THE YEAR 1921.

DISEASE.	Cases.	Deaths.	Case Rate.	Death Rate.	Fatality Rate.
Actinomycosis	2	1	.1	-	50.0
Anterior poliomyelitis	233	47	6.0	1.2	20.2
Anthrax	6	-	.2	-	-
Chicken pox	8,324	8	213.3	.2	.1
Diphtheria	9,100	603	233.2	15.5	6.6
Dog bite	118	-	3.0	-	-
Dysentery	25	23	.6	.6	92.0
Encephalitis lethargica ¹	117	74	3.0	1.9	63.2
Epidemic cerebrospinal meningitis	164	58	4.2	1.5	35.4
German measles	649	-	16.6	-	-
Gonorrhoea	5,563	5	142.5	.1	.1
Hookworm	1	-	-	-	-
Influenza	735	155	18.8	4.0	21.1
Leprosy	1	1	-	-	100.0
Malaria	49	2	1.3	.1	4.1
Measles	17,827	174	456.8	4.4	1.0
Mumps	3,952	6	101.3	.2	.2
Ophthalmia neonatorum ²	1,573	-	40.3	-	-
Pellagra	14	14	.4	.4	100.0
Pneumonia, lobar	4,080	1,818	104.5	46.6	44.6
Rabies	1	3	-	.1	300.0
Scarlet fever	8,331	189	213.5	4.8	2.3
Septic sore throat	140	42	3.6	1.1	30.0
Smallpox	37	-	.9	-	-
Syphilis	2,497	198	64.0	5.1	7.9
Tetanus	39	25	1.0	.6	64.1
Trachoma	97	-	2.5	-	-
Trichinosis	10	1	.3	-	10.0
Tuberculosis, pulmonary	6,168	3,304	158.0	84.7	53.6
Tuberculosis, other forms	827	551	21.2	14.1	66.6
Typhoid fever	917	121	23.5	3.1	13.2
Typhus fever	2	1	.1	-	50.0
Whooping cough	5,703	197	146.1	5.0	3.5
Totals	77,302	7,621	1,980.7	195.3	9.9

¹ Made reportable March 1, 1921.² Includes suppurative conjunctivitis.

INCIDENCE OF COMMUNICABLE DISEASES BY MONTHS, 1921.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Totals.
Actinomycosis	-	-	1	-	1	-	-	-	-	-	-	-	2
Anterior poliomyelitis	10	10	7	3	6	4	26	61	54	27	15	10	233
Anthrax	-	1	-	1	-	2	-	-	1	1	-	-	6
Chicken pox	1,454	1,349	1,490	947	502	448	226	53	61	248	646	900	8,324
Diphtheria	965	795	755	676	644	623	441	516	525	887	1,185	1,088	9,109
Dog bite	2	6	6	6	9	11	1	18	15	16	11	17	118
Dysentery	1	5	2	1	-	-	1	5	4	6	-	-	25
Encephalitis lethargica	-	-	43	14	7	4	9	5	12	12	8	3	117
Epidemic cerebrospinal meningitis	21	13	14	18	14	9	14	15	8	10	18	10	164
German measles	52	81	107	101	128	83	23	10	11	13	15	25	649
Gonorrhoea	483	474	473	468	449	441	459	542	508	434	460	372	5,563
Hookworm	-	-	-	-	-	-	-	-	-	-	1	-	1
Influenza	158	134	125	124	54	12	4	4	15	28	31	46	735
Leprosy	-	-	-	1	-	-	-	-	-	-	-	-	1
Malaria	1	-	4	5	-	7	8	6	10	5	1	2	49
Measles	2,230	2,325	2,836	3,291	2,449	1,635	866	268	201	313	578	835	17,827
Mumps	339	430	768	580	436	435	183	76	74	139	241	251	3,952

Ophthalmia neonatorum ²	141	137	112	161	129	113	130	141	149	119	129	112	1,573
Pellagra	1	1	2	3	2	1	-	1	2	-	1	-	14
Pneumonia, lobar	587	466	582	565	374	291	87	76	126	191	353	382	4,080
Rabies	-	-	-	-	-	-	1	-	-	-	-	-	1
Scarlet fever	1,135	1,192	1,258	1,013	619	492	251	231	279	431	661	739	8,331
Septic sore throat	23	20	10	11	8	9	4	5	6	8	14	22	140
Smallpox	9	3	12	7	-	-	-	-	-	5	1	-	37
Syphilis	256	203	267	216	217	185	171	191	196	170	208	217	2,497
Tetanus	-	-	-	5	2	3	7	4	8	5	3	2	39
Trachoma	6	10	8	14	11	8	6	7	9	7	6	5	97
Trichinosis	-	-	-	2	5	-	1	-	1	-	1	-	10
Tuberculosis, pulmonary	534	476	* 579	574	521	588	479	515	512	451	455	484	6,168
Tuberculosis, other forms	70	82	94	71	67	87	55	57	60	72	45	67	827
Typhoid fever	38	43	52	44	167	58	62	113	124	106	59	51	917
Typhus fever	-	1	-	-	-	-	-	-	-	-	-	1	2
Whooping cough	669	713	894	707	487	509	474	375	247	156	223	249	5,703
Totals	9,185	8,970	10,501	9,629	7,338	6,058	3,989	3,295	3,218	3,860	5,369	5,890	77,302

¹ Made reportable March 1, 1921.

² Includes suppurative conjunctivitis.

DIVISION OF BIOLOGIC LABORATORIES

BENJAMIN WHITE, Ph.D., *Director*

WILLIAM A. HINTON, M.D., *Assistant Director*

ROBERT N. NYE, M.D., *Assistant Director*

REPORT OF DIVISION OF BIOLOGIC LABORATORIES.

ANTITOXIN AND VACCINE LABORATORY.

The activities of this laboratory may be best discussed under the following headings: —

1. Production and distribution.
2. Improvements:
 - (a) In methods and production.
 - (b) In plant and equipment.
3. Expenses.
4. Personnel.
5. Educational activities.
6. Résumé.

1. *Production and Distribution.*

The accompanying table shows the amounts of the various biologic products distributed during the fiscal years 1920 and 1921.

PRODUCT.	1920.	1921.
1. Diphtheria antitoxin:		
Distributed (1,000 unit doses)	218,227	261,024
2. Antimeningococcic serum:		
Distributed (doses)	3,585	3,444
3. Antipneumococcic serum:		
Distributed (doses)	444	649
4. Smallpox vaccine:		
Distributed (capillary tubes)	189,064	197,733
5. Typhoid-paratyphoid vaccine:		
Distributed (doses)	49,191	55,804
6. Schick outfits:		
Distributed (doses)	6,300	54,750 ¹
7. Diphtheria toxin for Schick test:		
Distributed (cubic centimeters in bulk)	0	32
8. Diphtheria toxin-antitoxin mixture:		
Distributed (doses)	3,614	9,414
9. Normal serum:		
Distributed (cubic centimeters)	0	9,788

¹ One outfit equals 50 doses.

(a) *Diphtheria Antitoxin*. — From this table it is to be seen that the distribution of diphtheria antitoxin exceeds the amounts of any previous year. This unprecedented demand has been met from the reserve stocks mentioned in last year's report.

(b) *Antimeningococcic Serum*. — The amount of this product distributed remains approximately the same as last year.

(c) *Antipneumococcic Serum*. — There was approximately a 46 per cent increase in the amount of this product distributed.

(d) *Vaccine Virus*. — This item shows a 5 per cent increase.

(e) *Bacterial Vaccine made from Typhoid and Paratyphoid A and B Bacilli*. — There was a 12 per cent increase in the distribution of this product.

(f) *Schick Outfits*. — There were 1,095 outfits distributed in 1921 against 63 outfits in 1920. This great increase may be considered as a direct result of the active campaign carried on by the State Department of Public Health during the year.

(g) *Diphtheria Toxin-antitoxin Mixture*. — The 160 per cent increase in the distribution of diphtheria toxin-antitoxin mixture is most gratifying. Each month shows a progressive increase in the number of doses distributed and there is every reason to expect that this progressive increase will continue for some time to come. Every lot distributed has met every requirement of the United States Hygienic Laboratory, and in addition has been safeguarded by duplicate tests.

2. *Improvements.*

(a) The various methods of making the different biologic products have been refined, and the potency, sterility and safety tests have been amplified in excess of the government requirements. Further improvements in the packages and in the pamphlets accompanying the products are under way.

Owing to the fact that the success in producing more potent toxin has resulted in a higher degree of immunity in the horses and to the higher degree of efficiency developed in the concentration process, the potency of the diphtheria antitoxin shows a marked increase, and it is now possible to put out a much more concentrated antitoxin.

(b) The physical condition of the laboratory has been greatly improved by the painting of four rooms and the basement, by the addition of new apparatus, which greatly facilitates the work, and particularly by the installation of an incubator room. Although this incubator room cost approximately \$1,300 to construct and install, its operation has resulted in a marked reduction in electric current bills;

it takes the place of four other incubators and provides sufficient incubating space to accommodate any future expansion of the work. On account of its dependability, the lots of diphtheria toxin prepared since its installation show a greater uniformity and higher degree of potency than formerly.

3. *Expenses.*

A table showing the comparative amounts spent for personal services and expenses in 1920 and 1921 follows:—

	1920.	1921.
Personal service	\$23,094 16	\$28,610 41
Expenses	23,742 37	24,500 46
Total	\$46,836 53	\$53,110 87

The increase in appropriation has been necessary to put the laboratory in better physical condition, to supply much needed apparatus, to meet the increased production, and for the salaries of added assistants. Further increase, as already requested in budget estimate for 1922, will be necessary if this laboratory is to meet the demands made upon it by the physicians of the Commonwealth.

The laboratory has been fortunate in having horses presented and has, to a large extent, been spared the necessity of purchasing animals for serum production.

4. *Personnel.*

The former assistant director resigned in October, 1921, and the position has been filled by the appointment of Dr. Robert N. Nye. The director feels that on account of the training, experience and the scientific and personal qualifications of Dr. Nye the Department is to be congratulated upon this appointment.

During the past year two assistant bacteriologists Grade II, one laboratory assistant Grade I, one laborer, female, and one laborer, male, have been added to the staff. These additions have been made necessary partly by Federal requirements and partly on account of the increased activities of the laboratory due to the greatly increased demand for its products. With the appointment of Mr. Bemis, it will now be possible to concentrate practically all the diphtheria antitoxin produced in this laboratory. With the appointment of Miss Harris, the amplification of control tests on biologic products has been made possible, and through the appointment of the two laborers the cleanliness of the laboratory and stable has been markedly increased.

5. *Educational Activities.*

This laboratory has continued, to a greatly increased extent, its function as a place of instruction for physicians, medical and other college students, nurses and the general public in the preparation and use of biologic products and their application in preventive medicine. During the year 12 demonstrations have been given to a total of 526 people. The results of this educational work are shown by the interest aroused not only in private physicians, but in officials of various institutions, which has been manifested in their adoption and increased use of biologic products. In addition to this phase of the work, the director has also addressed medical, college and lay organizations on the achievements of preventive medicine and on the use of biologic products.

The greatest educational activity of this Division has been in the campaign to introduce and extend the use of the Schick test and diphtheria toxin-antitoxin mixture for the prevention of diphtheria. Clinics, demonstrations and lectures have been given before medical societies, before the Massachusetts Association of Boards of Health and before meetings arranged by boards of health, and popular talks have been given before school children, teachers and parents. Nearly everywhere this campaign has been met with eagerness and with the active co-operation of health officers, physicians and school officials. One phase or another of this work has been carried on in the following towns, and largely as a result of this work clinics have been established in all these towns, either by the board of health or the school board, and the use of the Schick test has been supplemented by the use of toxin-antitoxin mixture by practicing physicians in these localities.

Cities and Towns in which the Schick Test has been demonstrated.

CAMBRIDGE.	LYNN.	WALTHAM.
FALL RIVER.	NEWTON.	Wellesley.
Foxborough.	North Reading.	Winchendon.
Hingham.	SOMERVILLE.	WORCESTER.
LAWRENCE.		

On account of the importance of this work, it is intended to devote much time to its continuation during the coming year.

The laboratories of the Division have served to a greater extent as places of instruction to students and public health workers. During the past year students from the Harvard Medical School and foreign students, fellows of the International Health Board, have acted as

voluntary assistants in the laboratory. It is hoped that the laboratories may further serve as teaching centers for health workers in the public health field.

6. *Résumé.*

The greatly increased distribution of biologic products is undoubtedly due to the educative campaign carried out by the Department and by the hearty interest and co-operation shown by the various local boards of health, institutions and practicing physicians throughout the State. The Director desires to record here his deep appreciation of the courtesy and co-operation extended to him by these various agencies and individuals.

Acknowledgment should also be made of the faithful and conscientious services rendered by the majority of the employees of this laboratory during the year, demanded of them by the labor resulting from the increased production.

The increased distribution of products has taxed both the personnel and the capacity of the present laboratory to the utmost, and should this increase progress still further, it will be necessary to provide larger accommodations for this work.

WASSERMANN LABORATORY.

The general character of the work and the number of personnel of the Wassermann Laboratory have not changed during the past year. There has been, however, a noteworthy increase in the number of tests, as indicated by the following table: —

	1916.	1917.	1918.	1919.	1920.	1921.
Wassermann tests	25,497	28,524	27,534	31,485	36,953	42,679
Gonococcus fixation tests	-	-	-	222	1,726	1,703
Lange's colloidal gold tests	-	-	-	-	-	82
Diagnostic examinations for the Division of Animal Industry:						
(a) Complement fixation tests for glanders.	985	1,330	646	122	221	125
(b) Examinations for rabies	47	67	61	84	166	277
(c) Pathologic and bacteriologic examinations.	10	3	45	79	64	50
	26,539	29,924	28,286	31,992	39,130	44,916

It is to be noted from this table that the total number of tests for each succeeding year has shown an increase except for 1918. This was undoubtedly due to the pandemic of influenza which largely occupied the attention of medical men.

Lange's colloidal gold test was added because of insistent requests from the State-approved venereal clinics to furnish a more complete examination of spinal fluid for the "discharge cases" of treated syphilis and the diagnosis of neurosyphilis.

The increase in the number of Wassermann tests ($15\frac{1}{2}$ per cent) with the present personnel has been possible only by a high degree of efficiency on the part of the individual workers. This is likewise true of the diagnostic tests for rabies, which show an increase of 67 per cent. These two classes of examinations constitute approximately 90 per cent of the laboratory's work.

The requests for complement fixation tests for glanders have decreased owing to the slight prevalence of this disease. The peak of the crest reached during 1917 was due, undoubtedly, to the fact that thousands of mules and horses were brought into the State by the United States Army.

In addition to the above, a statistical investigation has been carried on in connection with 10,431 cases of pregnancy, which were consecutive admissions to four large institutions, and it therefore represents an analysis of the incidence of syphilis among married women. Three and three-quarters per cent gave a positive reaction and $3\frac{1}{4}$ per cent a doubtful reaction, leaving 93 per cent showing no evidence of syphilis as indicated by the Wassermann test. There was a variation in the age groups, the incidence of positive reactions being slightly larger in the younger than in the older women. A marked difference was noted in the incidence of positive reactions (syphilis) among the various racial groups, showing as low as 0.9 per cent among Greeks and 33 per cent among negroes. A detailed account of this investigation is being prepared for publication in one of the current medical journals.

DIVISION OF HYGIENE

MERRILL E. CHAMPION, M.D., *Director*

MARY R. LAKEMAN, M.D., *Assistant Director*

REPORT OF DIVISION OF HYGIENE.

The work of the Division of Hygiene has not extended into any particularly new fields during 1921, but has represented a measured and healthy progress along paths which have been gradually cleared during the past few years. Extension of our work is now made difficult by lack of money and personnel, to say nothing of lack of actual office space.

GENERAL SURVEY.

It may not be amiss to recapitulate the various activities of the Division of Hygiene. Broadly speaking, they are educational in character. Child hygiene occupies first place both in time and money expended. The attempt is made, however, to touch the whole field of personal hygiene, bearing down on adult as well as child hygiene. The preventable noncommunicable diseases come within the scope of the Division. Nevertheless, owing to the fact that heart disease and kidney disease are comparatively recent acquisitions, even to a limited degree, of the field of preventive medicine, little has been done by our Department to cope with these serious affections which so often cut off the individual at or near the time of his greatest productivity. Heart disease in children seems to offer a most promising field, but the unsolved problems of infant and maternal mortality and morbidity present such a challenge to a health department that, for the time being, others must be in the nature of luxuries beyond the purse of the impecunious official agency.

An Exception to the Rule — Cancer.

One exception to this rule should be recorded. For several years now \$3,000 have been spent annually through the Division of Hygiene to aid in the control of cancer. The problem of cancer is not entirely or even mainly one of public health. The dissemination of information as to methods of preventing death from cancer is clearly a health department function; so is the furnishing of diagnostic service. With the actual treatment of cancer, the municipality or State should not

interfere. The Division of Hygiene has scrupulously observed this distinction in its work.

With this general description of the work of the Division of Hygiene, it is in order to discuss more in detail the various phases of the active work carried on by the Division with special reference to the work of the past year. First in point of time comes our health exhibit and health weeks.

Health Exhibit and Health Weeks.

Health exhibits represent an early development of health educational work; health weeks are comparatively new. It is undoubtedly true, however, that the indiscriminate use of "weeks" of all kinds has seriously lessened their influence for good. The true purpose of a health week ought to be to focus public opinion and interest upon some phase of municipal or private health activity which is not being sufficiently stressed. The purpose back of the health exhibit or health week should be a serious one and not merely a desire to entertain or even to "take a shot in the dark." The objective ought to be clearly seen and ought to be worth the effort involved in arranging the activities of the "week." If the town is lacking in school nurses, the whole effort of the health week ought to be the getting of more nurses. This involves getting as many as possible of the townspeople talking and thinking school nurse. This cannot be done unless all the local agencies which normally touch on some phase of health work are sharing in making a "go" of the enterprise.

Advisory Committee on Health Weeks.

To aid in this effort, the State Department of Public Health, through its Division of Hygiene, formed during 1921 an Advisory Committee on Health Weeks, including representatives of all State organizations with health committees who might, through their local affiliations, aid in local health weeks. Whenever a group in some town begins to plan for a health week and asks the assistance of the State Department of Public Health, a meeting is called of the Advisory Committee on Health Weeks, to which are invited the local people who are to have the health week activities in charge. At this meeting plans are formulated for aiding the local agencies in every way possible. This plan has now been in operation long enough to demonstrate its value.

Exhibit at Health Weeks and Health Days.

Boston (five times).	Newton.
Brockton.	Northampton.
Chester.	North Attleborough.
East Longmeadow.	Revere.
Huntington.	Russell.
Lawrence.	Springfield.
Malden.	Templeton.
Medford.	Warren.
Montague.	Weymouth.
New Bedford.	Williamsburg.

Follow-up Work.

Valuable as all effort of this sort undoubtedly is, it is essential to success that the incentive to endeavor furnished by a health week or an exhibit be reinforced and made permanent through follow-up work on the part of the local agencies originally interested in starting the health week. To carry on the example used above, if the given town needs more school nurses and the health week stressed their importance and got people thinking about the need of school nurses, then the result ought to be municipal action and the acquisition of more nurses; otherwise, the enthusiasm aroused will soon evaporate and the health week will have been a failure.

Work at Agricultural Fairs.

Our work at the agricultural fairs, where we have a tent and exhibit, has been of value and was continued during the past year. A special cottage has been assigned for our use for the past two years at the Eastern States Exposition at Springfield where, literally speaking, throngs have viewed our exhibit. It goes without saying that very many retain no lasting impression under circumstances like these, but many others do.

Agricultural Fairs visited by Exhibits.

Barnstable.	Northampton.
Charlemont.	Springfield.
Great Barrington.	

Nutritional Activities.

The real importance of food in its relationship to health is becoming more and more recognized. It is a matter of satisfaction to know that the Massachusetts Department of Public Health recognized this early and took steps to place nutritional work on a par with other health activities. It is the duty of our health instructor in foods to advise communities or groups of persons in a community as to the need of nutrition classes, school lunches, and so forth, and to help them get started. It is our duty to serve as a clearing house for information on the subject of nutrition, and to this end we have been accumulating information as to what communities and States have been doing.

Pamphlets, Lantern Slides and Lectures.

Since we have only the one worker in nutrition, we have to extend her influence in other ways than by word of mouth if we are to cover the field adequately. Written material has its place as a supplement to the spoken word. During the past year several of our nutrition bulletins have been revised and, in addition, the following new pamphlets have been issued: —

- Diet for the Mother.
- Diet for the Breast Fed Baby.
- Diet for the Bottle Fed Baby.
- Three sets of Diet Cards for Children under Two Years Old.
- Suggestions for Diet in Cases of Constipation.
- Vitamines or Accessory Food Factors.
- Food in its Relation to Weight and Health.
- The A, B, C of Eating.

Our set of lantern slides for children, entitled "The Foodway to Health," has been revised and a new set for adults has been completed recently, as well as a set of slides on "The School Lunch." These stereopticon slides have met with an instant response and have apparently filled a genuine need.

Lectures by our health instructor in foods, prominently stressed in earlier years, have become more difficult to arrange owing to the press of office work. In other words, the demand now greatly exceeds the supply. During 1921, however, the health instructor in foods gave 31 lectures in various parts of the State. In addition to these, she conducted a course in dietetics for the nurses in training at the State sanatorium for tuberculosis at Rutland.

Lectures were given during the year on the following subjects: —

Food and its Relationship to Health	125	Social Hygiene	19
Mouth Hygiene	106	Personal Hygiene	19
Venereal Diseases	64	Public Health and School Nursing	14
Public Health	52	State Department of Public Health	14
Child Hygiene and Child Welfare	47	Preventable Diseases	11
Schick Test	40	School Hygiene	10
Communicable Diseases	38	Health Legislation	6
Maternity Benefits	30	Preventive Pediatrics	4
Sanitation	30	Wear and Tear Diseases of Adult Life	1
Vital Statistics	29	Rural Hygiene	1
Tuberculosis	26		
Health Laws Administration	25		
Industrial Nursing	22	Total	733

A table of lectures, by months, follows: —

MONTH.	Lectures.	Number present.
1920.		
December	55	4,467
1921.		
January	90	7,313
February	96	9,321
March	107	9,555
April	128	18,602
May	102	9,172
June	52	6,631
July	4	225
August	4	88
September	6	479
October	47	2,301
November	42	4,691
Totals	733	72,845

During the fiscal year ending Nov. 30, 1921, lectures were given in the following cities and towns: —

Adams	3	GLOUCESTER	1
Alford	3	Grafton	3
Arlington	6	Granby	1
Ashburnham	1	Great Barrington	7
Ashfield	1	Greenfield	11
Athol	1		
ATTLEBORO	1	Hadley	2
Auburn	2	Hampden	1
Avon	1	HAVERHILL	15
Ayer	1	Heath	1
		Hingham	3
Barnstable	5	HOLYOKE	10
Belchertown	1	Hudson	1
Belmont	1	Hull	1
BEVERLY	1	Huntington	2
Billerica	1		
Blackstone	1	Lakeville	1
BOSTON	213	Lancaster	1
Bourne	1	LAWRENCE	12
Braintree	2	Lee	1
BROCKTON	13	Leicester	3
Brookline	5	LEOMINSTER	2
Buckland	1	Leverett	3
		Longmeadow	1
CAMBRIDGE	19	LOWELL	15
Charlemont	1	LYNN	5
CHELSEA	3		
Cheshire	1	MALDEN	11
Chester	1	Manchester	1
Cohasset	1	Mansfield	2
		Marblehead	2
Dedham	1	MARLBOROUGH	1
Dennis	1	MEDFORD	3
Dighton	1	MELROSE	9
Dracut	11	Milford	1
Dudley	1	Milton	1
		Montague	1
East Bridgewater	1	Mount Washington	2
Egremont	2		
EVERETT	2	Natick	1
		NEW BEDFORD	9
FALL RIVER	12	New Marlborough	7
Falmouth	2	NEWBURYPORT	5
FITCHBURG	4	NEWTON	13
Foxborough	2	NORTH ADAMS	11
Framingham	10	North Attleborough	2

North Brookfield	1	Southwick	1
NORTHAMPTON	14	SPRINGFIELD	15
Norton	2	Stockbridge	3
		Swampscott	1
Oxford	1		
		TAUNTON	8
PITTSFIELD	8	Templeton	5
Plymouth	3	Tewksbury	1
Princeton	1	Topsfield	1
Provincetown	1		
		Wakefield	8
QUINCY	10	WALTHAM	6
		Wareham	2
Randolph	2	Warren	5
Reading	1	Watertown	7
REVERE	7	Webster	1
Richmond	1	Wellesley	2
Rockland	1	Wellfleet	1
Russell	2	West Newbury	3
Rutland	7	WESTFIELD	10
		Westford	1
SALEM	5	Westminster	5
Sandwich	1	Weymouth	4
Saugus	4	Whitman	1
Scituate	2	Williamsburg	1
Seekonk	1	Wilmington	2
Shelburne	1	Winchendon	1
Shirley	1	Winchester	5
Shrewsbury	1	Winthrop	2
Shutesbury	2	WOBURN	2
SOMERVILLE	7	WORCESTER	13
South Hadley	1		
Southborough	1	Total	733
Southbridge	1	Outside of State	4

Mouth Hygiene.

This important phase of hygiene has been receiving an increasing amount of recognition in recent years. The health instructor in mouth hygiene in the Division of Hygiene, like the health instructor in foods, has for her function the interpretation of the subject to municipalities and private agencies carrying on, or wishing to carry on, this type of work. There is much more involved in this than merely giving information as to how to start a dental clinic and as to its cost.

It is also the duty of the Department of Public Health to place before those seeking advice the relative importance of the various kinds of public health activity and what may be expected in the way of results from the expenditure of a given sum of money. Not infrequently a community wishes to make its *début* into public health work by establishing a dental clinic. It is, of course, the community's privilege to do this if it sees fit. Such an action, however, does not show good sense, since unquestionably a public health nurse is generally conceded to be the most logical first step in getting public health work started. Then the question of dental hygienist *versus* regular dental clinic has to be considered carefully before a decision is reached.

Assistance of this sort seems to be the most worth-while service the Division of Hygiene can offer communities. In addition to this, however, we have developed a lecture service, an attractive set of stereopticon slides, pamphlets on mouth hygiene subjects, and are circulating moving pictures on mouth hygiene.

Investigative Work.

It is highly necessary that investigative work be carried on by State health departments. It is only by the constant accumulation of information from all over the State and constant analysis of such information that a true perspective is maintained. A constant attempt must be made to measure results of various procedures and to modify these procedures in accordance with the information obtained.

An excellent example of what I mean by this is offered by the problem of maternal and infant hygiene. We know that a certain number of mothers die every year from causes related to pregnancy and childbirth. We know that the infant mortality under one month of age is from 40 to 50 or more per cent of the total infant mortality under one year. Nevertheless, there is a very great deal yet which puzzles us with regard to the maternal and infant mortality. We do not know why it is that in spite of improvements in medical, nursing and hospital care our maternal mortality in this State is apparently on the increase. We do not know why it is that in spite of a gradual reduction in the total infant mortality the early infant mortality remains practically stationary. Problems like these can be solved only by constant investigation and study. It is the duty of a Division charged with the responsibility of child hygiene activities to contribute to such study. Hitherto, because of lack of money and personnel, we have fallen far short of what we should like to do.

Child Hygiene Clinics.

Reference has been made elsewhere to the strictly advisory nature of the work of the Division of Hygiene. That this as a general State health policy is sound, is attested by the numerous health activities now being carried on by the majority of our 355 cities and towns. The policy of the Department in regard to child hygiene clinics is in nowise in conflict with that just stated. The pediatrician of the Division of Hygiene, as part of her duties, stimulates the establishment of child hygiene clinics throughout the State. A visit to the community is made on the invitation of some responsible agency — preferably the board of health — and a well-baby or well-child clinic conducted in a schoolhouse, the town hall, or some other central building. No treatment of any kind is given.

This clinic is merely for the purpose of demonstrating a need and a method of meeting this need. Children found defective are referred to their family physician. If the town has a public health nurse, she is given the names of those needing treatment in order that through sympathetic interpretation of the findings of the clinic physician the family may have the child's defects remedied. Parents and physicians are always invited to these clinics.

Once the demonstration has been made, the Division feels that its duty has been fulfilled for the time being. The responsibility for carrying on the work now rests with the town itself. Our services are always at their disposal, however, to assist and encourage but not to supplant.

It is only fair to say that this type of work is slow and uphill and results are not always immediately apparent. It has resulted, nevertheless, in the accumulation of a great deal of valuable data with regard to the health of the rural child.

Other Activities.

The Division of Hygiene, in addition to the duties already referred to, has charge of the departmental library, edits the Department's bimonthly bulletin, "The Commonwealth," also the "Manual of Laws relating to Public Health" and the annual report.

"The Commonwealth."

The yearly six issues of "The Commonwealth" are now divided evenly between numbers of general interest and numbers dealing with special subjects. Its circulation is comparatively limited, — about

11,000 copies, — but no attempt has been made to get a very wide popular circulation. It seems wiser at the present time to limit its circulation to professional people of all kinds and to those of the general public who show sufficient interest to write in to ask to be placed upon the mailing list. Such people will probably pass along to other groups information they obtain from "The Commonwealth." During the year 1921 special issues of "The Commonwealth" dealt with a study of open-air schools in Massachusetts, with a midwife investigation, with communicable diseases, and with cancer, the latter issue brought out at the time of the National Cancer Week.

Lectures to Training Schools for Nurses.

The service which we have been offering to training schools for nurses has been continued only in part during the past year. We still feel that it is highly desirable that the pupils in every training school for nurses in the State should have a certain number of lectures upon the public health subjects. The difficulty is to offer this service in a fashion convenient both to those who are to receive it and to those who are to give it. It has proved to be considerable of a burden upon the Department to furnish this lecture service to so many hospitals. Another year it probably will be necessary to offer a short course of lectures upon public health at certain central points to which the superintendents of the various training schools will be invited and urged to send their pupils. Those who will not be able to make use of the service one year will be able to get it before they graduate. It is difficult for hospital superintendents to allow their nurses to leave the hospitals for any great length of time owing to the difficulty they experience in maintaining their staff at full strength. None the less, it seems that if such brief absence is the only way whereby the nurses can get these public health lectures, hospital superintendents should make the necessary effort to accomplish this purpose.

Boston Health League.

A most interesting experiment is being tried in Boston looking towards the co-ordination of all the agencies carrying on public health work within the limits of the city. This organization of agencies has taken the name of the Boston Health League and has picked East Boston as the place where concentrated effort may be put forth with the hope that work accomplished in this section of Boston will serve as an example of what can be done throughout the whole city. The

Division of Hygiene has been much interested in furthering this work especially so far as it is likely to improve the standard of child hygiene. The director of the Division has served as secretary of the council of the Boston Health League.

Courses for Continuation School Teachers at Hyannis.

At the request of the director of the Division of Vocational Education of the Department of Education, the Division of Hygiene cooperated to the extent of giving a short course in the essentials of hygiene for continuation school teachers. This gave the director and assistant director of the Division a valuable opportunity to come in contact with a large proportion of the continuation school teachers of the State. Through them the Division was able to reach a very much wider public than could possibly be reached through the unaided efforts of one or two individuals. Incidentally, it served as a demonstration of the sort of interdepartmental co-operation which should be a matter of regular occurrence in the State service.

Parent-Teacher Association.

It is becoming more and more clearly evident that the Parent-Teacher Association is one of the most useful agencies for the dissemination of knowledge with regard to child hygiene. The members of this association, from the very nature of their work, are interested in the health of the child and are anxious to further all measures which will improve it. During the past year the director of the Division had the pleasant privilege of addressing a number of local Parent-Teacher Associations, basing his discussion upon a questionnaire which had been sent out in advance. This questionnaire, when fully filled out, represented a considerable degree of investigation on the part of local Parent-Teacher Association members into the health conditions of their community. This type of work can be extended indefinitely to great advantage.

Mental Hygiene.

The subject of mental hygiene is coming prominently to the front at the present time. Many are beginning to feel that it is a most important phase of hygiene in general, although, unquestionably, we know less about it than we do about other aspects of hygiene. There seems to be considerable reason to believe that if the Division of Hygiene is to fulfill its whole duty, it should have at least one worker

who deals solely with the subject of mental hygiene. It is to be hoped that in the near future it will be possible to obtain an appropriation for this purpose.

Relative Importance of the Different Activities of the Division of Hygiene.

It is a matter of considerable difficulty to apportion values to the different phases of activity as carried on by a State department. It is even more difficult to compare such relative values with those which would obtain in a municipality. Certain types of work as, for example, health education through health weeks, exhibits, moving pictures, etc., are peculiarly suited to a State department as distinguished from a municipal department of health. Such activities are extremely important and yet are relatively expensive if carried on on too small a scale.

Lecture work is difficult for the average local health department and may well be a large function of a State advisory body. There is no question, so far as the State Division of Hygiene is concerned, that work directed toward the improvement of the hygiene of mothers and infants has been greatly neglected hitherto. None the less, the Division of Hygiene in this State is expending at the present time approximately more than one-third of its appropriation upon this type of activity.

Another branch of its work which, unquestionably, is dealing with fundamental things is that of nutrition. It is unfortunate that this particular line of activity has not been extended more rapidly. At the present time there is great need in several directions, notably in that of classes in nutrition for expectant mothers and for others who are interested and who might serve as local leaders in this work. The problem of extending a knowledge of nutrition is perhaps more difficult because of the paucity of concrete ways in which local groups can act. The school lunch and the nutrition class represent almost the only types of activity which can be carried on in groups.

In the case of mouth hygiene, on the other hand, the dental clinic serves as a definite objective for those who, through the expenditure of municipal or private funds, wish to carry on some dental work. One rather unfortunate result of this has been that, because of the very definiteness of the dental clinic, towns have been prone to place this type of work before other kinds which, while not necessarily more important, should come first in point of time. An example of this would be public health nursing of all kinds. Furthermore, owing to the popular appeal of the dental clinic it would seem as if a step had

been taken too far in advance with regard to the establishment of dental clinics without due regard to the fundamental problems of poor relief. This same thing is, of course, true of many well-baby and other clinics carried on by municipalities. An extended discussion of this would be out of place here, but it is pertinent to the subject to say that there is a great need at the present time for clear thinking upon the subject of furnishing free medical care on the part of municipalities, and in medical care must be included dental care.

New Needs.

Any discussion of new needs should be backed by a clear perception of State policy with regard to assistance to local communities. It has been the policy of the Division of Hygiene to do little or no detailed work but to serve merely as a leader in the field of hygiene, assisting the communities but not doing their work for them. For this reason the Division will never need a large field force. Certain types of assistance, however, already referred to in part, will always be necessary and will extend in scope naturally from year to year for some time to come. Beginning with 1915 the work of the Division for some time was largely that of reaching individual groups of the public. Gradually, as this work was extended, an increasing amount of time had to be given to office consultation with those who were in a position to start new lines of local activity to be paid for by municipal or private funds. With the growth of this type of consultation work there came the necessary curtailment of work in the field. There is no question that the consultation work is of the highest importance, of greater importance, in fact, than much of the individual field work. None the less, it seems a pity that more field work cannot be done, especially along the line of investigations into local conditions. In fact, the latter is absolutely essential if sound advice is to be given through the office. For this reason it is much to be hoped that at least one more worker be obtained in the field of nutrition and another in mouth hygiene.

Another promising field which ought to be worked more intensively by the Division of Hygiene is that of school nursing. Now that a compulsory school nursing law has been passed, we shall probably see many new nurses employed by municipalities and many of these nurses will be inexperienced. It would be of advantage if the Division of Hygiene had a nurse experienced in school nursing who could be at the service of the school nurses of the State for advice and assistance.

It is confidently hoped that the coming year will see regional con-

ferences for school nurses, physicians and school superintendents held under the joint auspices of the Department of Public Health and the Department of Education to discuss the subject of school hygiene in general and the medical supervision of school children in particular.

So far as infant and maternal hygiene is concerned, if Massachusetts is to do her full duty to the mothers and babies of the State, a considerable expenditure must be made in the near future in three directions: first, to spread our informational service with regard to the hygiene and needs of the mother and her child; secondly, to carry on a continuous investigation into the causes of maternal and infant mortality with a view to devising measures to combat such maternal and infant mortality and morbidity; thirdly, to establish a larger number of public health nurses who may serve constantly in the field to investigate local child welfare conditions and upon the basis of the investigations to advise communities as to ways of bettering the conditions under which both the city and rural mothers and babies live and die. This latter type of work was carried on with great success during the war by eight child welfare nurses attached to the Division of Hygiene.

Infant Mortality with Reference to Future Work.

The infant mortality for 1921, of the State as a whole and of the individual municipalities, can merely be foreshadowed at the time of writing this report. These figures are available only late in the year owing to the slowness with which the birth returns come into the office of the Registrar of Vital Statistics from the 355 cities and towns of the State. This renders the results of historical rather than of news value. The fault, if fault there be, does not rest with the Registrar of Vital Statistics, who has been very anxious to get the facts at the earliest possible moment.

Infant Mortality during 1921.

Basing our estimate on figures published by the Federal Census Bureau there seems to have been an unprecedented drop in infant mortality over all this country during 1921. Of the 51 cities included in the Federal report, 7 are in Massachusetts. The following are the decreases in infant mortality of these cities for 1921 over that for 1920, more complete reports will probably lower the rate somewhat further still: Boston, a decrease in rate of 25 per 1,000; Cambridge, 29; Fall River, 18; Lowell, 45; New Bedford, 23; Springfield, 17; Worcester, 8.

Lack of Knowledge of Causes.

Such changes as these are startling in nature and emphasize strongly how much we have yet to learn about the causes of infant mortality. The first reaction of enthusiastic child welfare workers will be, naturally, that at last their devoted work is showing results. Further thought, however, will serve to dampen this over-enthusiasm. It is manifestly impossible to expect to see such sudden results produced over all the country as a result of work of varying degrees of efficiency. Indubitably there is some factor operating to influence infant mortality in a way not yet fully understood.

Future Lines of Attack.

The knowledge we do possess, however, leads to the conviction that we must reach that part of the infant mortality which occurs within the first month of life if we are to see a reduction in the total rate to correspond to that of recent years. That fraction of the infant mortality rate which occurs during the first month of life is pretty consistently 40 per cent or more of the total rate. In certain places it is over 70 per cent. Yet nowhere in the world has there been as yet any noteworthy reduction in the early infant mortality. Such a reduction has been accomplished in parts of certain cities, but we have yet to see a State-wide demonstration. Such a demonstration is long overdue.

DIVISION OF TUBERCULOSIS (SANATORIA)

SUMNER H. REMICK, M.D., *Director*

REPORT OF DIVISION OF TUBERCULOSIS (SANATORIA).

I have the honor to submit the annual report of the Division of Tuberculosis for the year ending Nov. 30, 1921.

This annual report, on account of the sudden death of Dr. William J. Gallivan, the former director, must be inadequately presented for I find it impossible, having been connected with the Division for so short a period, to give a comprehensive analysis of the work of the year 1921.

All who knew the late Dr. Gallivan mourn his loss as a personal one; the tuberculosis workers and sufferers throughout the State feel deeply his passing from the work he had been so interested in; the Division of Tuberculosis, to which he had bent his great energies as director from its inauguration as a division of the State Department of Public Health, misses his genial smile, his courage, his leadership.

The four sanatoria under this Division, Rutland, Westfield, North Reading and Lakeville, have had a successful year and have provided a total of 375,535 days of treatment for 2,363 patients. The general policy of administration has been changed in three points: first, to limit the residence of patients to a period of two years in any one institution; second, to reserve Westfield for children; third, to admit the early and favorable cases of tuberculosis not only to Rutland but all the State sanatoria.

The first point has been successfully carried out at Westfield and Rutland, and at the present time all patients having a residence of over two years at North Reading are being transferred to other institutions as fast as opportunity permits. The same method will be carried out at Lakeville, now that we have sufficient bed capacity in the county and municipal hospitals for the care of unfavorable or advanced cases of tuberculosis.

For several years tuberculous children, requiring institutional treatment, have been segregated at Westfield in a separate children's building. The demand for beds has increased so rapidly that children have often had to wait months before being admitted. Realizing the importance of this phase of the tuberculosis problem, and the disaster a few months' waiting for treatment can mean to the child, the Department decided to change the policy as above stated in point two,

viz., to eliminate the adults at Westfield as fast as possible, and to reserve this sanatorium for the use of children from four to sixteen years of age. So far has this plan been carried out that at the present time we have at Westfield only forty-two adults and two hundred and twenty-five children. I believe this plan a very important step in the campaign against tuberculosis, and am happy to say it has been received by official and unofficial agencies throughout the State with enthusiastic approval.

When Rutland was opened in 1898 the policy of the sanatorium was to treat only early and favorable cases of tuberculosis. But as the years passed the original policy had to be modified. Because of the great need of the advanced type and the lack of hospitals which could care for these cases, the State tried to reserve one sanatorium for the early cases, namely Rutland, and provide hospital treatment, without being properly equipped to do so, for the large number of needy cases of the advanced type. At present the situation is changing, and with the opening of the county and municipal institutions, the State Department is able to return to its original policy. With the increased bed capacity for the unfavorable or advanced type, it is important that early cases be admitted not only to Rutland, as formerly, but to all the State sanatoria.

The dispensary act, passed in 1911, requires every city or town of over 10,000 population to establish and maintain a dispensary for the diagnosis of pulmonary tuberculosis. There are now fifty-six established dispensaries under the supervision of the State Department of Public Health. It is impossible at the present time to state the amount of work accomplished during the past year, but my impressions are that the work, with a few exceptions, is unsatisfactory, and that a large number of the cities and towns are complying with the letter of the law only, and are not trying to develop the work to its maximum efficiency. I feel that there are many causes for this, and believe that the subject needs careful consideration at once, for these dispensaries are one of the most important agencies we have in the State for discovering early tuberculosis and supervising those who suffer from it.

The consultation clinics, established in sixteen cities in the Commonwealth in 1920, have not been utilized by the physicians as much as anticipated. This, I believe, is not because the general practitioner does not desire this service or that he does not realize its value to him, but more from the fact that he has forgotten that such a service exists. This clinic gives any physician in the State an opportunity to have any suspected case examined, free of charge, by members of the staffs

of the State sanatoria. Every effort will be made during the coming year to acquaint the physician with this service, and if found practicable to extend the clinics to other centers.

Eight hundred and ninety-five patients were referred to the consultation clinics, and were classified as follows: —

Pulmonary tuberculosis (active)	438
Pulmonary tuberculosis (inactive)	55
Further observation	255
Nontuberculous	147

A large per cent of the 438 active cases desired sanatorium treatment, and were hospitalized at once in either State, county or municipal hospitals.

Expert medical examination service for small towns under 10,000 population where no provisions are made for a regular dispensary has been a problem for a number of years. The Massachusetts Tuberculosis League, recognizing this weak point in our system, rendered a distinct service to the Commonwealth by working up clinics in the rural communities and appealing to this Division for the assistance of the sanatoria staffs to make the examinations. This service was gladly given and every effort will be made in the future to co-operate with the League in this work. During the past year clinics have been held in twelve towns and 225 cases have been examined, the great majority of those examined being children. These clinics have brought to light the fact that tuberculosis and malnutrition in children show a very close relationship. "Watch out for the undernourished child" may well be our watchword to-day. Eighteen of the 225 examined were definitely tuberculous; 103 were held for further observation; 104 were considered nontuberculous.

If we are to get a clear picture of the results of our work, the supervision and follow-up work of this Department are readily seen to be of vital importance and well repay the expense entailed. The Department requires an original history card on every reported case, and files that card with this Division. That in the past six years 23,000 cards have been filed is a convincing argument. These cases are all under the direct supervision of the local boards of health, who report yearly on every case to the State Department. The Division, through its seven District Health Officers and their nursing assistants, follows up every case discharged from our four sanatoria. On these cases a report is made to the Division every six months.

Last year with the desire to stimulate interest in "follow-up" work, and to create better co-operation among public health nurses, the

Division organized an association in each of the territorial assignments of the District Health Officers, seven in number. Two conferences were held, — the first at Rutland State Sanatorium, the second at Lakeville State Sanatorium, — with marked success. The work of the nurse is invaluable in public health work, and we feel that the inspiration gained by the individual nurse at such conferences enables her to give better service to the community, and fills a great need in her life and work.

Essex County Tuberculosis Sanatorium at Middleton was opened last June, with a bed capacity of 104 which will be increased to 175 beds. With the completion of the remaining two county hospitals, as required by law, and the necessary addition to a few local and county hospitals, adequate hospitalization will be provided for all needing institutional treatment in the Commonwealth.

The tuberculosis sanatoria, both State, county and municipal, should, in the future, serve as educational centers, first for the patient, and second for the public; and should be equipped to carry on the clinical work of their hospital area.

The campaign against tuberculosis has been going on for over twenty-five years and is showing splendid progress as seen by the steady decline in the death rate. In Massachusetts in 1900 the death rate was 185.3 per 100,000; in 1910, 133; in 1915, 113; in 1920, 96.7; in 1921, 84.6, the lowest in the history of the State, and a record of which we are indeed proud.

This is a great fight, and we have made great strides, "but the end is not yet." Let us not relax our efforts until the victory is assured.

LAKEVILLE STATE SANATORIUM.

RESIDENT OFFICERS.

SUMNER COOLIDGE, M.D.	<i>Superintendent.</i>
MINOT W. GALE, M.D.	<i>Assistant Superintendent.</i>
—	<i>Assistant Physician.</i>
Mrs. MARY M. COAKLEY	<i>Steward.</i>
Mrs. HARRIET M. GASSETT	<i>Head Matron.</i>
ROBERT A. KENNEDY	<i>Chief Engineer.</i>
THOMAS FRANCIS MAHONEY	<i>Head Farmer.</i>

REPORT OF THE SUPERINTENDENT.

TO EUGENE R. KELLEY, M.D., *Commissioner, Department of Public Health, State House, Boston, Mass.*

I have the honor to submit the twelfth annual report of the Lakeville State Sanatorium for the year ending Nov. 30, 1921.

During the year there has been expended \$202,236.43 for maintenance, a

gross weekly per capita cost of \$16.42, and \$29,716.63 from the appropriation authorized by chapters 153 and 203, Resolves of 1919 and 1921. The details of these disbursements are contained in the report of the treasurer.

There has been collected from miscellaneous sources \$44,099.76 (the total of all collections). Deducting this amount from the gross maintenance expense leaves a net expense of \$158,136.67, and a net weekly per capita cost of \$12.84.

There has been collected from private funds \$228.56; from charitable institutions \$4,585.92; from cities and towns \$28,461.55; from the United States Veterans Bureau \$9,925.91. Seventy cases were supported wholly or in part from private funds; 334 by cities and towns; 48 wholly by the State; 47 by the United States Veterans Bureau.

There were 251 patients in the sanatorium at the beginning of the year and 238 at the close. The largest number present at one time was 257 and the smallest 211. The daily average number of patients was 236.9150. There were 380 cases admitted during the year, — 7 incipient, 190 moderately advanced, 157 advanced, 25 unclassified and 1 not examined. There were 292 cases admitted from cities and towns under 25,000 population. The average age of patients admitted was thirty-two. Including deaths, there were 393 discharged, and the average duration of residence was seven months and nine days. Of those discharged, 183 gained 2,747 pounds, an average gain of 15 pounds per person. Of the discharges there were 8 apparently arrested cases, 12 less than last year; 18 quiescent, 2 more than last year; 152 improved and 79 unimproved. There were 48 patients not considered, the duration of treatment being less than one month. There were 85 deaths, 46 less than last year. There were 2 discharged nontuberculous. There were 86,474 hospital days of treatment, 1,803 more than last year.

The following table shows the classification on the application blank and our classification on admission: —

	Classification on Application Blank.	Our Classification on Admission.
Incipient	41	7
Moderately advanced	263	186
Advanced	66	149
Unclassified	10	37
Not examined	—	1
Totals	380	380

MEDICAL REPORT.

The medical work of the year has been handicapped by changes and vacancies in the medical staff. Dr. Frederick Moore resigned on July 14, 1921, to accept a position with the Public Health Service, and the vacancy thus caused was filled on July 13, 1921, by the appointment of Dr. Earl F. Ryan. After a stay

of three months he resigned to accept a more lucrative position on Oct. 3, 1921, since which time it has not been possible to secure a suitable candidate for the vacancy.

The remedial procedures of former years were continued throughout the year. Our confidence in heliotherapy has been confirmed by another year of experience in its use. The only new feature of our treatment was the introduction of the Alpine lamp, which it is believed supplements heliotherapy by its application on cloudy days or at night when direct sunlight is not available.

CLINICS.

Consultation clinics were attended by members of the Lakeville State Sanatorium staff throughout the year in Fall River, Brockton, Taunton and Plymouth. The number of patients examined at these clinics is as follows:--

	Nontuber- culous.	Tubercu- losis.	Suspicious Tuber- culosis.	Totals.
Fall River	2	-	-	2
Brockton	-	4	3	7
Taunton	-	-	-	-
Plymouth	2	6	4	12
Totals	4	10	7	21

DENTISTRY.

There being no dentist on the sanatorium staff, the imperative dentistry has been done by arrangement with one of the Middleborough dentists. A large number of patients who have been able to finance their own dentistry have seen fit to patronize this same dentist. Others have been given leaves of absence so that they might have their dentistry done at home. We have usually found boards of health quite willing to finance the dentistry of town cases, including repair work and artificial teeth.

FARM.

The farming operations at the sanatorium showed a substantial financial profit. The development of the tuberculosis free herd is progressing satisfactorily, there being now forty young animals that have passed the tuberculin test. Since the development of a segregated herd was undertaken the maintenance of so large a number of nonproducing animals has reduced the usual dairy profit, and is likely to continue to do so for two years more, after which it is hoped that the old herd can be entirely eliminated and replaced by the clean herd.

IMPROVEMENTS.

The completion of the dairy barn and the new storehouse, both of which were sorely needed for many years, has been successfully accomplished during the year, and should very much increase efficiency in handling those two departments.

A graphoscope moving-picture machine has been installed in the chapel and has been greatly enjoyed by the patients since it has been in operation.

A new house telephone system has been purchased to replace the old worn-out system which has been in use since the institution opened.

A new boiler feed pump has been installed in the power plant, bringing the boiler room equipment up to a condition of efficiency.

RECOMMENDATIONS.

There is urgent need of an addition to the chapel, plans for which have been made, to include an adequate laboratory and space for the installation of an X-ray equipment. Our present chapel is not large enough for the audiences which it is expected to hold. For this work an appropriation of \$9,500 is requested.

There should also be undertaken an extension of the source of water supply for the sanatorium as well as of the pumping equipment and storage capacity. A duplicate pumping unit and a 30,000-gallon tank have been requested for two years, and until they are installed the institution may at any time be without a water supply if the single pumping unit now in operation should break down. Estimates have been submitted for the duplicate pumping unit and the 30,000-gallon tank, of \$2,500 and \$6,000 respectively, but a considerable sum must be added to this to develop an additional supply of water at the source.

I would also recommend the purchase of property adjacent to the sanatorium containing houses suitable for homes for sanatorium employees. Two such properties are now in the market, the purchase of one of which, that of Mr. Clarence A. Holmes on Bridge Street, is requested this coming year, to cost \$3,500. The property on the southerly side of the sanatorium, on Main Street, belonging to Mr. Charles Spooner, should also be acquired. It contains two habitable houses, one of which is so close to the sanatorium property that its inmates have at times been rather offensive to the institution administration. The lack of proper quarters for married physicians is the sole cause of our inability to find a physician for the position of second assistant. The Holmes' house on Bridge Street is conveniently located and in every way a suitable home for a member of the medical staff.

There is also serious need of a dormitory for male employees who may be maintained at the institution. At present these employees are scattered in many buildings, including the upper story of the women's ward, and as all available rooms are full all the time we are not able to employ a larger number of this class of men for the reason that we have no rooms to accommodate them. A considerable sum might be saved in the wages of day laborers if we had accom-

modations for a larger number of monthly men with maintenance. I recommend the erection of a new building with rooms for twenty-five or thirty male employees.

ACKNOWLEDGMENTS.

I again take pleasure in acknowledging the helpful co-operation of the Catholic, Protestant and Jewish clergymen who have served us during the year.

The untiring loyalty and zeal of the assistant superintendent, who has done the work of two physicians during many weeks of the year, deserves special recognition.

The same is true of the several heads of departments who by their hearty co-operation have greatly assisted in the administration of sanatorium affairs during the year.

Numerous gifts of books, flowers and entertainment by friends of the institution are gratefully acknowledged.

Respectfully submitted,
SUMNER COOLIDGE,
Superintendent.

VALUATION.

<i>Land.</i>	
Grounds (50 acres)	\$9,289 17
Lawns and buildings, 48 acres.	
Roads, 2 acres.	
Woodland (10 acres)	535 70
Mowing (44 acres)	2,130 37
Tillage (51 acres)	4,391 81
Tillage, 31½ acres.	
Garden, 19½ acres.	
Orchard (8 acres)	611 65
Pasture (13 acres)	696 41
Waste and miscellaneous (33 acres)	1,582 27
Rough pasture, 20 acres.	
Meadow swamp land, 12 acres.	
Sewer beds.	
New coal trestle, 1 acre.	
	\$19,237 38
Sewerage system	4,572 00
	\$23,809 38
<i>Buildings.</i>	
Institution buildings	\$129,894 50
Farm, stable and grounds	34,142 87
Miscellaneous	91,410 10
	255,447 47
Total	\$279,256 85
Present value of all personal property as per inventory of Dec. 1, 1921	120,089 85
	\$399,346 70

SPECIAL REPORT.

The following special report is prepared in accordance with a resolution of the National Conference of Charities and Corrections adopted May 15, 1906:—

Population.

	Males.	Females.	Totals.
Number received during the year	253	127	380
Number passing out during year	261	132	393
Number at end of fiscal year in the institution	159	79	238
Daily average attendance (number of inmates actually present) during the year.	155.36	81.54	236.915
Average number of employees and officers during the year	—	—	110

Expenditures.

Current expenditures:		
1. Salaries and wages	\$91,907 49	
2. Clothing	5 74	
3. Subsistence	27,317 22	
4. Ordinary repairs	7,233 22	
5. Office, domestic and outdoor expenses	76,772 76	
		\$202,236 43
Extraordinary expenses:		
1. Permanent improvements to existing buildings	29,716 63	
Grand total		\$231,953 06

Summary of Current Expenses.

Total expenditure	\$231,953 06
Deducting extraordinary expenses	29,716 63
	\$202,236 43
Deducting amount of sales	651 50
	\$201,584 93

Dividing this amount by the daily average number of patients—237—gives a cost for the year of \$850.81, equivalent to an average weekly net cost of \$16.36.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients admitted Dec. 1, 1920, to Nov. 30, 1921, inclusive.	253	127	380
Number of patients discharged Dec. 1, 1920, to Nov. 30, 1921, inclusive.	261	132	393
Number of deaths (included in preceding item)	61	24	85
Number remaining in sanatorium Nov. 30, 1921	159	79	238
Daily average number of bed patients Dec. 1, 1920, to Nov. 30, 1921.	48	43	91
Daily average number of patients	155	82	237

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Married	125	63	188
Single	117	47	164
Widowed	8	12	20
Divorced	3	5	8
Totals	253	127	380

TABLE 3. — *Ages of Patients admitted.*

	Males.	Females.	Totals.
14 to 20 years	16	12	28
20 to 30 years	92	67	159
30 to 40 years	64	28	92
40 to 50 years	59	13	72
Over 50 years	22	7	29
Totals	253	127	380

Average age, 32 years.

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	90	20	20	54	15	10	144	35	30
Other New England States	12	10	9	7	7	5	19	17	14
Other States	13	8	11	6	6	6	19	14	17
Total native	115	38	40	67	28	21	182	66	61
Other countries:									
Africa	1	1	1	—	—	—	1	1	1
Austria-Hungary	2	3	3	1	1	1	3	4	4
Azores	1	2	2	—	—	—	1	2	2
Armenia	1	1	1	2	2	2	3	3	3
Bohemia	1	1	1	—	1	1	1	2	2
Canada	18	34	28	18	28	26	36	62	54
Cape Breton Island	1	2	1	—	—	—	1	2	1
Cape Verde Islands	4	4	4	—	—	—	4	4	4
England	12	13	11	3	3	8	15	16	19
Europe	1	1	1	—	—	—	1	1	1
Finland	3	3	3	1	1	1	4	4	4
France	—	—	—	—	1	1	—	1	1
Germany	—	1	1	3	4	4	3	5	5
Greece	8	8	8	3	3	3	11	11	11
Ireland	16	57	65	7	19	21	23	76	86
Italy	19	20	20	8	13	14	27	33	34
Lithuania	—	—	—	2	1	2	2	1	2
Newfoundland	4	4	4	1	2	2	5	6	6
Norway	—	1	1	1	1	1	1	2	2
Roumania	—	1	—	—	—	—	—	1	—
Russia	24	28	28	4	7	6	28	35	34
Poland	9	9	9	3	6	6	12	15	15
Portugal	4	6	6	1	1	1	5	7	7
Scotland	6	8	8	1	3	3	7	11	11
Sweden	1	3	2	1	2	2	2	5	4
Syria	2	2	2	—	—	—	2	2	2
Wales	—	—	1	—	—	—	—	—	1
Total foreign	138	213	211	60	99	105	198	312	316
Unknown	—	2	2	—	—	1	—	2	3
Grand totals	253	253	253	127	127	127	380	380	380

Patients native born, 47.8947 per cent; patients foreign born, 52.1053 per cent.

TABLE 5. — *Residence of Patients admitted.*

PLACE.	Number.	PLACE.	Number.
Adams	2	Medford	1
Arlington	3	Melrose	4
Athol	1	Methuen	1
Attleboro	2	Middleborough	1
Bedford	1	Milford	3
Belmont	1	Natick	2
Boston	146	Needham	1
Braintree	2	New Bedford	24
Brockton	2	Newburyport	1
Cambridge	6	Newton	9
Carver	1	Northbridge	3
Chelsea	8	Norwood	2
Chicopee	1	Oxford	1
Clinton	1	Pawtucket, R. I.	1
Concord	4	Quincy	5
Dracut	2	Salem	2
Edgartown	1	Saugus	2
Everett	5	Seekonk	1
Fall River	35	Sherborn	1
Foxborough	1	Somerset	1
Framingham	3	Somerville	12
Gardner	1	Southbridge	2
Gloucester	2	Springfield	3
Hardwick	2	Stoneham	1
Haverhill	1	Upton	1
Hawley	1	Uxbridge	1
Hingham	1	Wakefield	1
Holyoke	1	Walpole	1
Hopedale	1	Waltham	1
Lakeville	2	Wareham	1
Lawrence	1	Watertown	4
Leominster	2	Westport	1
Lexington	1	Westwood	1
Lowell	3	Winthrop	2
Ludlow	1	Woburn	2
Lynn	6	Worcester	4
Malden	19	Total	380
Marlborough	3		

TABLE 6. — *Occupations of Patients admitted.*

	Males.	Females.	Totals.
Attendant	1	1	2
Auto repairer	1	-	1
Baker	4	-	4
Barber	2	-	2
Bartender	1	-	1
Blacksmith	3	-	3
Bookbinder	-	1	1
Bookkeeper	-	2	2
Book sewer	1	1	2
Bottler	1	-	1
Boxmaker	2	-	2
Brass buffer	1	-	1
Bricklayer	1	-	1
Brushmaker	1	-	1
Candy factory	-	1	1
Carpenter	8	-	8
Carpet factory	2	-	2
Chairmaker	1	-	1
Chambermaid	-	2	2
Chauffeur	12	-	12
Checker, creamery	1	-	1
Chef	1	-	1
Child's nurse	-	3	3
Clerk	17	3	20
Clothing salesman	1	-	1
Conductor	1	-	1
Confectionery factory	1	-	1
Cook	7	1	8
Coremaker	1	-	1
Cotton mill	5	6	11
Cream filler	-	1	1
Creamery manager	1	-	1
Curtain cutter	1	-	1
Domestic	-	1	1
Dealer, fruit	2	-	2
Dealer, provisions	1	-	1
Electrician	2	-	2

TABLE 6. — *Occupations of Patients admitted* — Continued.

	Males.	Females.	Totals.
Factory worker	5	—	5
Fireman	3	—	3
Forelady in mill	—	1	1
Garage man	1	—	1
Gardener	1	—	1
Gasoline merchant	1	—	1
Generator operator	—	1	1
Greenhouse	1	—	1
Hatter	—	1	1
Housekeeper	—	14	14
Housewife	—	53	53
Ironworker	3	—	3
Janitor	3	—	3
Laborer	22	—	22
Leather store	1	—	1
Letter carrier	1	—	1
Linotypist	1	—	1
Longshoreman	2	—	2
Machine operators	2	—	2
Machinist	10	—	10
Marine engineer	1	—	1
Mason	3	—	3
Meat cutter	1	—	1
Mechanic	3	—	3
Merchant	1	—	1
Metal factory	2	—	2
Mill operatives	4	1	5
Milliner	—	1	1
Musician	1	—	1
News agent	1	—	1
Night watchman	1	—	1
None	1	1	2
Nun	—	1	1
Optician	1	—	1
Packer	—	1	1
Painter	4	—	4
Paper mill	2	—	2

TABLE 6. — *Occupations of Patients admitted* — Continued.

	Males.	Females.	Totals.
Parish visitor	-	1	1
Peddler	2	-	2
Photographer	1	-	1
Plasterer	1	-	1
Plumber	1	-	1
Porter	1	-	1
Portrait artist	1	-	1
Poultryman	1	-	1
Printer	1	-	1
Real estate collector	1	-	1
Restaurant manager	1	-	1
Rubber factory	3	3	6
Salesman	9	-	9
Saleswoman	-	1	1
Sawmill	1	-	1
Seaman	3	-	3
Seamstress	-	3	3
Ship fitter	1	-	1
Shipping clerk	3	-	3
Shoe repairer	1	-	1
Shoe shop	2	-	2
Silversmith	1	-	1
Social worker	-	1	1
Stage performer	-	1	1
Stamp girl	-	1	1
Steamfitter	1	-	1
Stenographer	-	3	3
Stitcher, shoe factory	3	3	6
Stone cutter	6	-	6
Storekeeper	1	-	1
Student	3	2	5
Tailor shop	10	1	11
Tannery	1	-	1
Teacher	1	1	2
Teamster	2	-	2
Telephone operator	-	3	3
Tinsmith	3	-	3

TABLE 6. — *Occupations of Patients admitted — Concluded.*

	Males.	Females.	Totals.
Tool checker	1	—	1
Trucking	3	—	3
Upholsterer	1	—	1
Vulcanizer	1	—	1
Waiter	7	—	7
Waitress	—	2	2
Watchmaker	1	—	1
Weaver	3	2	5
Wholesale dealer	1	—	1
Wool handler	1	—	1
Woolen mill	1	1	2
Totals	253	127	380

TABLE 7. — *Condition on Admission.*

	Males.	Females.	Totals.	Percentage.
Incipient	2	5	7	1.8421
Moderately advanced	133	57	190	50.0000
Advanced	99	58	157	41.3158
Not classified	18	7	25	6.5790
Nontuberculous	—	—	—	.2632
Not examined	1	—	1	—
Totals	253	127	380	—

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Apparently arrested	2	6	8	2.04
Quiescent	13	5	18	4.58
Improved	99	53	152	38.68
Unimproved	51	28	79	20.10
Died	61	24	85	21.63
Not considered	33	15	48	12.21
Nontuberculous	1	1	2	.51
Nonactive tuberculosis	1	—	1	.25
Totals	261	132	393	—

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month	-	-	-	9	4	13
1 to 2 months	1	-	1	9	3	12
2 to 3 months	-	-	-	7	3	10
3 to 4 months	-	-	-	5	1	6
4 to 5 months	2	1	3	5	-	5
5 to 6 months	1	1	2	-	2	2
6 to 7 months	5	1	6	2	3	5
7 to 8 months	3	1	4	2	2	4
8 to 9 months	3	-	3	3	1	4
9 to 10 months	3	-	3	2	-	2
10 to 11 months	-	3	3	3	1	4
11 to 12 months	4	1	5	1	1	2
12 to 18 months	12	4	16	3	1	4
18 to 24 months	2	3	5	2	2	4
Over 2 years	23	9	32	8	-	8
Unknown	2	-	2	-	-	-
Totals	61	24	85	61	24	85

TABLE 10. — *Cause of Deaths.*

	Males.	Females.	Totals.
Phthisis pulmonalis	61	24	85
Totals	61	24	85

TREASURER'S REPORT.

To the Commissioner of Public Health.

I respectfully submit the following report of the finances of this institution for the fiscal year ending Nov. 30, 1921:—

CASH ACCOUNT.

Balance Dec. 1, 1920 \$4,501 68

*Receipts.**Income.*

Board of inmates:

Private	\$4,585 92	
Reimbursements, insane, War Risk Insurance	9,925 91	
Cities and towns	28,461 55	
Reimbursements, charitable	228 56	
	<hr/>	\$43,201 94

Personal services:

Reimbursement from Board of Retirement	15 25	
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Sales:

Travel, transportation and office expenses	\$18 26	
Clothing and materials	9 00	
Furnishings and household supplies	20 28	
Medical and general care	5 00	

Farm:

Cows and calves	\$247 00	
Pigs and hogs	80 00	
Grease	215 15	
Roosters	4 50	
Sundries	52 31	
	<hr/>	598 96

651 50

Miscellaneous:

Interest on bank balances	231 07	
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 44,099 76

Other receipts:

Refunds of previous year	6 00	
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Receipts from Treasury of Commonwealth.

Maintenance appropriations:

Balance of 1920	\$7,796 89	
Advance money (amount on hand November 30)	10,000 00	
Approved schedules of 1921	186,448 35	
	<hr/>	204,245 24

Special appropriations	29,356 76	
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Total	\$282,209 44	
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Payments.

To treasury of Commonwealth:			
Institution income		\$44,099 76	
Refunds, account of maintenance		71 07	
Returned drum, account of 1920		6 00	
		<hr/>	\$44,176 83
Maintenance appropriations:			
Balance of schedules of previous year		\$12,298 57	
Eleven months' schedules, 1921	\$186,448 35		
Less returned	71 07		
		<hr/>	186,377 28
November advances		8,303 15	
		<hr/>	206,979 00
Special appropriations:			
Approved schedules		\$29,356 76	
November advances		359 87	
		<hr/>	29,716 63
Balance, Nov. 30, 1921:			
In bank		\$1,059 49	
In office		277 49	
		<hr/>	1,336 98
Total			<hr/>
			\$282,209 44

MAINTENANCE.

Balance from previous year, brought forward		\$275 18
Appropriation, current year		209,130 00
		<hr/>
Total		\$209,405 18
Expenses (as analyzed below)		202,236 43
		<hr/>
Balance reverting to treasury of Commonwealth		\$7,168 75

Analysis of Expenses.

Personal services:			
Sumner Coolidge, M.D., superintendent		\$3,900 00	
Medical		3,429 20	
Administration		5,640 00	
Kitchen and dining-room service		6,775 78	
Domestic		16,204 16	
Ward service (male)		6,358 87	
Ward service (female)		5,571 19	
Engineering department		7,665 35	
Repairs		4,879 13	
Farm		28,850 12	
Stable, garage and grounds		2,633 69	
		<hr/>	\$91,907 49
<i>Amount carried forward</i>			<hr/>
			\$91,907 49

<i>Amount brought forward</i>		\$91,907 49	
Religious instruction:			
Catholic	\$600 00		
Hebrew	225 10		
Protestant	450 00		
Other	13 00		
			1,288 10
Travel, transportation and office expenses:			
Advertising	\$17 25		
Postage	130 51		
Printing and binding	244 87		
Stationery and office supplies	848 30		
Telephone and telegraph	327 25		
Travel	1,101 70		
Freight	19 58		
			2,689 46
Food:			
Flour	\$2,775 20		
Cereals, rice, meal, etc.	1,136 37		
Bread, crackers, etc.	121 18		
Peas and beans (canned and dried)	193 38		
Macaroni and spaghetti	59 57		
Potatoes	128 00		
Meat	9,421 83		
Fish (fresh, cured and canned)	2,104 71		
Butter	4,680 01		
Butterine, etc.	105 60		
Cheese	149 51		
Coffee	321 68		
Tea	53 60		
Cocoa	53 97		
Milk (condensed, evaporated, etc.)	40 00		
Eggs (fresh)	1,239 38		
Sugar (cane)	2,027 62		
Fruit (fresh)	280 45		
Fruit (dried and preserved)	373 92		
Lard and substitutes	115 20		
Molasses and syrups	74 62		
Vegetables (fresh)	42 96		
Seasonings and condiments	489 98		
Yeast, baking powder, etc.	146 12		
Sundry foods	64 04		
Freight	1,118 42		
			27,317 22
Clothing and materials:			
Clothing (outer)			5 74
Furnishings and household supplies:			
Beds, bedding, etc.	\$665 74		
Carpets, rugs, etc.	322 20		
Croekery, glassware, cutlery, etc.	534 62		
Dry goods and smallwares	164 75		
Electric lamps	386 63		
<i>Amounts carried forward</i>	\$2,073 94	\$125,281 95	

<i>Amounts brought forward,</i>	\$2,073 94	\$125,281 95
Furnishings and household supplies — <i>Concluded.</i>		
Fire hose and extinguishers	57 03	
Furniture, upholstery, etc.	1,071 67	
Kitchen and household wares	2,185 73	
Laundry supplies and materials	856 16	
Lavatory supplies and disinfectants	659 32	
Table linen, paper napkins, towels, etc.	484 72	
Sundries	52 94	
Freight	158 71	
	<hr/>	7,600 22
Medical and general care:		
Books, periodicals, etc.	\$45 40	
Entertainments, games, etc.	897 03	
Funeral expenses	249 00	
Ice and refrigeration	184 43	
Laboratory supplies and apparatus	96 29	
Medicines (supplies and apparatus)	2,043 20	
Medical attendance (extra)	46 00	
Sputum cups, etc.	997 57	
Tobacco, pipes, matches	10 25	
Freight	39 36	
	<hr/>	4,608 53
Heat, light and power:		
Coal (bituminous)	\$9,481 84	
Freight and cartage	8,173 10	
Coal (anthracite)	1,245 11	
Freight and cartage	485 13	
Oil	335 63	
Operating supplies for boilers and engines	399 78	
Sundries	148 43	
Freight	31 83	
	<hr/>	20,300 85
Farm:		
Bedding materials	\$333 26	
Blacksmithing and supplies	359 00	
Carriages, wagons and repairs	124 47	
Dairy equipment and supplies	587 08	
Fencing materials	136 81	
Fertilizers	2,763 68	
Grain, etc.	17,281 05	
Hay	915 73	
Harnesses and repairs	49 96	
Cows	109 00	
Other live stock	1,188 00	
Labor (not on pay roll)	339 30	
Rent	115 00	
Road work and materials	312 91	
Spraying materials	283 62	
Stable and barn supplies	273 62	
Tools, implements, machines, etc.	1,807 72	
	<hr/>	
<i>Amounts carried forward</i>	\$26,980 21	\$182,697 82

<i>Amounts brought forward,</i>	\$26,980 21	\$182,697 82
Farm — Concluded.		
Trees, vines, seeds, etc.	1,127 37	
Veterinary services, supplies, etc.	318 00	
Sundries	468 48	
Freight	1,678 68	
	<hr/>	30,572 74
Garage, stable and grounds:		
Motor vehicles	\$1,550 00	
Automobile repairs and supplies	3,184 81	
Fertilizers	238 77	
Road work and materials	326 31	
Spraying materials	27 00	
Tools, implements, machines, etc.	95 88	
Trees, vines, seeds, etc.	142 84	
Freight	110 23	
	<hr/>	5,675 84
Repairs, ordinary:		
Brick	\$46 88	
Cement, lime crushed stone, etc.	413 00	
Electrical work and supplies	687 68	
Hardware, iron, steel, etc.	722 92	
Labor (not on pay roll)	281 62	
Lumber, etc. (including finished products)	1,407 33	
Paint, oil, glass, etc.	796 54	
Plumbing and supplies	334 94	
Roofing and materials	457 32	
Steam fittings and supplies	821 89	
Tents, awnings, etc.	380 86	
Tools, machines, etc.	247 23	
Boilers, repairs	191 47	
Dynamos, repairs	37 91	
Engines, repairs	149 47	
Sundries	97 49	
Freight	158 67	
	<hr/>	7,233 22
Repairs and renewals:		
Moving picture machine	\$1,149 97	
House telephone system	1,387 10	
Boiler feed pump	499 95	
	<hr/>	3,037 02
		<hr/>
Total expenses for maintenance		\$202,236 43
SPECIAL APPROPRIATIONS.		
Balance Dec. 1, 1920		\$12,155 18
Appropriations for current year		18,000 00
		<hr/>
Total		\$30,155 18
Expended during the year (see statement below)	\$29,356 76	
Reverting to treasury of Commonwealth	96	
	<hr/>	29,357 72
		<hr/>
Balance Nov. 30, 1921, carried to next year		\$797 46

OBJECT.	Act or Resolve.	Whole Amount.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
Generator unit	Chap. 629, 1920	\$9,005 00	\$8,850 81	\$9,004 11	\$0.89*
Purchase of house and land, J. Letcher estate.	Chap. 153, 1919	2,500 00	2,500 00	2,500 00	-
Shelter for young stock	Chap. 629, 1920	2,500 00	803 41	2,499 93	.07*
Storehouse	Chap. 203, 1921	10,000 00	9,960 58	9,960 58	39 42
Cow barn addition	Chap. 203, 1921	8,000 00	7,241 96	7,241 96	758 04
		\$32,005 00	\$29,356 76	\$31,206 58	\$798 42

* Balance reverting to treasury of the Commonwealth \$0 96
 Balance carried to next year 797 46
 Total as above \$798 42

RESOURCES AND LIABILITIES.

Resources.

Cash on hand	\$1,336 98	
November cash vouchers (paid from advance money):		
Account of maintenance	\$8,303 15	
Account of special appropriations	359 87	
	<u>8,663 02</u>	\$10,000 00
Due from treasury of Commonwealth from available appropriation, account of November, 1921, schedule		5,859 15
		<u>\$15,859 15</u>

Liabilities.

Outstanding schedules of current year:	
Schedule of November bills	\$15,859 15

PER CAPITA.

During the year the average number of inmates has been 236.915.
 Total cost for maintenance, \$202,236.43.
 Equal to a weekly per capita cost of \$16.4162.
 Receipt from sales, \$651.50.
 Equal to a weekly per capita of \$0.05288.
 All other institution receipts, \$43,448.26.
 Equal to a weekly per capita of \$3.5267.
 Net weekly per capita cost \$12.8367.

Respectfully submitted,

SUMNER COOLIDGE,
Treasurer.

Examined and found correct as compared with the records in the office of the Auditor of the Commonwealth.

ALONZO B. COOK,
Auditor.

RUTLAND STATE SANATORIUM.

RESIDENT OFFICERS.

ERNEST B. EMERSON, M.D.	. . . . .	<i>Superintendent.</i>
LEON A. ALLEY, M.D.	. . . . .	<i>Assistant Superintendent.</i>
HALBERT C. HUBBARD, M.D.	. . . . .	<i>Physician.</i>
WILLIAM B. DAVIDSON, M.D.	. . . . .	<i>Physician.</i>
JAMES F. McLAUGHLIN, M.D.	. . . . .	<i>Physician.</i>
DAVID ZACKS, M.D.	. . . . .	<i>Physician.</i>
WILLIAM J. O'CONNOR, D.M.D.	. . . . .	<i>Dentist.</i>
DELYA E. NARDI	. . . . .	<i>Superintendent of Nurses.</i>
CORA A. PHILLIPS	. . . . .	<i>Head Matron.</i>
OLIN C. BLAISDELL	. . . . .	<i>Steward.</i>
WALTER C. BROWN	. . . . .	<i>Chief Engineer.</i>
JOSEPH A. CARROLL	. . . . .	<i>Farmer.</i>

REPORT OF THE SUPERINTENDENT.

TO EUGENE R. KELLEY, M.D., *Commissioner, Department of Public Health, State House, Boston, Mass.*

I have the honor to submit the twenty-fifth annual report of the Rutland State Sanatorium for the year ending Nov. 30, 1921.

During the year there has been expended \$312,281.20 for maintenance, a gross weekly per capita cost of \$17.3406. There has been expended from the special appropriation authorized by chapter 55, Resolves of 1918, \$853.42. The details of these disbursements are contained in the report of the treasurer.

There has been collected from miscellaneous sources (the total of all collections) \$58,926.53. Deducting this amount from the gross maintenance expense leaves a net expense of \$253,354.67, and a net weekly per capita cost of \$14.0682. There has been collected from private funds \$12,667.37; from cities and towns \$39,880.32; from the United States Veterans Bureau \$4,940.38. One hundred and twenty-eight cases were supported wholly or in part from private funds; 213 by cities and towns; 58 wholly by the State; 23 by the United States Veterans Bureau.

There were 356 patients in the sanatorium at the beginning of the year, and 364 at the close. The largest number present at one time was 371 and the smallest 304. The daily average number of patients was 346.32. There were 483 cases admitted during the year, — 118 incipient, 174 moderately advanced, 165 advanced and 26 unclassified. There were 338 cases admitted from cities and towns of over 25,000 population, and 145 from cities and towns under 25,000 population. The average age of patients admitted was twenty-nine years. Including deaths, there were 475 patients discharged, and the average duration of residence was seven months and twenty-one days. Of those discharged, 345 gained 4,647½ pounds, an average gain of 13.47 pounds per person. Of the discharges there were 14 arrested cases, 11 less than last year; 26 apparently arrested, 8 less than last year; 215 quiescent, 28 more than last year; 75 improved and 46 unimproved. There were 45 patients not considered, the dura-

tion of treatment being less than one month. There were 51 deaths, 11 less than last year. There were 3 discharged nontuberculous. There were 126,407 hospital days of treatment, 365 more than last year.

The following table shows the classification on the application blank and our classification on admission:—

	Classification on Application Blank.	Our Classification on Admission.	Per Cent.
Incipient	278	118	24.4
Moderately advanced	186	174	36.0
Advanced	11	165	34.0
Unclassified	8	26	5.6
Totals	483	483	—

MEDICAL REPORT.

There were two vacancies on the staff at the beginning of the year occasioned by resignations Sept. 12 and Oct. 15, 1920, noted in last year's report. The following appointments were made to fill these vacancies:—

Dr. James F. McLaughlin, a graduate of Tufts Medical School, of the Springfield Hospital and of the Evangeline Booth Maternity Hospital, was appointed assistant physician Jan. 1, 1921.

Dr. David Zacks, a graduate of Tufts Medical School, of the Boston City Hospital and of the Evangeline Booth Maternity Hospital, was appointed assistant physician on Aug. 15, 1921.

In view of the length of time these positions were vacant it may not be out of place to mention again the difficulty of securing well-trained and competent physicians. Such men are not looking to the institutions for a career. Institutional work is rarely entered with the idea of making it a permanent calling; rather it is taken up primarily as a means to an end. With the accumulation of experience and a replenished pocketbook the young physician enters other fields where he may obtain greater rewards for his efforts. A mechanic's wage and one room do not appeal to the live man who has spent twenty years in preparation for a career. Constant changes in a medical staff are discouraging and demoralizing and standards cannot be maintained, to say nothing of progress. It is either the enthusiast desirous of further experience before taking up the practice of medicine or the one who has failed to make good and anticipates an easy existence who is attracted to a State institution. There should be an opportunity in the State institutions for a strictly medical career, with a reward for ability and experience sufficient to attract and to hold in the service the best that are coming from the medical schools.

Mrs. Doris L. Davidson, a graduate of Smith College and more recently technician at the Worcester City Hospital, was appointed assistant bacteriologist to take charge of the laboratory Aug. 8, 1921.

Treatment has been carried along essentially the same lines as in previous years except that we are prescribing more rest in bed for a group of patients previously treated as chair cases. These patients are not given absolute rest treatment but are allowed toilet and bathroom privileges, meals at the bedside and the liberty of visiting about the ward in the evening. We believe that prolonging the period of bed treatment for this group lays a foundation for a more rapid arrest or inactivity of the disease than undertaking to secure sufficient relaxation with the patient dressed and supposedly taking chair treatment as prescribed. A few patients will co-operate beyond criticism if allowed clothes, but the majority feel too well to appreciate the significance of their trouble or the importance of rest, and it is practically impossible for the nurse to check accurately those disposed to regulate their own activities. Acute and active cases, as in the past, are given more intensive treatment and are not allowed the privileges granted the other group. All new admissions are automatically treated as bed cases for two weeks. The daily rest period observed by all patients has been increased from one hour to two hours.

It should not be lost sight of that the increased number of bed cases adds materially to the work of the laundry, nursing, housekeeping and kitchen departments.

Our experience has been similar to that of the Westfield Sanatorium, that more harm is done by overeating than by undereating, as a result of which, lunches are being prescribed less and less as time goes on.

The increase in weights this year has been quite remarkable. The average gain of those who gained is 2 pounds more than the average gain of the previous three years, and the average loss in weight of those who have lost is $3\frac{4}{10}$ pounds less for the same period. It is a question whether to attribute these gains to the omission in part of the lunches, to the increased bed treatment, or to both. The fact that 24.4 per cent of the admissions were classified as incipient as against 32.6 per cent incipient last year is suggestive so far as figures go that these modifications of the treatment may have some bearing.

There is a routine examination of sputum and urine and a specimen of blood drawn for the Wassermann test immediately after admission. The sputa of those cases found positive for tuberculosis are then examined once a month; all negative cases twice monthly. A special effort has been made this year to confirm diagnoses by demonstrating the tubercle bacillus. Persistently negative cases have been examined by the antiformin method or a daily sputum examination has been made for a period of two weeks or longer. Animal inoculations have been made in a few instances. There are, however, 15.7 per cent negative cases or 84.3 per cent positive cases.

The following examinations have been made: —

Urine	691
Sputum	5,320
Blood counts	20
Blood smears	1
Examinations for pneumococcus	2
Smears from eyes, throat, etc.	5
Blood drawn for Wassermann test	462

Routine dental examination is made of all admissions. The following table is a summary of the dentistry done during the year: —

Office visits and treatments	1,552
Prophylactics	130
Amalgam fillings	268
Cement fillings	91
Gutta-percha fillings	132
Temporary fillings	141
Pulp treatments	41
Treatment cases	406
Surgical dressings	10
Extractions	148
Abscess cases	60
Mouth washes	71
Vincent's disease	3
Inlays	73
Repairs to plates	5
Bridges	82
Plates	16
Crowns	91
X-rays	112
Repairs to bridges	5

A sterilizer and motor-driven dental engine have been added to the equipment.

The staff meets three times a week, — Monday morning for the consideration particularly of administrative questions, and Tuesday and Friday mornings for a clinical conference. All new patients are presented by the physicians, together with the case histories, laboratory reports and X-ray plates. The patient is examined and classified and prognosis and treatment discussed. Patients ready for discharge are similarly seen at these conferences. The staff meetings and clinical conferences have developed a co-operative spirit and teamwork which has been most gratifying.

CLINICS.

The consultation clinics inaugurated by the Department last year have been held monthly at Worcester, Fitchburg, Clinton and Gardner. I believe this service is an advance in the campaign against tuberculosis and that as time goes on its value will become more generally recognized. Certainly the call for this service justifies its continuation for another year at least.

The day of the monthly clinic is more or less lost sight of by the busy practitioner; consequently, the number of cases referred is in a large measure due to the activity of the local nurse. I believe the attention of physicians should be called more frequently to this service until such time as it may become more firmly established and generally known. The clinics as now conducted are more or less unsatisfactory from the viewpoint of the consultant, inasmuch as we are frequently seeing cases in which a diagnosis is practically impossible from a single examination and oftentimes doubtful after several examinations. There are occasional cases in which a diagnosis can be made only after a careful study

and investigation, involving the X-ray, the laboratory and clinical observation, all of which facilities are available in the sanatorium. A large proportion of these obscure cases might be satisfactorily cleared up were it possible to admit them at once to the sanatorium for a limited period of observation and study. Proof positive of tuberculosis is the presence of the tubercle bacillus in the sputum, yet it is the established practice to admit to the sanatorium on physical findings, symptoms and the assumption of an existing tuberculosis rather than to wait for a positive sputum. As our admitting wards are essentially observation wards for the cases regularly admitted but not necessarily correctly diagnosed, it would appear to be a logical step to admit at once to these wards for observation the doubtful cases discovered at the clinic. If the patient is found to be nontuberculous, he need not be labeled as such; no harm has been done and he may be relieved of the depressing thought that he is a consumptive. On the other hand, valuable time may be saved in starting the proper treatment which in early cases particularly is of vital importance.

The following statistics cover a period of fifteen months since the consultation service was established:—

Number of patients examined	296
Diagnosis:	
Tuberculosis	127
Nontuberculous	56
Observation	113
Number of physicians referring cases	71
Number of cases brought in by nurse	4
Number of patients examined once	296
Number of patients examined twice	29
Number of patients examined three times	10
Number of patients examined four times	1
Number of patients examined five times	1

There were 24 cases admitted to this sanatorium following examinations at the clinics.

The following examinations were made at the sanatorium covering a period of twelve months:—

Ex-patients examined	57
Patients referred by outside physicians	35
Patients examined at own request	27
	—
Total	119
Diagnosis:	
Tuberculosis	99
Nontuberculous	13
Observation	7
	—
Total	119
Number of physicians referring cases	31

Number of ex-patients examined once	57
Number of ex-patients examined twice	7
Number of ex-patients examined three times	2

There were 21 cases admitted to this sanatorium following examinations.

It will be noted that 102 physicians have referred cases either to the clinics or to the sanatorium for examination, and that as a result of the clinics and the examinations at the sanatorium 45 cases favorable for improvement or arrest have been admitted. These facts indicate the possibilities of the consultation service.

TRAINING SCHOOL.

There are 25 nurses in training, — 5 probationers, 7 juniors and 13 seniors. Seven nurses have received four months' training at the Milford General Hospital, which constitutes a part of the prescribed course. The following have been awarded diplomas: —

- Caroline Thompson White.
- Margaret Mary McKay.
- Mary Blanche Boucher.
- Mary Latina Musante.
- Florence Isabelle Grady.

The training school offers an exceptional opportunity for the ex-patient to obtain a profession while at the same time living under ideal conditions and in a sense continuing treatment. There is a broad field for graduates of this school either in public health work or in sanatorium service, and the demand for our graduates far exceeds the supply.

Our nurses are recruited for the most part from the ranks of the patients. They enter the school with a point of view somewhat different than that of one who has never experienced the life of the patient. With this background I have felt that the true spirit of nursing is developed as an outstanding feature of the school and that the course given is an exemplification of practical vocational training.

The prescribed course for a registered nurse is given by the superintendent of nurses and the medical staff. The course in dietetics was given by Mrs. Alzira Sandwall of the Department of Public Health. Instruction in mental diseases was given by Dr. Michael J. O'Meara of Worcester.

FARM.

The stone wall south of the Bartlett Farm and the wall in the field on Central Tree Road have been removed, in addition to considerable grubbing to make this land suitable for cultivation. The chestnut timber has been cut and is to be sawed for use about the institution. A tractor, power sprayer and other less expensive items of machinery have been added to the farm equipment.

IMPROVEMENTS.

Outside painting, including metal roofs, has been done over the entire institution, in addition to considerable work in the wards. All brickwork has been repointed. Outside stucco work and inside plastering have been repaired or

replaced. Work on the gravel roofs started in October has progressed slowly because of weather conditions. Repairs to the metal roofs have been completed. About 1 mile of road and driveway has been resurfaced. Shortly before the close of the year the coal pocket collapsed, at the same time breaking away the northeast corner of the power house. Repairs requiring considerable brickwork, cement and steel girders are under way.

RECOMMENDATIONS.

Plans and specifications have been submitted for a building to provide quarters for forty-two employees now sleeping in dormitories adjacent to the wards and sharing toilets, lavatories and locker rooms with the patients. This condition is deplorable, to say the least, and results in overcrowding and more or less friction between patients and employees. Desirable nontuberculous employees will not tolerate such accommodations, which the ex-patient, equally entitled to the privacy of a single room, is compelled to accept by reason of his misfortune. At the present time there is no place patients may go, with the exception of the lavatories and toilets, where heat is provided. The lack of such facilities is a hardship particularly during the winter months. The removal of these employees from the dormitories will relieve the overcrowding, increase the capacity of the institution and afford much needed space for the use of patients. Estimates have been submitted that the building can be erected for \$67,000, and I recommend an appropriation of that amount. I recommend that \$10,000 be appropriated for steel lockers to replace the present wooden lockers which are obsolete and unsanitary, and that \$4,000 be appropriated for the erection of a garage to provide space for motor equipment now housed in the horse barn.

Since the trestle at Muschopauge was condemned, the delivery of coal has become a serious problem inasmuch as there is not space at the siding in Jefferson to store over six cars without rehandling. This is expensive and inconvenient; the expense of shoveling alone practically offsetting the price which may be obtained for immediate delivery or large shipments. Furthermore, because of inadequate storage, it is necessary to haul coal at the most inopportune times, seriously interfering with other work, whereas with sufficient storage space it would be hauled at our convenience and at less expense. I believe the Jefferson trestle either should be extended or a new trestle built on the site of the old one at Muschopauge. A new trestle at Muschopauge would appear to be a better proposition than an extension to the one at Jefferson. The siding at Jefferson is approximately 3 miles from the boiler house and the coal pocket several feet under water in the spring; the siding at Muschopauge is 1½ miles away and the site above water. Notwithstanding the advantage of the State road to Jefferson, the difference in the length of the haul adds materially to the cost of coal in the bunker; a pair of horses can make five trips to Muschopauge as against three trips to Jefferson. I recommend that plans and estimates be obtained for this construction.

News of the death of Dr. William J. Gallivan, Director of the Division of Tuberculosis, came as a shock to all on the morning he had planned to visit the sanatorium for a week end. During the time he had been officially connected

with the sanatorium he had won the respect and love of all with whom he was associated. He had a warm, personal interest in every one; a word of encouragement and good cheer accompanied his visits to the wards. Prominent for many years in health and tuberculosis work, with a broad vision of the future, the Commonwealth loses a most conscientious worker in the interests of better health. To me his counsel and optimism were invaluable and his loss a personal one.

The members of the staff, nurses and employees have rendered a year of faithful service and merit your approval.

Deeply appreciating your interest and confidence during the year, I am

Respectfully,

ERNEST B. EMERSON,

Superintendent.

VALUATION.

Land.

Grounds (51.107 acres)	\$17,979 20	
Lawns and buildings, 41.107 acres.		
Roads, 10 acres.		
Woodland (77.21 acres)	2,683 65	
Mowing (56.05 acres)	5,605 00	
Tillage (58.52 acres)	6,646 74	
Tillage, 42.32 acres.		
Garden, 16.20 acres.		
Orchard (1.64 acres)	328 00	
Pasture (93.05 acres)	2,933 85	
Waste and miscellaneous (26.65 acres)	1,369 50	
Rough pasture, 1.95 acres.		
Meadow swamp land, 18.22 acres.		
Sewer beds, 5.98 acres.		
New coal trestle, .50 acre.		
		\$37,545 94
Sewerage system		15,508 32
		\$53,054 26

Buildings.

Institution buildings	\$493,312 69	
Farm, stable and grounds	25,375 00	
Miscellaneous	30,295 75	
		548,983 44
Total		\$602,037 70
Present value of all personal property as per inventory of Dec. 1, 1921		103,585 61
		\$705,623 31

SPECIAL REPORT.

The following special report is prepared in accordance with a resolution of the National Conference of Charities and Corrections, adopted May 15, 1906:—

Population.

	Males.	Females.	Totals.
Number received during the year	262	221	483
Number passing out of the institution during the year	265	210	475
Number at end of fiscal year in the institution	180	184	364
Daily average attendance (number of inmates actually present) during the year.	174.50	171.82	346.32
Average number of employees and officers during the year	118.40	65.90	184.30

Expenditures.

Current expenditures:

1. Salaries and wages	\$133,195 45	
2. Clothing	241 52	
3. Subsistence	78,421 92	
4. Ordinary repairs	8,542 35	
5. Office, domestic and outdoor expenses	91,879 96	
		\$312,281 20

Extraordinary expenses:

1. Permanent improvements to existing buildings	853 42
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Grand total	\$313,134 62
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Summary of Current Expenses.

Total expenditure	\$313,134 62
Deducting extraordinary expenses	853 42
	\$312,281 20
Deducting amount of sales	600 25
	\$311,680 95

Dividing this amount by the daily average number of patients — 346.32 — gives a cost for the year of \$899.97, equivalent to an average weekly net cost of \$17.3073.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in sanatorium Nov. 30, 1921	182	174	356
Patients admitted Dec. 1, 1920, to Nov. 30, 1921	262	221	483
Patients discharged Dec. 1, 1920, to Nov. 30, 1921	265	210	475
Patients remaining in sanatorium Nov. 30, 1921	180	184	364
Daily average number of patients	174.50	171.82	346.32
Deaths (included in number discharged)	26	25	51

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Single	139	119	258
Married	112	94	206
Widowed	10	7	17
Divorced	1	1	2
Totals	262	221	483

TABLE 3. — *Age of Patients admitted.*

	Males.	Females.	Totals.	Percentage.
14 to 20 years	49	45	94	19
20 to 30 years	100	103	203	42
30 to 40 years	71	54	125	26
40 to 50 years	32	15	47	10
Over 50 years	10	4	14	3
Totals	262	221	483	—
Average age	30.32	27.94	29.23	—

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	158	48	44	118	36	40	276	84	84
Other New England States	15	16	16	21	16	15	36	32	31
Other States	13	13	13	9	6	6	22	19	19
Total native	186	77	73	148	58	61	334	135	134
Other countries (24)	76	182	186	73	159	154	149	341	340
Unknown	—	3	3	—	4	6	—	7	9
Grand totals	262	262	262	221	221	221	483	483	483

TABLE 5. — *Residence of Patients admitted.*

PLACE.	Number.	PLACE.	Number.
Adams	6	Gardner	8
Andover	1	Gloucester	1
Arlington	2	Grafton	1
Ashland	1	Hardwick	1
Athol	1	Haverhill	8
Barre	1	Hingham	2
Beverly	1	Holden	4
Boston	178	Holyoke	4
Brockton	3	Hopkinton	1
Cambridge	19	Hudson	2
Chelsea	7	Ipswich	2
Chicopee	1	Lawrence	4
Clinton	4	Leicester	2
Danvers	2	Leominster	5
Dedham	1	Lexington	3
Douglas	1	Lowell	4
Everett	2	Ludlow	1
Fall River	5	Lynn	12
Falmouth	1	Malden	4
Fitchburg	4	Mansfield	1
Framingham	9	Marlborough	13

TABLE 5. — *Residence of Patients admitted* — Concluded.

PLACE.	Number.	PLACE.	Number.
Maynard	1	Shelburne	1
Medford	6	Sherborn	1
Medway	1	Somerville	7
Melrose	2	Southbridge	2
Methuen	1	Springfield	13
Milford	4	Sudbury	1
Millville	1	Sutton	1
Milton	1	Templeton	3
Nahant	1	Tewksbury	1
Natick	2	Upton	1
New Bedford	1	Uxbridge	2
Newburyport	1	Wakefield	1
Newton	9	Walpole	2
North Adams	3	Waltham	3
Northborough	1	Watertown	1
Northbridge	7	Webster	1
Norwood	4	West Boylston	1
Peabody	2	West Springfield	1
Pittsfield	3	Westborough	2
Plymouth	2	Weymouth	1
Quincy	2	Winchendon	2
Revere	6	Winthrop	2
Rutland	1	Woburn	3
Salem	4	Worcester	29
Saugus	1	Total	483
Sharon	1		

TABLE 6. — *Occupations of Patients admitted.*

	Males.	Females.	Totals.
Accountant	1	—	1
Advertising agent	1	—	1
Attendant	1	—	1
Baker	1	—	1
Barber	3	—	3
Boiler tender	1	—	1
Bookbinder	—	1	1
Bookkeeper	—	3	3
Brakeman	2	—	2
Bundle girl	—	1	1
Candy maker	2	—	2
Carpenter	5	—	5
Chairmaker	1	—	1
Chambermaid	—	2	2
Chauffeur	7	—	7
Clerk	21	11	32
Collector	—	2	2
Conductor, Elevated Railroad	1	—	1
Conductor, street railway	3	—	3
Cook	2	—	2
Cook, helper	1	—	1
Cutter, clothing	1	—	1
Cutter, meat	1	—	1
Cutter, shoe	1	—	1
Cutter, stone	1	—	1
Designer	—	1	1
Draftsman	4	—	4
Dressmaker	—	1	1
Dyeworker	1	—	1
Electrician	4	—	4
Electrician, helper	1	—	1
Elevator operator	2	1	3
Engineer, electrical	1	—	1
Engineer, mechanical	1	—	1
Engineer, stationary	3	—	3
Errand boy	1	—	1
Expressman	1	—	1

TABLE 6. — *Occupations of Patients admitted* — Continued.

	Males.	Females.	Totals.
Factory	18	36	54
Farmer	1	1	2
Fireman	2	-	2
Gate tender	1	-	1
Governess	-	1	1
Hatter	1	-	1
Housekeeper	-	3	3
Housewife	-	85	85
Housework	-	18	18
Illustrator	1	-	1
Inspector, fire insurance	1	-	1
Insurance adjuster	1	-	1
Iron worker	1	-	1
Janitor	1	-	1
Junk dealer	1	-	1
Laborer	18	-	18
Laundress	-	2	2
Leather worker	3	-	3
Letter carrier	1	-	1
Machinist	23	-	23
Maid, lady's	-	1	1
Mason	1	-	1
Mechanic	2	-	2
Mechanic, auto	3	-	3
Motorman	3	-	3
Molder	1	-	1
Musician	1	-	1
No occupation	4	12	16
Nurse, student	-	2	2
Nurse, trained	-	6	6
Nursemaid	-	1	1
Optical workman	1	-	1
Orderly	3	-	3
Painter	6	-	6
Paymaster	1	-	1
Peddler	1	-	1
Pharmacist	1	-	1

TABLE 6. — *Occupations of Patients admitted* — Concluded.

	Males.	Females.	Totals.
Plumber	2	-	2
Pool room proprietor	1	-	1
Pressman	1	-	1
Printer	7	-	7
Produce dealer	1	-	1
Repairer, car	1	-	1
Repairer, shoe	1	-	1
Repairer, telephone	1	-	1
Sailor	2	-	2
Salespeople	20	7	27
Seamstress	-	2	2
Secretary	1	-	1
Shipbuilder	1	-	1
Shipper	2	-	2
Shoemaker	9	-	9
Singer, professional	1	-	1
Stage manager	1	-	1
Stenographer	-	7	7
Student	11	6	17
Tailor	2	-	2
Teacher	-	2	2
Teamster	4	-	4
Telephone operator	-	2	2
Telephone supervisor	-	1	1
Tinsmith	1	-	1
Toolmaker	4	-	4
Trainman, passenger	1	-	1
Typist	-	2	2
Upholsterer	1	-	1
Waiter	4	-	4
Watchman	1	-	1
Weaver	1	1	2
Wireworker	2	-	2
Totals	262	221	483

TABLE 7. — *Condition on Admission.*

	Males.	Females.	Totals.	Percentage.
Incipient	64	54	118	24.43
Moderately advanced	89	85	174	36.03
Far advanced	98	67	165	34.16
Unclassified	11	15	26	5.38
Totals	262	221	483	—

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Arrested	3	11	14	2.95
Apparently arrested	7	19	26	5.48
Quiescent	122	93	215	45.26
Improved	42	33	75	15.77
Unimproved	29	17	46	9.69
Died	26	25	51	10.74
Nontuberculous	2	1	3	.63
Not considered	34	11	45	9.48
Totals	265	210	475	—

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month	—	—	—	—	1	1
1 to 2 months	—	—	—	4	7	11
2 to 3 months	—	—	—	—	—	—
3 to 4 months	—	—	—	2	1	3
4 to 5 months	—	—	—	3	2	5
5 to 6 months	—	1	1	4	2	6
6 to 7 months	—	—	—	2	1	3
7 to 8 months	—	—	—	1	2	3
8 to 9 months	1	1	2	2	2	4
9 to 10 months	—	1	1	1	3	4
10 to 12 months	2	2	4	3	—	3
12 to 18 months	7	5	12	4	3	7
18 to 24 months	2	5	7	—	1	1
Over 2 years	14	10	24	—	—	—
Totals	26	25	51	26	25	51

TABLE 10. — *Cause of Deaths.*

	Males.	Females.	Totals.
Pulmonary tuberculosis	26	24	50
Acute endocarditis	—	1	1
Totals	26	25	51

TREASURER'S REPORT.

To the Commissioner of Public Health.

I respectfully submit the following report of the finances of this institution for the fiscal year ending Nov. 30, 1921: —

CASH ACCOUNT.

Balance Dec. 1, 1920			\$11,486 19
	<i>Receipts.</i>		
	<i>Income.</i>		
Board of inmates:			
Private	\$12,667 37		
Cities and towns, War Risk	44,820 70		
		\$57,488 07	
Personal services:			
Reimbursement from Board of Retirement		115 72	
Sales:			
Food	\$273 45		
Clothing and materials	38		
Furnishings and household supplies	40 95		
Medical and general care	121 39		
Heat, light and power	8 61		
Farm:			
Cows and calves	\$43 00		
Pigs and hogs	40 00		
Hides	7 33		
Sundries	59 55		
		149 88	
Garage, stable and grounds	5 59		
		600 25	
Miscellaneous:			
Interest on bank balances	\$548 13		
Sundries	174 36		
		722 49	
			58,926 53
Other receipts:			
Refunds of previous year			133 69
Amount carried forward			\$70,546 41

Amount brought forward \$70,546 41

Receipts from Treasury of Commonwealth.

Maintenance appropriations:

Balance of 1920 \$10,090 42
 Advanced money (amount on hand November 30) 20,000 00
 Approved schedules of 1921 288,135 33
————— 318,225 75

Special appropriations 853 42

Total \$389,625 58

Payments.

To treasury of Commonwealth:

Institution income \$58,926 53
 Refunds, account of maintenance 6 70
 Refunds of previous year 133 69
————— \$59,066 92

Maintenance appropriations:

Balance of schedules of previous year \$21,576 61
 Eleven months' schedules, 1921 \$288,135 33
 Less returned 670
————— 288,128 63
 November advances 9,979 16
————— 319,684 40

Special appropriations:

Approved schedules 853 42

Balance, Nov. 30, 1921:

In bank \$5,123 61
 In office 4,897 23
————— 10,020 84

Total \$389,625 58

MAINTENANCE.

Balance from previous year, brought forward \$2,447 46
 Appropriation, current year, \$344,300 plus \$6.70 (refunds current year) 344,306 70

Total \$346,754 16

Expenses (as analyzed below) 312,281 20

Balance reverting to treasury of Commonwealth \$34,472 96

Analysis of Expenses.

Personal services:

Ernest B. Emerson, superintendent \$3,900 00
 Medical 8,131 92
 Administration 9,571 98
 Kitchen and dining-room service 12,477 38
 Domestic 30,589 77

Amount carried forward \$64,671 05

<i>Amount brought forward</i>	\$64,671 05	
<i>Personal services — Concluded.</i>		
Ward service (male)	13,115 33	
Ward service (female)	16,543 58	
Engineering department	12,617 45	
Repairs	6,014 21	
Farm	14,005 47	
Stable, garage and grounds	6,227 06	
	<hr/>	\$133,194 15
<i>Religious instruction:</i>		
Catholic	\$600 00	
Hebrew	600 00	
Protestant	600 00	
Other	50 00	
	<hr/>	1,850 00
<i>Travel, transportation and office expenses:</i>		
Advertising	\$22 06	
Postage	267 00	
Printing and binding	315 72	
Stationery and office supplies	1,150 37	
Telephone and telegraph	1,145 10	
Travel	608 04	
Freight	21 09	
	<hr/>	3,529 38
<i>Food:</i>		
Flour	\$2,974 70	
Cereals, rice, meal, etc.	1,702 86	
Bread, crackers, etc.	103 31	
Peas and beans (canned and dried)	195 41	
Macaroni and spaghetti	123 54	
Potatoes	1,664 90	
Meat	27,843 49	
Fish (fresh, cured and canned)	2,080 03	
Butter	5,706 13	
Butterine, etc.	9 81	
Cheese	152 53	
Coffee	822 02	
Tea	154 96	
Cocoa	61 33	
Whole milk	11,325 66	
Milk (condensed, evaporated, etc.)	206 73	
Eggs (fresh)	7,003 43	
Sugar (cane)	2,376 33	
Sugar (maple, etc.)	68 54	
Fruit (fresh)	1,810 23	
Fruit (dried and preserved)	4,025 74	
Molasses and syrups	123 92	
Vegetables (fresh)	1,594 00	
Vegetables (canned and dried)	4,147 12	
Seasonings and condiments	1,177 22	
Yeast, baking powder, etc.	169 06	
Sundry foods	1 65	
Freight	793 77	
	<hr/>	78,418 42
<i>Amount carried forward</i>		<hr/> \$216,991 95

<i>Amount brought forward</i>		\$216,991 95	
Clothing and materials:			
Boots, shoes and rubbers		\$135 00	
Clothing (outer)		105 69	
Freight		83	
		<hr/>	241 52
Furnishings and household supplies:			
Beds, bedding, etc.		\$2,587 72	
Carpets, rugs, etc.		19 50	
Crockery, glassware, cutlery, etc.		1,294 21	
Dry goods and smallwares		152 36	
Electric lamps		245 12	
Fire hose and extinguishers		37 03	
Furniture, upholstery, etc.		279 81	
Kitchen and household wares		1,690 10	
Laundry supplies and materials		534 01	
Lavatory supplies and disinfectants		1,305 82	
Table linen, paper napkins, towels, etc.		674 87	
Freight		176 59	
		<hr/>	8,997 14
Medical and general care:			
Books, periodicals, etc.		\$144 48	
Entertainments, games, etc.		276 42	
Gratuities		12 34	
Ice and refrigeration		193 84	
Laboratory supplies and apparatus		1,397 29	
Medicines (supplies and apparatus)		4,195 83	
Medical attendance (extra)		57 00	
Sputum cups, etc.		1,357 97	
Tobacco, pipes, matches		21 74	
Water		2,182 60	
Freight		78 67	
		<hr/>	9,918 18
Heat, light and power:			
Coal (bituminous)		\$16,269 13	
Freight and cartage		20,494 90	
Coal (anthracite)		1,360 47	
Freight and cartage		930 01	
Charcoal		100 00	
Electricity		120 00	
Oil		1,163 80	
Operating supplies for boilers and engines		412 35	
Rent of coal trestle		6 66	
Freight		27 98	
		<hr/>	40,885 30
Farm:			
Bedding materials		\$523 35	
Blacksmithing and supplies		378 47	
Carriages, wagons and repairs		973 26	
Dairy equipment and supplies		328 95	
Fencing materials		185 39	
Fertilizers		1,377 55	
Grain, etc.		6,415 11	
		<hr/>	
<i>Amounts carried forward</i>		\$10,182 08	\$277,034 09

<i>Amounts brought forward</i>	\$10,182 08	\$277,034 09
Farm — Concluded.		
Harnesses and repairs	244 07	
Horses	190 00	
Cows	375 00	
Other live stock	710 83	
Labor (not on pay roll)	107 00	
Spraying materials	45 87	
Stable and barn supplies	81 02	
Tools, implements, machines, etc.	3,889 04	
Trees, vines, seeds, etc.	518 19	
Veterinary services, supplies, etc.	506 72	
Hennery supplies and pasturing	153 70	
Freight	225 32	
	<hr/>	17,228 84
Garage, stable and grounds:		
Automobile repairs and supplies	\$2,770 85	
Bedding and materials	30 71	
Blacksmithing and supplies	74 72	
Carriages, wagons and repairs	204 17	
Grain	131 12	
Harnesses and repairs	104 80	
Labor (not on pay roll)	16 00	
Road work and materials	27 50	
Spraying materials	8 45	
Stable supplies	33 97	
Tools, implements, machines, etc.	391 00	
Trees, vines, seeds, etc.	24 63	
Freight	4 00	
	<hr/>	3,821 92
Repairs, ordinary:		
Cement, lime, crushed stone, etc.	\$902 01	
Electrical work and supplies	802 72	
Hardware, iron, steel, etc.	349 82	
Labor (not on pay roll)	51 21	
Lumber, etc. (including finished products)	819 67	
Paint, oil, glass, etc.	2,659 30	
Plumbing and supplies	460 74	
Roofing and materials	28 53	
Steam fittings and supplies	436 99	
Tents, awnings, etc.	226 88	
Tools, machines, etc.	884 63	
Boilers, repairs	337 80	
Dynamos, repairs	8 04	
Engines, repairs	43 20	
Labor, not on pay roll	406 00	
Freight	122 91	
	<hr/>	8,540 45
Repairs and renewals:		
Scales for weighing coal	\$759 50	
Plumbing	229 19	
Roofing	3,894 79	
Steam fitting	384 10	
	<hr/>	
<i>Amounts carried forward</i>	\$5,267 58	\$306,625 30

Amounts brought forward \$5,267 58 \$306,625 30

Repairs and renewals — *Concluded.*

Painting 192 33
 Boilers 42 00
 Lumber 147 29

5,649 20

Total expenses for maintenance \$312,274 50

SPECIAL APPROPRIATIONS.

Balance Dec. 1, 1920 \$1,094 26
 Expended during the year (see statement below) \$853 42
 Reverting to treasury of Commonwealth 240 84

\$1,094 26

Balance Nov. 30, 1921, carried to next year —

OBJECT.	Act or Resolve.	Whole Amount.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
Kitchen, service and store-house building.	Chap. 55, 1918	\$55,000 00	\$853 42	\$54,759 16	\$240 84*
		\$55,000 00	\$853 42	\$54,759 16	\$240 84

* Balance reverting to treasury of the Commonwealth.

RESOURCES AND LIABILITIES.

Resources.

Cash on hand \$10,020 84
 November cash vouchers (paid from advance money), account of maintenance 9,979 16

\$20,000 00

Due from treasury of Commonwealth from available appropriation, account of November, 1921, schedule 4,145 87

\$24,145 87

Liabilities.

Outstanding schedules of current year:
 Schedule of November bills \$24,145 87

PER CAPITA.

During the year the average number of inmates has been 346.32.
 Total cost for maintenance, \$312,274.50.
 Equal to a weekly per capita cost of \$17.3402.
 Receipt from sales, \$600.25.
 Equal to a weekly per capita of \$0.0333.
 All other institution receipts, \$58,326.28.
 Equal to a weekly per capita of \$3.2387.
 Net weekly per capita cost, \$14.0682.

Respectfully submitted,

LEON A. ALLEY,
Treasurer.

Examined and found correct as compared with the records in the office of the Auditor of the Commonwealth.

ALONZO B. COOK,
Auditor.

WESTFIELD STATE SANATORIUM.

RESIDENT OFFICERS.

HENRY D. CHADWICK, M.D.	. . . . .	<i>Superintendent.</i>
ROY MORGAN, M.D.	. . . . .	<i>Assistant Superintendent.</i>
HEMAN B. CHASE	. . . . .	<i>Physician.</i>
RUSSELL H. BETHELL	. . . . .	<i>Dentist.</i>
EMILY B. MORGAN	. . . . .	<i>Superintendent of Nurses and Matron.</i>
BENJAMIN J. SANDIFORD	. . . . .	<i>Chief Engineer.</i>
ROBERT J. GOLDBERG	. . . . .	<i>Farmer.</i>

REPORT OF THE SUPERINTENDENT.

TO EUGENE R. KELLEY, M.D., *Commissioner, Department of Public Health, State House, Boston.*

I have the honor to submit the twelfth annual report of the Westfield State Sanatorium for the year ending Nov. 30, 1921.

During the year there has been expended \$190,027 for maintenance, a gross weekly per capita cost of \$13,896, and \$5,237.11 from the appropriations authorized by chapter 225, Resolves of 1920, and chapter 203, Resolves of 1921. The details of these disbursements are contained in the report of the treasurer.

There has been collected from miscellaneous sources \$48,039.10. Deducting this amount from the gross maintenance expense leaves a net expense of \$141,987.90, and a net weekly per capita cost of \$10,383. There has been collected from private funds \$4,930.12; from cities and towns \$36,112.99; from the United States Veterans Bureau \$3,721.69. Fifty-six cases were supported wholly or in part from private funds; 318 by cities and towns; 83 wholly by the State; 5 by the United States Veterans Bureau; 25 by the Department of Public Welfare; in 51 the status was undetermined.

There were 266 patients in the sanatorium at the beginning of the year and 273 at the close. The largest number present at one time was 276 and the smallest 250. The daily average number of patients was 262.98. There were 309 cases admitted during the year, — 83 incipient, 141 moderately advanced, 82 advanced and 3 nontuberculous. There were 167 cases admitted from cities and towns of over 25,000 population, and 142 from cities and towns under 25,000 population. The average age of patients admitted was 21.05 years. Including deaths, there were 303 discharges, and the average duration of residence was eleven months and ten days. Of those discharged, 211 gained 2,322 pounds, an average gain of 11 pounds per person. Of the discharges there were 160 apparently arrested, 24 more than last year; 21 quiescent, 31 less than last year; 25 improved and 42 unimproved. There were 14 patients not considered, the duration of treatment being less than one month. There were 38 deaths, 3 less than last year. There were 3 discharged nontuberculous. There were 95,987 hospital days of treatment, 1,828 less than last year.

The following table shows the classification on the application blank and our classification on admission:—

	Classification on Application Blank.	Our Classification on Admission.
Incipient	149	83
Moderately advanced	116	141
Advanced	15	82
Unclassified	29	-
Nontuberculous	-	3
Totals	309	309

MEDICAL REPORT.

We have found heliotherapy of great advantage in cases of superficial tuberculous lesions, such as lupus, scrofula derma, suppurating adenitis and sinuses from diseased bones and joints. The sun's rays are used on the exposed part when weather conditions warrant, and on cold and cloudy days the Quartz lamp is found to be an effective substitute. We have used bed rest treatment more than ever before and are getting better results.

The X-ray equipment has been of inestimable value to the medical staff to supplement the first physical examination, and to study conditions that arise as the result of complications and artificial pneumothorax treatment. In the study of the thoracic conditions of children, the X-ray is indispensable for accurate diagnosis.

I have written two papers the past year. Both have been published in the "American Review of Tuberculosis," — "Malnutrition and its Relation to Tuberculosis" and "The Child's Place in the Tuberculosis Program." In addition to this I have given addresses on "Childhood Tuberculosis and Nutrition" in Westfield, Marlborough, Cambridge, Worcester, Northampton and Boston. In May I served on a joint committee of the National Tuberculosis Association and the American Association to define Rules of Discipline and Treatment of War Risk Insurance Beneficiaries. The report of this committee was accepted and has been put into practice.

CLINICS.

Consultation clinics have been held each month in Springfield, Holyoke, Pittsfield and Adams. Those in Holyoke and Adams have been well attended and seemed to be appreciated by the local physicians, who frequently accompany their patients to the dispensary where the examinations are made. The physicians of Pittsfield have been slower to make use of the clinic. During the past four months of the year, however, several of the leading doctors have sent in patients, and this indication of interest on their part makes the prospect encouraging for a more successful clinic there in the future. I think the reason we have had so few patients at the Springfield clinic is the proximity of the sanatorium to that city. The physicians find it more convenient to direct their patients to come to the sanatorium on any day of the week than to wait for the

second Wednesday of the month to see us at the dispensary. Although but 10 patients were seen at the consultation clinics, 42 Springfield patients came to the sanatorium for examination during the year. Most of them were advised to do so by their physicians, to whom we reported the results of our findings.

The total number of patients examined at the consultation clinics was as follows:—

	Positive.	Further Ex-amination.	Negative.	Totals.
Holyoke	30	7	5	42
Adams	26	16	5	47
Springfield	3	3	6	12
Pittsfield	8	1	1	10
Totals	67	27	17	111

Examination clinics have been continued during the year in co-operation with the Hampden County Tuberculosis Association. These have been arranged by the public health nurses in the employ of the association. They have been well planned and the positive and suspicious cases found at these clinics have been followed up by the nurses to see that suitable treatment was instituted. These clinics have been held in Ludlow, West Springfield, Palmer, East Longmeadow, Three Rivers, Southwick and Brimfield, 13 clinics altogether. Two hundred and twenty-five patients were examined; 18 were found to be positive, and 103 had suspicious signs and are being kept under observation. These are all small towns without dispensaries, and the physicians and the people have seemed to welcome this service. It is a plan that should be extended to all the rural communities so that we may complete the chain of systematic tuberculosis work and make it State wide. The sanatoria, both State and county, should serve as centers for this clinical work in their adjacent territory. Its purpose is not to compete with existing dispensaries, but to supplement them in the small towns and isolated villages. The intensive work done in recent years in the cities has resulted in bringing down the death rate from tuberculosis close to the rural level and bids fair to go below it. The change in the rural tuberculosis death rate as compared with the urban has declined but little. We have reason to assume that this is because the small towns have been neglected in the past by the tuberculosis crusade. The Berkshire County Tuberculosis Association arranged two clinics this last year,—one at Williamstown, where we examined 20 patients, and the other at Lee, where we examined 24. The board of health of Chicopee invited us to hold a clinic at their dispensary last spring, and 18 patients appeared for examination.

Sanatorium out-patient work has increased in a very satisfactory way. In 1920 we examined 118 out-patients. This year we have examined 185,—110 males and 75 females. Of these, 70 were active tuberculous cases, 26 quiescent, 69 negative and 20 suspicious. It was found desirable as an aid in diagnosis to

take an X-ray film of the chest in 71 of these cases. We have therefore been called upon to make a diagnosis in 296 cases, including out-patients and those who appeared at the consultation clinics. This number is within 13 of as many as were admitted to the sanatorium. Including the out-patients, those examined at the consultation clinics, at the examination clinics, and at the board of health clinics, we have examined a total of 583 patients for diagnosis of chest conditions.

DENTISTRY.

All the new patients are examined within a few days after admission. All the children are re-examined within four months. As a matter of interest the younger patients were asked whether or not they were in the habit of using a toothbrush at home and their answers were as follows:—

AGES.	BOYS.			GIRLS.		
	Number.	Per Cent.	Answer.	Number.	Per Cent.	Answer.
4 to 13 years	45	42	Yes	40	75	Yes
13 to 17 years	38	48	Yes	30	75	Yes

The teaching of oral hygiene and providing needed dental work is a very important factor in the care of sanatorium patients. Undoubtedly such treatment hastens recovery in many cases.

The following is a summary of Dr. Bethell's work during the year. The total number of operations is one-third more than the preceding year.

Number of patients examined	367
Number of eanal dressings	96
Number of prophylaxis	660
Number of extractions	429
Number of amalgam fillings	450
Number of cement fillings	515
Number of pulp cappings	160
Number of pulp treatments	87
Number of devitalizations	35
Number of temporary stoppings	141
Number of X-rays	46
Number of irrigations	63
Total number of operations	3,049

CHILDREN.

In September we began to carry out your policy of making more beds available for children. About 30 adult patients were transferred to other sanatoria and municipal hospitals. On the date of this report we had but 66 patients over sixteen years of age out of a population of 272. This rearrangement has been brought about without serious objection. There is, however, some difficulty in administration in the men's ward because the young boys and men have to

use the same locker room. This leads to some friction and also the men patients cause some disturbance by teasing the boys and stirring up trouble among them. Minor details of construction, such as rearrangement of locker room and plumbing, will have to be made to accommodate the young boys. If the present plan of using one-half of the ward for adults and the other half for boys is to be continued, it will be necessary to construct an additional locker and toilet room. A plan for such addition, with estimated cost, has been submitted for your consideration. I would recommend, however, that no more men be admitted to Westfield, and in that event no additional construction will be necessary as we can continue to get along as we are until all the men here are transferred or discharged.

For the next year we have asked for two additional employees, — one more attendant for the boys and another handicraft teacher. The children require more supervision than the adults but less actual skilled nursing. It means more employees of the attendant class but fewer trained nurses will be necessary.

We have had the advantage of weekly visits of two teachers of handicraft work from the Junior Achievement Bureau of Springfield during the past two months. They have taught the boys and girls who are confined to the wards toy making and millinery. This supplements the craft work done by the regular teachers. The additional teacher to be employed next year will continue this work and we will be fortunate, indeed, if we can also have the benefit of the instruction that has been furnished without charge by Director Martin of the Achievement League and his assistant, Miss Garrison.

We have recently secured permission to organize a troop of Girl Scouts among our patients. This organization will, I am sure, be of great service in providing the girls with many interesting things to do and they will learn much that will be useful in later life.

SANATORIUM SCHOOL.

The attendance has averaged 134, with a total enrollment of 378. This will be increased next year because we are using more beds for children. I think, however, that we will be able to accommodate the additional children by placing more desks in the classrooms.

Much work has been done in the craft shop. The production of baskets has increased and these have met with a ready sale; \$599.83 worth of baskets has been sold besides many given to the patients, who get one for each three that they make. Other patients, who become proficient in basket making are paid 15 cents an hour. In such cases their product goes into stock and is sold. The receipts from sales has been sufficient to buy nearly all the raw materials. Easter and Christmas cards were designed and printed by the school children. These were sold to the value of \$76.39.

The children are carefully graded and the school work is kept up to the standard of the public schools. Although the children only attend a half-day session, they are able in most instances to keep up with their home classes in all of the fundamental requirements. When they are discharged well a year or two later, they do not lose a grade on account of absence.

Average Daily Attendance.

Grade I	12.21
Grade II	14.88
Grade III	12.46
Grade IV	20.69
Grade V	15.54
Grade VI	11.82
Grade VII	14.32
Grade VIII	9.73
Domestic science	7.06
Manual training	15.78
	<hr/>
Total	134.49

FARM.

We have raised more garden truck and field crops this year than ever before. We have spent but \$54.94 for green vegetables and \$497.55 for potatoes. All other fresh vegetables used on our table have been produced on the farm.

The dairy has supplied all the milk used in the institution, a total of 156,964 quarts, at a cost, including pasteurization, of 9.4 cents a quart.

There have been 13,075 pounds of pork produced and consumed on our table. The advisability of establishing a poultry plant should be seriously considered another year.

IMPROVEMENTS.

We have extended a 4-inch water main to the school building, farmhouse and barns and installed three hydrants for fire protection.

The locker room at the men's ward has been enlarged and improved and two private rooms have been added to the infirmary section of the ward.

A tunnel has been constructed to connect the men's ward with the children's ward. Now all the water and steam pipes connecting the children's ward, which have been underground, can be placed in the tunnel where they will be accessible for repairs, and the steam pipes can be kept properly insulated.

A new 12-ton ammonia compressor and new steam engine for pumping water has been added to our power house equipment.

There have been 25.6 acres of pasture and woodland added to the sanatorium property by purchase. The ownership of this property will give us an attractive area for the patients to enjoy and a portion of it will furnish much needed pasture.

RECOMMENDATIONS.

A tunnel should be built to connect the school building with the power house; then all our main buildings will be connected by passages through which the steam and water pipes will run and be easy of access at all times.

One small area of excellent tillage land is needed to complete the farm property. It is about 6 acres in area and is very desirable because it can be used to great advantage with our adjoining field. An appropriation of \$1,890 was obtained

two years ago to purchase this lot, but the owner changed his mind and refused to sell and the money reverted to the treasury. This sum should be again appropriated and an act passed allowing the taking of this property by right of eminent domain.

ACKNOWLEDGMENTS.

The Catholic, Protestant and Jewish chaplains have continued without change in personnel to hold religious services each Sunday. The personal relations which they establish with the individual patients by week-day visits aids materially in keeping the men and women cheerful and contented and gives them courage to continue treatment.

We have received many gifts of magazines, books, toys and games for the children from several individuals, from Troops of Girl Scouts, from Sunday-school classes and the Children of the American Revolution. These donations have been of great help to us in providing presents for the children at Christmas. Much reading matter was also furnished throughout the year.

The annual bazaar, which has become an established feature of the Westfield Sanatorium activities, was even more successful in a financial way than in former years. This event is entered into by the patients and employees with great enthusiasm. Fifty or more of the well-known residents of Westfield came up for the cafeteria supper which is held on the lawn; \$732.28 was cleared and this sum goes to provide entertainment for the patients. It was later decided to expend \$350 of it for the construction of a swimming pool, which was completed in September. This was too late for use last season, but will give great pleasure to the patients and employees in the summers to come. It is a distinct asset and will prevent the boys from running away to swim in the more dangerous river where they cannot be supervised.

EMPLOYEES.

There have been no changes among the physicians, dentist, office force, heads of any department or head nurses during the year. I feel that I have been particularly fortunate in this respect and it has resulted in a very efficient organization. For their loyal support and co-operation I wish to express my most grateful appreciation.

HENRY D. CHADWICK,
Superintendent.

VALUATION.

<i>Land.</i>			
Grounds (25.8 acres)	. . . . .	\$5,100	00
Lawns and buildings, 25.8 acres.			
Roads.			
Woodland (97.6 acres)	. . . . .	4,764	00
Mowing (2.6 acres)	. . . . .	195	00
Tillage (53 acres)	. . . . .	3,925	00
Tillage, 48 acres.			
Garden, 5 acres.			
Orchard (2 acres)	. . . . .	400	00
Pasture (13.1 acres)	. . . . .	747	00
Waste and miscellaneous (12.6 acres)	. . . . .	690	50
Rough pasture, 7.6 acres.			
Meadow swamp land.			
Sewer beds, 4 acres.			
New coal trestle, 1 acre.			
		\$15,821	50
Sewerage system	. . . . .	12,928	80
			\$28,750 30
<i>Buildings.</i>			
Institution buildings	. . . . .	\$161,836	29
Farm, stable and grounds	. . . . .	17,070	00
Miscellaneous	. . . . .	46,921	97
			225,828 26
Total	. . . . .	\$254,578	56
Present value of all personal property as per inventory of Dec. 1, 1921	. . . . .		94,781 29
Grand total	. . . . .	\$349,359	85

SPECIAL REPORT.

The following special report is prepared in accordance with a resolution of the National Conference of Charities and Corrections, adopted May 15, 1906: —

Population.

	Males.	Females.	Totals.
Number received during the year	158	151	309
Number passing out of the institution during the year	144	159	303
Number at end of fiscal year in the institution	142	126	268
Daily average attendance (number of inmates actually present) during the year.	133.53	129.45	262.98
Average number of employees and officers during the year	66	44	110

Expenditures.

Current expenditures:	
1. Salaries and wages	\$87,617 86
2. Clothing	761 53
3. Subsistence	33,173 35
4. Ordinary repairs	9,936 08
5. Office, domestic and outdoor expenses	58,538 18
	\$190,027 00
Extraordinary expenses:	
1. Permanent improvements to existing buildings	8,343 76
	\$198,370 76
Grand total	\$198,370 76

Summary of Current Expenses.

Total expenditure	\$198,370 76
Deducting extraordinary expenses	8,343 76
	\$190,027 00
Deducting amount of sales	424 83
	\$189,602 17

Dividing this amount by the daily average number of patients — 262.98 — gives a cost for the year of \$720.89, equivalent to an average weekly net cost of \$13.87.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients admitted Dec. 1, 1920, to Nov. 30, 1921, inclusive.	158	151	309
Number of patients discharged Dec. 1, 1920, to Nov. 30, 1921, inclusive.	144	159	303
Number of deaths (including those in previous item)	18	20	38
Number in sanatorium Dec. 1, 1920	131	135	266
Number remaining Nov. 30, 1921	144	128	272

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Married	29	17	46
Single	125	132	257
Widowed	4	2	6
Totals	158	151	309

TABLE 3. — *Ages of Patients admitted.*

	Males.	Females.	Totals.
1 to 13 years	70	60	130
13 to 20 years	35	60	95
21 to 30 years	18	16	34
31 to 40 years	18	6	24
41 to 50 years	15	7	22
51 to 60 years	2	2	4
Over 60 years	-	-	-
Totals	158	151	309

 TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	106	32	35	106	32	26	212	64	60
Other New England States	15	11	6	9	4	8	24	15	15
Other States	7	9	9	5	11	16	12	20	25
Total native	128	52	50	120	47	50	248	99	100
Other countries:									
Austria	2	2	3	1	3	2	3	5	5
Azores	-	-	-	-	1	1	-	1	1
Canada	8	24	21	7	24	26	15	48	47
Brazil	-	-	-	1	-	-	1	-	-
Denmark	-	-	-	1	1	1	1	1	1
England	-	3	2	1	6	3	1	9	5
Finland	1	1	1	-	-	-	1	1	1
France	-	1	1	1	1	3	-	2	4
Germany	1	2	2	-	-	-	1	2	2
Greece	-	1	1	4	4	4	4	5	5
Ireland	-	18	25	2	9	15	2	27	40
Italy	2	9	11	1	11	10	4	20	21
Lithuania	-	3	3	1	3	3	1	6	6
Peru	-	-	-	-	-	1	-	-	1
Poland	2	4	4	1	6	7	3	10	11

TABLE 4. — *Nativity and Parentage of Patients admitted* — Concluded.

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
Portugal	1	-	1	1	1	1	2	1	2
Russia	3	6	6	-	3	5	3	9	11
Scotland	2	2	2	1	4	1	3	6	3
Sweden	2	5	6	-	-	-	2	5	6
Switzerland	-	-	-	-	1	-	-	1	-
Turkey	1	1	1	1	1	1	2	2	2
Total foreign	25	82	90	24	79	84	49	161	174
Unknown	5	24	18	7	25	17	12	49	35
Grand totals	158	158	158	151	151	151	309	309	309

TABLE 5. — *Residence of Patients admitted.*

PLACE.	Number.	PLACE.	Number.
Adams	4	Gloucester	6
Agawam	3	Great Barrington	1
Amherst	1	Hampden	1
Andover	1	Hardwick	3
Arlington	1	Haverhill	3
Ashfield	1	Holyoke	12
Beverley	3	Huntington	1
Boston	34	Lawrence	5
Brockton	3	Lee	1
Brookfield	1	Lenox	2
Cambridge	3	Leominster	21
Chicopee	5	Lowell	11
Colrain	1	Ludlow	6
Concord	2	Lynn	5
Easthampton	2	Malden	6
Everett	2	Marlborough	5
Fall River	9	Medford	2
Fitchburg	4	Melrose	2
Framingham	3	Montgomery	1
Gardner	3	Needham	1

TABLE 5. — *Residence of Patients admitted* — Concluded.

PLACE.	Number.	PLACE.	Number.
Newton	1	Springfield	37
North Adams	6	State minor wards	4
Northampton	6	Taunton	2
Northfield	1	Wakefield	1
Norwood	1	Waltham	1
Oxford	1	Ware	1
Palmer	6	Warren	2
Pittsfield	7	Watertown	1
Plymouth	3	Webster	2
Quincy	4	West Springfield	4
Rutland	2	Westfield	11
Salem	1	Wilbraham	1
Shelburne	1	Williamstown	1
Somerville	5	Winchester	2
Southbridge	2	Woburn	1
Southwick	1	Worcester	8
Spencer	1	Total	309

TABLE 6. — *Occupation of Patients admitted.*

	Males.	Females.	Totals.
Armory inspector	1	-	1
At home	-	4	4
Bank clerk	1	-	1
Battery repairer	1	-	1
Bindery factory hand	-	1	1
Blacksmith	1	-	1
Blank book store	-	1	1
Bleacher	1	-	1
Bookbinder	-	1	1
Bookkeeper	-	1	1
Car service man	1	-	1
Carriage factory hand	1	-	1
Celluloid factory hand	-	1	1
Chemist	1	-	1
Chocolate dipper	-	1	1

TABLE 6. — *Occupation of Patients admitted* — Continued.

	Males.	Females.	Totals.
Clerk	-	1	1
Companion	-	1	1
Corset maker	-	2	2
Cotton mill hand	3	-	3
Crane man	1	-	1
Cutlery inspector	1	-	1
Diet kitchenmaid	-	1	1
Draftsman	1	-	1
Electric motorman	1	-	1
Electrician	2	-	2
Engineer (motor)	1	-	1
Factory shipper	1	-	1
Farm hand	2	-	2
Farmer	1	-	1
Fish peddler	1	-	1
Foreman pump factory	1	-	1
Freight house worker	1	-	1
Grocery clerk	1	-	1
Hospital attendant	-	1	1
Housewife	-	12	12
Houseworker	-	3	3
Laborer	3	-	3
Laundress	-	1	1
Machinist	7	-	7
Maid	-	1	1
Match factory hand	1	-	1
Meat cutter	1	-	1
Mill worker	-	1	1
No occupation (under five years)	3	3	6
Nurse	-	2	2
Office clerk	1	1	2
Orderly	2	-	2
Painter	2	-	2
Paper mill hand	2	1	3
Paymaster	1	-	1
Printer	1	-	1
Railroad worker	1	-	1

TABLE 6. — *Occupation of Patients admitted* — Concluded.

	Males.	Females.	Totals.
Rubber factory hand	-	1	1
Salesman	3	-	3
Saw shop hand	-	1	1
School	96	101	197
Searchlight plant	-	1	1
Shipping clerk	1	-	1
Shoemaker	1	-	1
Social worker	-	1	1
Stenographer	-	1	1
Stock room clerk	1	-	1
Street railroad inspector	1	-	1
Tailor	1	-	1
Textile weaver	1	-	1
Tool maker	1	-	1
Toothbrush factory hand	-	1	1
Waitress	-	2	2
Wire mill hand	1	-	1
Yarn mill hand	-	1	1
Totals	158	151	309

TABLE 7. — *Condition on Admission.*

	ADULTS.				CHILDREN UNDER SIX-TEEN YEARS OF AGE.			
	Males.	Fe-males.	Totals.	Per-centage.	Males.	Fe-males.	Totals.	Per-centage.
Incipient	4	2	6	1.94	44	33	77	24.59
Moderately advanced	13	24	37	11.97	49	55	104	33.98
Far advanced	41	25	66	21.36	5	11	16	5.18
Unclassified	-	-	-	-	-	-	-	-
Nontuberculous	1	-	1	.33	1	1	2	.65
Totals	59	51	110	35.60	99	100	199	64.40

TABLE 8. — *Condition on Discharge.*

	ADULTS.			Per-centage.	CHILDREN UNDER SIX-TEEN YEARS OF AGE.			Per-centage.
	Males.	Fe-males.	Totals.		Males.	Fe-males.	Totals.	
Apparently arrested	9	20	29	9.57	65	66	131	43.23
Quiescent	3	13	16	5.28	1	4	5	1.65
Improved	9	6	15	4.95	5	5	10	3.33
Unimproved	20	13	33	10.89	4	5	9	2.97
Died	16	15	31	10.23	3	4	7	2.31
Nontuberculous	1	-	1	.33	1	1	2	.66
Not considered	5	5	10	3.33	2	2	4	1.32
Totals	63	72	135	44.58	81	87	168	55.47

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month	-	-	-	1	2	3
1 to 2 months	-	-	-	3	-	3
2 to 3 months	-	-	-	1	2	3
3 to 4 months	-	-	-	-	1	1
4 to 5 months	-	1	1	3	4	7
5 to 6 months	2	1	3	1	1	2
6 to 7 months	-	-	-	1	1	2
7 to 8 months	-	1	1	-	2	2
8 to 9 months	-	-	-	1	1	2
9 to 10 months	1	1	2	-	1	1
10 to 12 months	-	1	1	3	-	3
12 to 18 months	2	3	5	2	2	4
18 to 24 months	2	4	6	1	-	1
Over 2 years	12	7	19	2	2	4
Totals	19	19	38	19	19	38

TABLE 10. — Cause of Death.

	Males.	Females.	Totals.
Tuberculosis of the lungs	10	14	24
Tuberculosis of lungs and bowels	-	2	2
Tuberculosis of larynx and lungs	7	1	8
Tuberculosis of lungs and kidney	-	1	1
Tuberculosis of lungs and meningitis	1	1	2
Tuberculosis of lungs and peritonitis	1	-	1
Totals	19	19	38

TREASURER'S REPORT.

To the Commissioner of Public Health.

I respectfully submit the following report of the finances of this institution for the fiscal year ending Nov. 30, 1921: —

CASH ACCOUNT.

Balance Dec. 1, 1920 \$240 21

Receipts.

Income.

Board of inmates:

Private \$8,651 81
 Reimbursements, cities and towns 38,725 68
 ----- \$47,377 49

Personal services:

Reimbursement from Board of Retirement 19 49

Sales:

Food \$103 65
 Medical and general care 16 50
 Farm:
 Cows and calves \$136 00
 Pigs and hogs 13 50
 Vegetables 17 25
 Sundries 77 93
 ----- 244 68
 Use of auto 60 00
 ----- 424 83

Miscellaneous:

Interest on bank balances 217 29
 ----- 48,039 10

Amount carried forward \$48,279 31

<i>Amount brought forward</i>		\$48,279 31
<i>Receipts from Treasury of Commonwealth.</i>		
Maintenance appropriations:		
Balance of 1920	\$9,419 73	
Advance money (amount on hand November 30)	10,000 00	
Approved schedules of 1921	177,185 88	
		<u>196,605 61</u>
Special appropriations		8,343 76
		<u>\$253,228 68</u>
<i>Payments.</i>		
To treasury of Commonwealth, institution income		\$48,039 10
Maintenance appropriations:		
Balance of schedules of previous year	\$9,659 94	
Eleven months' schedules, 1921	177,185 88	
November advances	8,487 59	
		<u>195,333 41</u>
Special appropriations:		
Approved schedules		8,343 76
Balance, Nov. 30, 1921:		
In bank	\$971 53	
In office	540 88	
		<u>1,512 41</u>
		<u>\$253,228 68</u>
MAINTENANCE.		
Appropriation, current year		\$190,050 00
Expenses (as analyzed below)		190,027 00
		<u>\$23 00</u>
Balance reverting to treasury of Commonwealth		
<i>Analysis of Expenses.</i>		
Personal services:		
Henry D. Chadwick, superintendent	\$3,900 00	
Medical	5,010 00	
Administration	4,049 09	
Kitchen and dining-room service	10,170 92	
Domestic	10,662 63	
Ward service (male)	7,653 46	
Ward service (female)	7,882 86	
Industrial and educational department	3,875 30	
Engineering department	9,696 34	
Repairs	2,834 33	
Farm	19,358 64	
Stable, garage and grounds	2,524 29	
		<u>\$87,617 86</u>
Religious instruction:		
Catholic	\$600 00	
Hebrew	249 60	
Protestant	365 00	
		<u>1,214 60</u>
<i>Amount carried forward</i>		<u>\$88,832 46</u>

<i>Amount brought forward</i>		\$88,832 46
Travel, transportation and office expenses:		
Advertising	\$12 62	
Postage	111 23	
Stationery and office supplies	933 69	
Telephone and telegraph	704 09	
Travel	504 66	
Freight	12 49	
	<hr/>	2,278 78
Food:		
Flour	\$1,706 84	
Cereals, rice, meal, etc.	1,168 19	
Bread, crackers, etc.	145 85	
Peas and beans (canned and dried)	593 12	
Macaroni and spaghetti	83 49	
Potatoes	497 55	
Meat	12,041 83	
Fish (fresh, cured and canned)	1,285 40	
Butter	2,986 53	
Butterine, etc.	326 85	
Peanut butter	8 55	
Cheese	82 81	
Coffee	399 10	
Tea	71 77	
Cocoa	26 16	
Milk (condensed, evaporated, etc.)	159 38	
Eggs (fresh)	5,096 47	
Egg powders, etc.	255 16	
Sugar (cane)	1,607 16	
Fruit (fresh)	661 28	
Fruit (dried and preserved)	1,605 09	
Lard and substitutes	680 40	
Molasses and syrups	126 43	
Vegetables (fresh)	53 94	
Vegetables (canned and dried)	547 49	
Seasonings and condiments	466 96	
Yeast, baking powder, etc.	151 67	
Sundry foods	205 59	
Freight	132 29	
	<hr/>	33,173 35
Clothing and materials:		
Boots, shoes and rubbers	\$86 80	
Clothing (outer)	356 93	
Clothing (under)	102 77	
Dry goods for clothing	208 66	
Hats and caps	1 87	
Socks and smallwares	4 50	
	<hr/>	761 53
Furnishings and household supplies:		
Beds, bedding, etc.	\$2,740 86	
Carpets, rugs, etc.	22 75	
Crockery, glassware, cutlery, etc.	703 52	
Dry goods and smallwares	481 59	
Electric lamps	135 21	
	<hr/>	
<i>Amounts carried forward</i>	\$4,083 93	\$125,046 12

<i>Amounts brought forward</i>	\$4,083 93	\$125,046 12
Furnishings and household supplies — <i>Concluded.</i>		
Fire hose and extinguishers	6 00	
Furniture, upholstery, etc.	282 16	
Kitchen and household wares	1,095 55	
Laundry supplies and materials	1,551 93	
Lavatory supplies and disinfectants	1,896 22	
Table linen, paper napkins, towels, etc.	424 97	
Freight	60 84	
	<hr/>	9,401 60
Medical and general care:		
Books, periodicals, etc.	\$43 26	
Entertainments, games, etc.	87 39	
Funeral expenses	70 00	
Ice and refrigeration	138 97	
Laboratory supplies and apparatus	682 71	
Manual training supplies	119 76	
Medicines (supplies and apparatus)	1,309 65	
Medical attendance (extra)	4 00	
School books and supplies	175 77	
Sputum cups, etc.	129 21	
Tobacco, pipes, matches	3 25	
Freight	53 95	
	<hr/>	2,817 92
Heat, light and power:		
Coal (bituminous)	\$11,445 07	
Freight and cartage	9,068 84	
Coal (anthracite)	361 10	
Freight and cartage	212 52	
Oil	339 73	
Operating supplies for boilers and engines	379 02	
Freight	22 62	
	<hr/>	21,828 90
Farm:		
Bedding materials	\$320 76	
Blacksmithing and supplies	106 65	
Carriages, wagons and repairs	64 75	
Dairy equipment and supplies	171 66	
Fencing materials	126 19	
Fertilizers	598 13	
Grain, etc.	6,178 22	
Hay	2,894 79	
Harnesses and repairs	27 05	
Horses	100 00	
Cows	300 00	
Other live stock	100 00	
Rent	65 00	
Spraying materials	124 42	
Stable and barn supplies	187 01	
Tools, implements, machines, etc.	323 52	
Trees, vines, seeds, etc.	269 38	
Veterinary services, supplies, etc.	232 32	
Freight	1,407 10	
	<hr/>	13,596 95
<i>Amount carried forward</i>		\$172,691 49

Amount brought forward \$172,691 49

Garage, stable and grounds:

Motor vehicles	\$1,420 00
Automobile repairs and supplies	2,342 94
Spraying materials	17 75
Trees, vines, seeds, etc.	121 86
Freight	79

3,093 34

Repairs, ordinary:

Cement, lime, crushed stone, etc.	\$701 57
Electrical work and supplies	779 24
Hardware, iron, steel, etc.	551 37
Labor (not on pay roll)	1,294 98
Lumber, etc. (including finished products)	733 16
Paint, oil, glass, etc.	1,408 43
Plumbing and supplies	1,332 87
Roofing and materials	49 30
Steam fittings and supplies	1,221 48
Tents, awnings, etc.	132 35
Tools, machines, etc.	1,138 58
Boilers, repairs	142 22
Engines, repairs	160 21
Freight	290 32

9,936 08

Repairs and renewals:

Ammonia compressor	\$1,000 00
Tunnel, E Ward to C Ward	1,050 00
Shingling roofs and repairing rooms	1,134 95
Repairs on sanatorium side track	311 14

3,496 09

Total expenses for maintenance \$190,027 00

SPECIAL APPROPRIATIONS.

Balance Dec. 1, 1920,	\$7,127 11
Appropriations for current year	3,200 00
Total	\$10,327 11
Expended during the year (see statement below)	8,343 76
Balance Nov. 30, 1921, carried to next year	\$1,983 35

OBJECT.	Act or Resolve.	Whole Amount.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
Purchase of land	Chap. 225, 1920	\$1,890 00	-	-	\$1,890 00*
Remodeling farmhouse and dormitory	Chap. 225, 1920	10,000 00	\$11 77	\$10,000 00	-
Remodeling barn	Chap. 225, 1920	5,700 00	37 24	5,700 00	-
Installing engine and generator	Chap. 225, 1920	6,500 00	5,188 10	6,500 00	-
Purchase of land	Chap. 203, 1921	2,000 00	1,910 00	1,910 00	90 00*
Fire protection	Chap. 203, 1921	1,200 00	1,196 65	1,196 65	3 35*
		\$27,290 00	\$8,343 76	\$25,306 65	\$1,983 35

* Balance reverting to treasury of the Commonwealth.

RESOURCES AND LIABILITIES.

Resources.

Cash on hand	\$1,512 41	
November cash vouchers (paid from advance money), account of maintenance	8,487 59	
		\$10,000 00
Due from treasury of Commonwealth from available appropriation account of November, 1921, schedule	2,841 12	
		\$12,841 12

Liabilities.

Outstanding schedules of current year:		
Schedule of November bills	\$12,841 12	

PER CAPITA.

During the year the average number of inmates has been 262.98.
 Total cost for maintenance, \$190,027.00.
 Equal to a weekly per capita cost of \$13.8959.
 Receipt from sales, \$424.83.
 Equal to a weekly per capita of \$0.0310.
 All other institution receipts, \$47,614.37.
 Equal to a weekly per capita of \$3.4818.
 Net weekly per capita cost \$10.3831.

Respectfully submitted,

HENRY D. CHADWICK,
Treasurer.

Examined and found correct as compared with the records in the office of the Auditor of the Commonwealth.

ALONZO B. COOK,
Auditor.

NORTH READING STATE SANATORIUM.

RESIDENT OFFICERS.

CARL C. MACCORISON, M.D.	<i>Superintendent.</i>
EARLE C. WILLOUGHBY, M.D.	<i>Assistant Superintendent.</i>
JOSEPH W. REDDY, M.D.	<i>Physician.</i>
SAMUEL RANDALL	<i>Dentist.</i>
KATHRYN V. DAILY, R.N.	<i>Superintendent of Nurses.</i>
MIRA B. ROSS	<i>Head Matron.</i>
J. ELLIS DOUCETTE	<i>Steward.</i>
DANIEL J. SCOTT	<i>Chief Engineer.</i>
EDWARD LEARY	<i>Farmer.</i>

REPORT OF THE SUPERINTENDENT.

To EUGENE R. KELLEY, *Commissioner, Department of Public Health, State House, Boston.*

I have the honor to submit the thirteenth annual report of the North Reading State Sanatorium for the year ending Nov. 30, 1921.

During the year there has been expended \$156,642.11 for maintenance, a gross weekly per capita cost of \$16.4925, and \$7,789.55 from the appropriation authorized by chapter 203, Resolves of 1921. The details of these disbursements are contained in the report of the treasurer.

There has been collected from miscellaneous sources \$32,568.51 (the total of all collections). Deducting this amount from the gross maintenance expense leaves a net expense of \$155,976.54, and a net weekly per capita cost of \$16.4226. There has been collected from private funds \$4,461.68; from cities and towns \$22,125.67; from the United States Veterans' Bureau \$5,315.59. Seventy-seven cases were supported wholly or in part from private funds; 209 by cities and towns; 77 wholly by the State; 3 by the United States Veterans' Bureau.

There were 186 patients in the sanatorium at the beginning of the year and 201 at the close. The largest number present at one time was 203 and the smallest 156. The daily average number of patients was 182.65. There were 220 cases admitted during the year, — 2 incipient, 104 moderately advanced, 111 advanced and 3 unclassified. There were 181 cases admitted from cities and towns of over 25,000 population, and 39 from cities and towns under 25,000 population. The average age of patients admitted was 32.13. Including deaths, there were 205 discharged, and the average duration of residence was nineteen months and seven days. Of those discharged, 103 gained 1,374 pounds, an average gain of 13.31 pounds per person. Of the discharges there were 8 arrested cases, 5 more than last year; 4 apparently arrested, 10 less than last year; 17 quiescent, 15 less than last year; 78 improved and 36 unimproved. There were 21 patients not considered, the duration of treatment being less than one month. There were 39 deaths, 8 less than last year. There were 2 discharged non-tuberculous. There were 66,667 hospital days of treatment, 2,252 less than last year.

The following table shows the classification on the application blank and our classification on admission: —

	Classification on Application Blank.	Our Classification on Admission.
Incipient	48	2
Moderately advanced	139	104
Incipient, moderately advanced	2	-
Advanced	26	111
Unclassified	5	3
Totals	220	220

Consultation clinics have been held monthly during the past year at Haverhill, Lowell, Lawrence and Woburn. We feel very strongly that the medical profession in this district has failed to avail itself to the fullest extent of the opportunities placed at its disposal. The clinic at Woburn has been very poorly attended, and we believe if this clinic is discontinued and one established in Stoneham, it would serve a much larger area, inasmuch as Stoneham is within a short distance of Woburn, Reading, Wakefield, Melrose and Winchester. The following table will show the extent of the work accomplished:—

	Number of Clinics held during the Year.	Number of Cases referred to Clinic.	Number of Physicians referring Cases.
Haverhill	15	37	8
Lowell	15	17	8
Lawrence	14	69	9
Woburn	15	20	4
Totals	59	143	29

In addition to the above, 15 physicians practicing in the smaller towns within a radius of 5 to 15 miles from North Reading referred 30 cases direct to the sanatorium, thus making a total at the end of the year of 173 cases. Of the 173 cases examined, 65 were classified as active pulmonary tuberculosis, 29 as inactive, 1 as nontuberculous and 78 as suspects.

On February 16, 1921, Dr. Samuel Randall of Boston was appointed dentist at the sanatorium. Although the dental clinic has been in existence but a short time, the results obtained have been most gratifying. At the beginning we found it difficult to get the patients to accept dental service, but as time went on the majority requested to be treated.

At present a routine examination is made of the teeth of all patients admitted. The following table will show what has been accomplished:—

Total number of patients examined	372
Prophylaxis	233
Extractions	165
Pyorrhea	6
Removal of defective bridges and crowns	11
Vulcanite plates	18
Gold inlays reset	4
Synthetic fillings	58
Cement fillings	14
Silver fillings	24
Gold fillings	8
Repairing plates	6
Porcelain crowns	2
Gold crowns	5
Bridges	4

On March 24 3 men in the Prison Camp and 3 employees reported at the infirmary, complaining of sore throat. Cultures were taken and examined for Klebs-Loeffler bacillus. One prisoner gave positive culture for K.L., although the patients did not show the clinical symptoms of diphtheria. A few days later all these throats gave positive cultures for hemolytic streptococcus. Immediately following the laboratory report on these cases, practically all patients and employees were given a dose of diphtheria antitoxin, and those who were showing symptoms, such as sore throat, fever, etc., were given from 5,000 to 15,000 units of antitoxin.

The sanatorium was under a strict quarantine for fourteen days, and no patients were admitted to the institution between March 26 and May 10. During the epidemic 35 cases gave a positive culture of hemolytic streptococcus. In addition to the above, 5 cases showed throat symptoms but negative culture for hemolytic streptococcus. Cultures made from smears taken from the throats of 2 patients and 5 employees gave positive culture for hemolytic streptococcus, but at no time did the suspects complain of sore throat or show symptoms.

Sixteen employees sent to us during the epidemic were cultured on arriving at the sanatorium. Three of this group gave cultures of hemolytic streptococcus, but at no time complained of sore throat or showed symptoms.

Of the 281 cases receiving diphtheria antitoxin, 44 developed urticaria, 16 developed both urticaria and joint symptoms, and 41 complained of arthritic pains. Four of this latter group developed very severe arthritis lasting about six months in one case, and about three weeks in the others.

Of the 220 cases admitted to the hospital during the year, 190 were subjected to a Wassermann test. One hundred of this number were reported negative and 11 positive.

The productivity of the farm during the past year has been rather disappointing. The severe frosts of May completely wiped out the possibility of apple and strawberry crops. The drouth lasting up to the first of July markedly interfered with the germination of seed and the early development of plants, and the heavy rains of July and August ruined many of the crops.

The cottage for the engineer and steward was completed in February. A new washing machine has been installed in the laundry. The water tanks and towers have been painted and repaired. About 500 feet of surface drainage have been installed, and rather extensive repairs made on the buildings, plumbing, heating and electrical systems. Work has been started on the fire protective system.

The overcrowded condition of our sick ward has not been relieved, and during the past three months 50 per cent of all the admissions in the female unit were bed cases. If a new hospital building is not to be considered, I feel very strongly that new lockers and toilet room facilities should be installed in our present wards, that new locker and toilet room facilities on each pavilion in the female unit and on the two pavilions in the male unit be constructed, and that the fronts of these buildings be glazed in and heat installed in the sleeping quarters. With this arrangement we could much better care for the fever cases which are being sent to us. It is estimated that \$60,952 will be necessary for this improvement.

The steam mains which run in the conduits from the power plant to the

various buildings are evidently in poor condition. Green grass grows over these conduits throughout the winter. It is estimated that it will cost \$8,658 to properly cover the steam mains.

The sleeping quarters for male employees are altogether inadequate. Many of the employees are quartered in the old farmhouse, and it is necessary for men who sleep in the upper rooms to pass through a sleeping room on the lower floor occupied by three employees. A small dormitory to accommodate twelve employees could be added to this building at an approximate cost of \$14,800.

We are handicapped in our work by the lack of an X-ray outfit. We estimate that an up-to-date machine can be installed for the sum of \$5,000.

Services by the Protestant, Jewish and Catholic chaplains have been held each week.

On behalf of the patients I wish to express appreciation of gifts of books, flowers, magazines, entertainments, etc. We are especially grateful to D. W. Griffith for the use of his film, "Way Down East."

I feel very much indebted to the heads of the departments and employees for their faithful and efficient work during the year.

I appreciate your support during the past year and also the assistance rendered by your Department during the recent septic throat epidemic.

Respectfully submitted,

CARL C. MACCORISON,
Superintendent.

VALUATION.

<i>Land.</i>	
Grounds (11.76 acres)	\$566 48
Lawns and buildings, 11.01 acres.	
Roads, 76 acres.	
Woodland (28.99 acres)	1,155 60
Mowing (16.60 acres)	803 96
Tillage (7.30 acres)	351 64
Tillage, 1.50 acres.	
Garden, 5.80 acres.	
Orchard (2.64 acres)	127 17
Pasture (2.09 acres)	100 67
Waste and miscellaneous (37.28 acres)	1,795 78
Rough pasture, 6.53 acres.	
Meadow swamp, 30 acres.	
Sewer beds.	
New coal trestle, .75 acre.	
	\$4,901 30
Sewerage system	5,692 93
	\$10,594 23
<i>Buildings.</i>	
Institution buildings	\$135,188 68
Farm, stable and grounds	15,285 00
Miscellaneous	64,605 09
	215,078 77
Total	\$225,673 00
Present value of all personal property as per inventory of Dec. 1, 1921	90,895 01
Grand total	\$316,568 01

SPECIAL REPORT.

The following special report is prepared in accordance with a resolution of the National Conference of Charities and Corrections, adopted May 15, 1906: —

Population.

	Males.	Females.	Totals.
Number received during the year	104	116	220
Number passing out of the institution during the year	95	110	205
Number at end of fiscal year in the institution	113	88	201
Daily average attendance (number of inmates actually present) during the year.	103.715	78.93	182.65
Average number of employees and officers during the year	47.604	32.925	80.529

Expenditures.

Current expenditures:		
1. Salaries and wages	\$67,925 29	
2. Clothing	217 76	
3. Subsistence	61,317 02	
4. Ordinary repairs	3,295 06	
5. Office, domestic and outdoor expenses	18,671 49	
	\$151,426 62	
Extraordinary expenses:		
1. Permanent improvements to existing buildings		5,220 16
Grand total		\$156,646 78

Summary of Current Expenses.

Total expenditure	\$156,646 78
Deducting extraordinary expenses	5,220 16
	\$151,426 62
Deducting amount of sales	665 57
	\$150,761 05

Dividing this amount by the daily average number of patients — 182.65 — gives a cost for the year of \$825.4095, equivalent to an average weekly net cost of \$15.873.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in the sanatorium Nov. 30, 1920	104	82	186
Patients admitted from Dec. 1, 1920, to Nov. 30, 1921, inclusive.	104	116	220
Patients discharged from Dec. 1, 1920, to Nov. 30, 1921, inclusive.	95	110	205
Patients remaining in sanatorium Nov. 30, 1921	113	88	201
Daily average number of patients	103.71	78.93	182.65
Deaths (included in number discharged)	22	17	39

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Single	40	52	92
Married	57	58	115
Widowed	7	6	13
Divorced	—	—	—
Totals	104	116	220

TABLE 3. — *Age of Patients admitted.*

	Males.	Females.	Totals.	Percentages.
14 to 20 years	5	13	18	8.18
20 to 30 years	29	60	89	40.46
30 to 40 years	32	28	60	27.27
40 to 50 years	29	12	41	18.64
Over 50 years	9	3	12	5.45
Totals	104	116	220	—
Average age	35.36	29.23	32.13	—

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	47	15	17	57	15	21	104	30	38
Other New England States	2	3	3	7	3	3	9	6	6
Other States	10	6	3	4	12	6	14	18	9
Total native	59	24	23	68	30	30	127	54	53
Other countries:									
Armenia	-	-	-	1	1	1	1	1	1
Belgium	-	-	-	-	1	1	-	1	1
Bohemia	1	1	1	-	-	-	1	1	1
Canada	15	19	18	21	30	31	36	49	49
Denmark	-	-	-	1	1	1	1	1	1
East Indies	-	-	-	-	1	-	-	1	-
England	9	9	11	3	3	2	12	12	13
France	-	1	1	-	-	-	-	1	1
Germany	-	2	1	1	3	3	1	5	4
Greece	1	1	1	-	-	-	1	1	1
Ireland	6	29	30	10	23	26	16	52	56
Italy	1	2	2	6	9	9	7	11	11
Poland	2	2	2	1	-	-	3	2	2
Russia	7	8	8	3	8	8	10	16	16
Scotland	1	1	2	-	1	1	1	2	3
Sweden	-	2	1	1	3	2	1	5	3
Syria	1	1	1	-	-	-	1	1	1
Turkey	1	1	1	-	-	-	1	1	1
Total foreign	45	79	80	48	84	85	93	163	165
Unknown	-	1	1	-	2	1	-	3	2
Grand totals	45	80	81	48	86	86	93	166	167

TABLE 5. — *Residence of Patients admitted.*

PLACE.	Number.	PLACE.	Number.
Andover	1	Lynn	5
Amesbury	2	Malden	11
Arlington	1	Medford	4
Beverly	1	Melrose	2
Billerica	1	Methuen	3
Boston	106	Newton	4
Brockton	2	Peabody	2
Brookline	1	Pittsfield	1
Cambridge	3	Reading	2
Canton	1	Revere	1
Chelsea	2	Somerville	12
Danvers	2	Southborough	1
Dracut	2	Townsend	2
Everett	10	Wakefield	3
Fitchburg	1	Waltham	1
Framingham	1	Waverley	2
Gardner	1	Winchester	1
Gloucester	2	Woburn	1
Haverhill	2	Worcester	2
Lawrence	13	Total	220
Lowell	5		

TABLE 6. — *Occupation of Patients admitted.*

	Males.	Females.	Totals.
Actor	1	—	1
At home	—	6	6
Attendant	1	1	2
Barber	3	—	3
Bookkeeper	—	1	1
Brass worker	1	—	1
Carpenter	6	—	6
Chauffeur	6	—	6
Chef	1	—	1
Chemist	1	—	1

TABLE 6. — *Occupation of Patients admitted* — Continued.

	Males.	Females.	Totals.
Clergyman	1	-	1
Clerk	4	8	12
Cooper	1	-	1
Dressmaker	-	4	4
Electrical worker	1	-	1
Electrician	1	-	1
Factory foreman	1	-	1
Factory worker	4	11	15
Fisherman	1	-	1
Housekeeper	-	20	20
Housewife	-	42	42
Junk dealer	2	-	2
Laborer	8	-	8
Longshoreman	2	-	2
Machinist	5	-	5
Metal polisher	1	-	1
Metal worker	4	-	4
Mill operative	5	2	7
Milliner	-	1	1
Motorman	1	-	1
Nurse	-	3	3
Nursemaid	-	1	1
Painter	5	-	5
Parish visitor	-	1	1
Pharmacist	1	-	1
Piano maker	1	-	1
Pipe organ voicer	1	-	1
Police officer	3	-	3
Porter	1	-	1
Printer	1	-	1
Pupil nurse	-	1	1
Railroad worker	1	-	1
Sailor	1	-	1
Salesman	4	-	4
Shipper	1	-	1
Shoe cutter	1	-	1
Stenographer	-	5	5

TABLE 6. — *Occupation of Patients admitted — Concluded.*

	Males.	Females.	Totals.
Steward	1	-	1
Student	2	3	5
Tailor	3	-	3
Teacher	-	3	3
Telephone operator	-	3	3
Telephone repairman	4	-	4
Theatreman	1	-	1
Tool maker	1	-	1
Truckman	5	-	5
Waiter	4	-	4
Totals	104	116	220

TABLE 7. — *Condition on Admission.*

	Males.	Females.	Totals.	Percentage.
Incipient	1	1	2	.91
Moderately advanced	51	53	104	47.27
Far advanced	50	61	111	50.45
Unclassified	2	1	3	1.37
Totals	104	116	220	100.00

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Arrested	7	1	8	3.92
Apparently arrested	1	3	4	1.95
Quiescent	11	6	17	8.29
Improved	27	51	78	38.04
Unimproved	17	19	36	17.56
Died	22	17	39	19.02
Nontuberculous	2	-	2	.98
Not considered	8	13	21	10.24
Totals	95	110	205	100.00

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month	-	1	1	3	-	3
1 to 2 months	-	-	-	2	-	2
2 to 3 months	-	-	-	1	1	2
3 to 4 months	-	-	-	1	2	3
4 to 5 months	-	-	-	1	-	1
5 to 6 months	-	1	1	-	-	-
6 to 7 months	-	-	-	1	-	1
7 to 8 months	1	-	1	-	-	-
8 to 9 months	1	-	1	1	3	4
9 to 10 months	-	1	1	-	1	1
10 to 12 months	1	1	2	-	4	4
12 to 18 months	1	1	2	2	4	6
18 to 24 months	2	2	4	-	-	-
Over 2 years	16	10	26	10	2	12
Totals	22	17	39	22	17	39

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Tuberculosis of lungs	21	17	38
Chronic endocarditis	1	-	1
Totals	22	17	39

TREASURER'S REPORT.

To the Commissioner of Public Health.

I respectfully submit the following report of the finances of this institution for the fiscal year ending Nov. 30, 1921:—

CASH ACCOUNT.		
Balance Dec. 1, 1920		\$1,159 45
<i>Income.</i>	<i>Receipts.</i>	
Board of inmates:		
Private	\$9,777 27	
Cities and towns	22,125 67	
	\$31,902 94	
Personal services:		
Reimbursement from Board of Retirement		41 36
Sales:		
Food	\$97 64	
Clothing and materials	16 22	
Furnishings and household supplies	28 77	
Heat, light and power	60 65	
Farm:		
Ice	\$7 75	
Vegetables	85	
Sundries	212 23	
	220 83	
Garage, stable and grounds	28 75	
	452 86	
Miscellaneous:		
Interest on bank balances	\$169 47	
Sundries	43 24	
	212 71	
		32,609 87
Other receipts:		
Refunds of previous year		5 71
<i>Receipts from Treasury of Commonwealth.</i>		
Maintenance appropriations:		
Balance of 1920	\$16,972 00	
Advance money (amount on hand November 30)	10,000 00	
Approved schedules of 1921	139,779 04	
	166,751 04	
Special appropriations		14,675 97
		\$215,202 04
Total		
<i>Payments.</i>		
To treasury of Commonwealth:		
Institution income	\$32,609 87	
Refunds, account of maintenance	26 50	
Refunds of previous year	5 71	
	\$32,642 08	
<i>Amount carried forward</i>		\$32,642 08

<i>Amount brought forward</i>		\$32,642 08	
Maintenance appropriations:			
Balance of schedules of previous year	\$18,261 36		
Eleven months' schedules, 1921	\$139,779 04		
Less returned	265 50		
	<hr/>	139,752 54	
November advances	7,283 09		
	<hr/>		165,296 99
Special appropriations:			
Approved schedules	\$14,675 97		
Less advances, last year's report	129 91		
	<hr/>	\$14,546 06	
November advances	441 36		
	<hr/>		14,987 42
Balance, Nov. 30, 1921:			
In bank	\$1,780 82		
In office	494 73		
	<hr/>		2,275 55
 Total			<hr/> \$215,202 04

MAINTENANCE.

Balance from previous year, brought forward	\$3,513 24
Appropriation, current year	167,750 00
	<hr/>
Total	\$171,263 24
Expenses (as analyzed below)	156,646 78
	<hr/>
Balance reverting to treasury of Commonwealth	\$14,616 46

Analysis of Expenses.

Personal services:			
Carl C. MacCorison, superintendent	\$3,900 00		
Medical	4,534 41		
Administration	5,907 39		
Kitchen and dining-room service	8,383 76		
Domestic	11,622 92		
Ward service (male)	7,500 79		
Ward service (female)	6,994 67		
Engineering department	7,434 53		
Repairs	3,525 66		
Farm	5,088 38		
Stable, garage and grounds	3,032 78		
	<hr/>		\$67,925 29
Religious instruction:			
Catholic	\$600 00		
Hebrew	500 00		
Protestant	500 00		
	<hr/>		1,600 00
 <i>Amount carried forward</i>			<hr/> \$69,525 29

<i>Amount brought forward</i>		\$69,525 29
Travel, transportation and office expenses:		
Advertising	\$11 05	
Postage	192 44	
Printing and binding	295 67	
Stationery and office supplies	614 37	
Telephone and telegraph	314 56	
Travel	442 00	
Freight	18 93	
	<hr/>	1,889 02
Food:		
Flour	\$1,670 88	
Cereals, rice, meal, etc.	621 90	
Bread, crackers, etc.	73 66	
Peas and beans (canned and dried)	23 25	
Macaroni and spaghetti	70 84	
Potatoes	1,076 11	
Meat	11,743 26	
Fish (fresh, cured and canned)	1,758 02	
Butter	2,354 44	
Butterine, etc.	145 50	
Cheese	84 68	
Coffee	373 52	
Tea	169 56	
Cocoa	8 72	
Whole milk	12,984 65	
Eggs (fresh)	3,136 86	
Sugar (cane)	1,303 31	
Fruit (fresh)	709 46	
Fruit (dried and preserved)	2,287 25	
Lard and substitutes	205 25	
Molasses and syrups	51 03	
Vegetables (fresh)	406 44	
Vegetables (canned and dried)	695 10	
Seasonings and condiments	413 19	
Yeast, baking powder, etc.	206 50	
Sundry foods	424 33	
Freight	848 89	
	<hr/>	43,846 60
Clothing and materials:		
Boots, shoes and rubbers	\$125 55	
Clothing (outer)	49 08	
Clothing (under)	7 50	
Hats and caps	12 15	
Socks and smallwares	21 12	
Freight	2 36	
	<hr/>	217 76
Furnishings and household supplies:		
Beds, bedding, etc.	\$1,296 79	
Carpets, rugs, etc.	202 73	
Crockery, glassware, cutlery, etc.	590 18	
Dry goods and smallwares	200 94	
Electric lamps	210 05	
Fire hose and extinguishers	29 79	
	<hr/>	
<i>Amounts carried forward</i>	\$2,530 48	\$115,478 67

<i>Amounts brought forward</i>	\$2,530 48	\$115,478 67
Furnishings and household supplies — <i>Concluded.</i>		
Furniture, upholstery, etc.	208 40	
Kitchen and household wares	1,877 32	
Laundry supplies and materials	383 28	
Lavatory supplies and disinfectants	463 66	
Table linen, paper napkins, towels, etc.	377 90	
Sundries	21 60	
Freight	107 93	
	<hr/>	5,970 57
Medical and general care:		
Books, periodicals, etc.	\$66 73	
Entertainments, games, etc.	617 56	
Funeral expenses	30 00	
Ice and refrigeration	136 64	
Laboratory supplies and apparatus	110 08	
Medicines (supplies and apparatus)	1,768 24	
Medical attendance (extra)	338 60	
Sputum cups, etc.	488 30	
Tobacco, pipes, matches	64 62	
Sundries	1 00	
Freight	125 64	
	<hr/>	3,747 41
Heat, light and power:		
Coal (bituminous)	\$5,206 45	
Freight and cartage	6,652 04	
Coal (anthracite)	821 31	
Freight and cartage	618 60	
Gas	35 75	
Oil	125 09	
Operating supplies for boilers and engines	250 67	
Freight	13 10	
	<hr/>	13,723 01
Farm:		
Bedding materials	\$130 00	
Blacksmithing and supplies	61 39	
Carriages, wagons and repairs	54 84	
Dairy equipment and supplies	6 27	
Fencing materials	41 44	
Fertilizers	773 31	
Grain, etc.	2,543 41	
Hay	178 42	
Harnesses and repairs	13 10	
Horses	250 00	
Other live stock	332 20	
Labor (not on pay roll)	1,742 00	
Road work and materials	274 14	
Spraying materials	39 49	
Stable and barn supplies	34 82	
Tools, implements, machines, etc.	194 12	
Trees, vines, seeds, etc.	97 10	
Veterinary services, supplies, etc.	107 23	
Sundries	19 59	
Freight	128 15	
	<hr/>	7,021 02
<i>Amount carried forward</i>		\$145,940 68

<i>Amount brought forward</i>		\$145,940 68
Garage, stable and grounds:		
Automobile repairs and supplies	\$1,352 47	
Bedding and materials	21 00	
Blacksmithing and supplies	16 41	
Carriages, wagons and repairs	36 23	
Fertilizers	37 50	
Grain	234 75	
Harnesses and repairs	2 20	
Labor (not on pay roll)	24 25	
Rent	133 25	
Road work and materials	100 20	
Spraying materials	14 60	
Stable supplies	4 00	
Tools, implements, machines, etc.	53 90	
Trees, vines, seeds, etc.	45 91	
Sundries	44 50	
Freight	69 95	
		<hr/>
		2,191 12
Repairs, ordinary:		
Cement, lime, crushed stone, etc.	\$103 65	
Electrical work and supplies	467 55	
Hardware, iron, steel, etc.	425 11	
Lumber, etc. (including finished products)	226 26	
Paint, oil, glass, etc.	597 63	
Plumbing and supplies	359 99	
Roofing and materials	19 99	
Steam fittings and supplies	262 07	
Tents, awnings, etc.	185 56	
Tools, machines, etc.	151 74	
Boilers, repairs	55 65	
Dynamos, repairs	6 07	
Engines, repairs	314 11	
Sundries	20 59	
Freight	94 18	
		<hr/>
		3,290 15
Repairs and renewals:		
Repairing dynamo	\$616 90	
Repairing tank and tower	434 11	
Partitioning two rooms	217 24	
Henrici washer	1,964 25	
Veranda repairs	147 69	
Recovering pipe	349 82	
Surface drainage	562 95	
Work in patients' dining room	139 27	
Plumbing	398 45	
Relocation of water heater	389 48	
		<hr/>
		5,220 16
		<hr/>
Total expenses for maintenance		\$156,642 11

SPECIAL APPROPRIATIONS.

Balance Dec. 1, 1920	\$6,888 71
Appropriations for current year	28,000 00
Total	<u>\$34,888 71</u>
Expended during the year (see statement below)	\$14,675 97
Reverting to treasury of Commonwealth	2 29
	<u>14,678 26</u>
Balance Nov. 30, 1921, carried to next year	\$20,210 45

OBJECT.	Aet or Resolve.	Whole Amount.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
Cottage for engineer and steward.	Chaps. 225, 629, 1920	\$16,500 00	\$6,886 42	\$16,497 71	\$2 29*
Fire protective system	Chap. 203, 1921	28,000 00	7,789 55	7,789 55	20,210 45
		<u>\$44,500 00</u>	<u>\$14,675 97</u>	<u>\$24,287 26</u>	<u>\$20,212 74</u>

* Balance reverting to treasury of the Commonwealth \$2 29
 Balance carried to next year 20,210 45
 Total as above \$20,212 74

RESOURCES AND LIABILITIES.

Resources.

Cash on hand	\$2,275 55	
November cash vouchers (paid from advance money):		
Account of maintenance	\$7,283 09	
Account of special appropriations	441 36	
	<u>7,724 45</u>	\$10,000 00
Due from treasury of Commonwealth from available appropriation account		
November, 1921, schedule		6,889 57
		<u>\$16,889 57</u>

Liabilities.

Outstanding schedules of current year:	
Schedule of November bills	\$16,889 57

PER CAPITA.

During the year the average number of inmates has been 182.65.
 Total cost for maintenance, \$156,642.11.
 Equal to a weekly per capita cost of \$16.4929.
 Receipt from sales, \$452.86.
 Equal to a weekly per capita of \$0.0476.
 All other institution receipts, \$32,157.01.
 Equal to a weekly per capita of \$3.3857.
 Net weekly per capita cost, \$13.1072.

Respectfully submitted,

CARL C. MACCORISON,
Treasurer.

Examined and found correct as compared with the records in the office of the Auditor of the Commonwealth.

ALONZO B. COOK,
Auditor.

REPORT OF THE BOARD OF STATE EXAMINERS
OF PLUMBERS

CHARLES J. O'BRIEN, *Chairman*

REPORT OF THE STATE EXAMINERS OF PLUMBERS.

Information concerning Examinations for Plumbers, showing the Place and Date of Examination and Number examined, together with the Results of the Examination, etc.

EXAMINATIONS.	Examined.	Passed.	Refused.
Boston, Dec. 4, 1920	77	12	65
Lowell, Dec. 18, 1920	31	11	20
Boston, Dec. 31, 1920	51	11	40
Pittsfield, Jan. 15, 1921	20	5	15
Boston, Feb. 5, 1921	101	24	77
Springfield, Feb. 19, 1921	53	20	33
Boston, Mar. 5, 1921	102	24	78
Fall River, Mar. 19, 1921	40	12	28
Boston, April 2, 1921	93	19	74
Worcester, April 16, 1921	49	25	24
Boston, May 7, 1921	98	19	79
Lowell, May 21, 1921	50	12	38
Boston, June 4, 1921	90	18	72
Pittsfield, June 18, 1921	25	5	21
Boston, July 2, 1921	91	13	78
Boston, July 16, 1921	45	3	42
Boston, Sept. 3, 1921	91	19	78
Springfield, Sept. 17, 1921	45	10	35
Boston, Oct. 1, 1921	91	19	72
Fall River, Oct. 15, 1921	38	11	27
Boston, Nov. 5, 1921	65	16	49
Worcester, Nov. 19, 1921	38	10	28
Totals	1,385	318	1,067

	Masters.	Journeyman.	Total.
Licenses granted on account of examination, Dec. 1, 1920, to Dec. 1, 1921.	121	190	310
Probationary licenses issued during year	-	8	-

REGISTRATIONS.	Masters.	Journeyman.
December, 1920	-	-
January, 1921	2	1
February, 1921	3	-
March, 1921	1	1
April, 1921	2	2
May, 1921	2	2
June, 1921	1	2
July, 1921	-	-
August, 1921	-	2
September, 1921	-	-
October, 1921	-	-
November, 1921	-	-
Totals	11	10

Meetings 48	Examinations 21
-----------------------	---------------------------

FEES RECEIVED.	Paid to the Treasurer of the Commonwealth.
1,385 examination fees, at \$0.50	\$692 50
133 master plumber licenses issued, at \$2	266 00
198 journeymen plumber licenses issued, at \$0.50	99 00
1,794 master plumber renewals at \$0.50	897 00
4,060 journeymen plumber renewals, at \$0.50	2,030 00
213 back fees, at \$0.50	106 50
Total	\$4,091 00
Interest during May, 1921	1 51

For carrying out the Provisions of the Act relative to the Examiners of Plumbers.

Salaries	\$3,500 00
Travel	741 79
Express	48 61
Printing	152 48
Postage	50 88
Books and stationery	99 19
Telephone and lighting	106 83
Plumbers' materials	6 00
Extra services	68 90
Cleaning	28 75
Miscellaneous	22 42
 Total	 \$4,815 77

Summary of Registrations.

	Masters.	Journeymen.
Certificate holders (individuals)	463 ¹	462
Licenses, year ending May 1, 1921 (individuals)	1,956 ²	3,146
Totals	2,419	3,608

¹ Holding journeymen also, 312.

² Holding journeymen also, 1,728.

Number of last master license issued up to Aug. 1, 1921 2,970

Number of last journeyman license issued up to Aug. 1, 1921 6,757

Deceased Plumbers reported to Examiners.

Masters 10 | Journeymen 5

REPORT OF DRAINAGE BOARD

LESLIE R. SMITH, *Secretary*

REPORT OF DRAINAGE BOARD.

The Drainage Board, as authorized in chapter 252 of the General Laws, is comprised "of one member designated by the Department of Public Health and one member designated by the Department of Agriculture."

The Drainage Board of 1921 comprises Mr. Warren C. Jewett of Worcester, chairman, who represents the Department of Public Health, and Leslie R. Smith of Hadley, secretary, representing the Department of Agriculture. During the year 1921 the Board has received and acted upon three petitions from landowners in as many different areas, who have asked help of the Board in organizing a drainage district as authorized in chapter 252 of the General Laws.

GREEN HARBOR DISTRICT.

The first petition was from certain landowners residing in the town of Marshfield, who asked for aid in organizing a drainage district to be known as the Green Harbor Drainage District. After viewing the area personally, the Board proceeded to appoint a local drainage commission as provided in chapter 252. Further action was delayed because of the fact that the local landowners have not decided as to which course to pursue in order to adequately drain the area which contains approximately 1,300 acres.

SALISBURY DRAINAGE DISTRICT.

A petition was received from certain landowners in the town of Salisbury for the aid of the Board in forming the Salisbury Drainage District. The Board was favorably impressed with the project, which would improve approximately 1,100 acres of land situated directly back of Salisbury Beach. The Board has appointed a local drainage commission, and the project is held up awaiting an amendment to chapter 252 of the General Laws. It developed that the logical place for dikes and tidewater gates necessary to carry out the project is situated over the line in the State of New Hampshire.

WEWEANTIC RIVER DRAINAGE DISTRICT.

A petition was received from certain landowners in the town of Carver asking aid in forming the Weweantic River Drainage District. The Board viewed the area and found that this area contained nearly 3,000 acres of cranberry bog dependent on the Weweantic River for drainage.

The local drainage commission was appointed and the county commissioners of Plymouth County have voted to finance the district to the extent of \$10,000, and the work of clearing out the Weweantic River is about to begin.

HERRING RIVER PROJECT.

Upon request of certain landowners in the town of Wellfleet, the Drainage Board visited the area in that town drained by the Herring River. This is a case where considerable State money has been expended in building a good dike with the necessary tide gates, and where the main river above the dike has grown full of wild rice, grass and flag in such a way as to almost completely clog the stream. The Board has not as yet received a petition from the owners of land in this district.

NOVA SCOTIA TRIP.

June 23, 1921, Commissioner of Agriculture Dr. Arthur W. Gilbert, Prof. Sidney B. Haskell, Director of the Experiment Station at the Massachusetts Agricultural College, together with Messrs. Jewett and Smith of the Drainage Board, went to Nova Scotia to study the great salt marsh areas, some of which have been drained for more than one hundred years. The party was shown the Great Canard Marsh and the Wellington Dike, the Wickwire Marsh, the extensive marsh areas around Grand Pré, also the various marshes around Nappan. The party was able to learn of the successes and failures of these extensive drainage projects. One important feature impressed itself upon all members of the party and that was the absolute necessity of State supervision over any drainage district. Local drains must be kept clear and the areas must be properly fed and cultivated in order to warrant the expenditure of public funds.

The cost of the work of the Drainage Board for the year was \$970.20; the appropriation was \$1,000, leaving a balance unexpended of \$29.80.

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ISSUED

PAPERS WRITTEN IN 1921 AND PAMPHLETS ISSUED.

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Bernard W. Carey, M.D.

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Jonathan E. Henry, M.D., C.P.H.

"A Brief Statistical Study of Recent Experience with Measles and Whooping Cough in Massachusetts." *American Journal of Public Health*, April, 1921.

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Lyman Asa Jones, M.D.

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Charles W. Milliken, M.D.

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Harold E. Miner, M.D.

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Edith A. Beckler, S.B.

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Cecilia Lemner, R.N.

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Division of Sanitary Engineering.

X. H. Goodnough, C.E.

"Rainfall in New England." *Journal of the New England Water Works Association*, June, 1921.

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Hermann C. Lythgoe, S.B.

"The Application of the Theory of Probability to the Interpretation of Milk Analyses." *Journal of the Association of Official Agricultural Chemists*, Aug. 15, 1921.

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Merrill E. Champion, M.D., C.P.H.

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Harriet L. Wedgwood, R.N.

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Cancer: Facts which every Adult should know. 13 pp.

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The Occurrence of Infantile Paralysis in Massachusetts in 1908. 26 pp.

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Do You Know That — (Leaflet, mouth hygiene.)

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Care of the Child in Hot Weather. (Booklet.) 7 pp.

Diet No. 1. The Breast Fed Baby.

Diet No. 2. The Bottle Fed Baby (from Birth to Ten Months). (Leaflet.)

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