# TWENTY-FIRST REPORT

(EIGHTH BIENNIAL)



OF THE

New Hampshire

# STATE BOARD OF HEALTH

OF THE

## STATE OF NEW HAMPSHIRE

FOR THE FISCAL PERIOD ENDING AUGUST 31, 1910

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CONCORD, NEW HAMPSHIRE
1910.

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## STATE OF NEW HAMPSHIRE.

OFFICE OF THE STATE BOARD OF HEALTH,
STATE HOUSE, CONCORD, September 1, 1910.

*To His Excellency the Governor and the Honorable Council:*

I have the honor to submit herewith, in accordance with the laws of the State of New Hampshire, the twenty-first report of the State Board of Health for the two fiscal years ending August 31, 1910.

Respectfully submitted,

Irving A. Watson

*Secretary.*

# REPORT.

In the report herewith presented, only a part of the work done by the state board of health during the fiscal period represented can be considered. We can include only some of those things that are generally instructive and of value as a matter of record. The voluminous correspondence, relative to the management of communicable diseases, questions asked by individuals, local boards of health, boards of education and by other organizations relative to local matters—the pollution of water supplies, the draining and sewering of towns, the sanitary improvements of summer resort localities, hotels and boarding houses, the interpretation of the Food and Drugs Law, etc.,—while interesting and educational, cannot be incorporated in this report without enlarging the volume to an extent not advisable nor even permissible under the appropriation allowed for publication.

## Water Supplies.

Elsewhere in this report is shown the record of the examinations of public water supplies of the state at the laboratory of the board. This record is a continuous one, covering a period of several years, and is presented in this form for reference purposes.

It is the policy of this board to make such occasional examinations of our water supplies as may be deemed advisable, in order that any deterioration in the quality of a given supply may be investigated and remedial measures be inaugurated. An analytical examination of these records will show that many supplies have been materially improved. In some instances it has been necessary for the board to make a personal examination, to ascertain the topographical surroundings of the source of the supply, in order to recommend the necessary changes to protect the supply.

A few special reports will be found in connection with the general report.

## Sanitary Inspections.

The last Legislature enacted a law providing for a sanitary inspector to act under the direction of the State Board of Health; to make examinations of certain meat supplies, the sanitary conditions of slaughter-houses and places where meats are kept, the methods of preparing meat products for sale; to investigate the general food products of the state, in order to detect violations of the Pure Food Law; to collect samples for analysis at the State Laboratory of Hygiene, and, under the direction of the board, to inspect local sanitary conditions in conjunction with local boards of health when requested, or when deemed advisable by the State Board.

Several months elapsed after the passage of this act, before an inspector was selected, which position was then filled by the appointment of Mr. Wallace F. Purrington, who was, for a considerable period, assistant chemist at the State Laboratory of Hygiene, and who is proving to be an efficient officer.

A large amount of inspection work has already been done, which in many instances has proven to be of great value—as will be mentioned below.

### Slaughter-House Inspection.

Under the direction of the board, an inspection has been made of many slaughter-houses and other buildings in which animals are slaughtered for the market. In some instances the most unsanitary conditions were found, but, as the law does not authorize an inspector to do more than to *recommend* changes in such cases and as the local boards of health have no specific power in the premises, it has been difficult to bring about the desired result in some instances; in others, the fear of publicity, alone, has been sufficient to secure some reforms.

As an illustration of some of the conditions found, the following transcript is given from the inspectors' report, suppressing only the names of the proprietors and the localities:

. . . . This place is filthy. The slaughtering floor is covered with manure and old blood. No means for water is at hand, and it is a great distance to any building. In one corner of the floor were piled up skulls, hoofs, and parts of carcasses which were black with age. A near-by tieup looked as if it were never cleaned.

. . . . This is another filthy place, even worse than the preceding. The stench from a hog-pen below the floor which received the blood and offal, was disgusting. Here, also, were old skulls, etc., and the combination gave rise to powerful odors. The slaughtering floor itself looked as if it were never cleaned, and the manure lies in cakes where the cattle are killed. The tieup is filthy with manure, and this is one of the approaches.



. . . . No attempt is made here to keep things clean. The place is dark and badly ventilated. There is a small hole in the wall, as in a coal bin, through which horse manure comes onto the slaughtering floor. Fresh manure was seen in the middle of the slaughtering floor, and the man of the place had gone away and left it. Separating the horse-stall from the floor was a horse blanket. There was no water for cleaning purposes.

. . . . This is a small building, divided by a partition into two parts: In one is kept a horse, and the slaughtering is done in the other. The horse, to get to his stall, has to cross the slaughtering floor, and evidences of manure, both by tracking and otherwise, were noticed. No attempt has ever been made to wash the floor, and there are no facilities for doing so. The cradle used for dressing calves, is in a filthy condition. Offal is fed to hogs under the slaughtering floor.

. . . . Work here is conducted in a shed. Filth and foul odors are very marked. The slaughtering floor is over a hog-pen, to which the offal goes. About the place are old, greasy rags, old dried skins and hair. The refrigerator is filthy. Tools had been recently used, and left unclean.

. . . . This place is filthy. The house is an old place on the edge of a swamp. The floor is apparently never cleaned. No one was present at the time of the inspection, and the place was left with offal, etc., lying about, with no attempt at disposal. No water within half a mile, except the swamp hole in which the hogs run. There was a strong stench. Hogs beneath, within a foot of the floor.

. . . . At this place they kill about ten hogs a week. An open vault is too near the slaughtering floor. The tieup has manure a foot deep in the gutter. A dirty hog-pen is too near the slaughtering floor. The floor itself is of wood, filled with blood, etc. The walls need a coat of whitewash. The place where the offal is deposited is nearly closed in, so that little air gets to it, and the place has a powerful stench.

. . . The slaughtering floor opens up to a yard where hogs are kept, within a few inches of the floor. The hog-pen is full of water in deep puddles. There is a horse-stable close by, and also a filthy tieup for cattle. The slaughtering place is in the barn floor. Swill, collected from the city, is deposited on one side of the floor, and, although covered, the stench was powerful. In the ice-box was a decomposed carcass, which was almost to the point where mold begins. The worst features of the place was the presence of human feces within a few feet of the floor. A seat was there, and under it was the paper and the feces which had become darkened with age. The place was a disgrace to a civilized community.

. . . . Considerable slaughtering is done here at times. Dirty, blood-caked floor about the sides of the walls, and the walls were filthy. The work is done in an old shed, with a hog-pen about a foot below the floor which gets the offal. Old skulls and bones were lying about. No water is used. Chloride of lime is used in the summer.

. . . . Work here is done at the end of the barn, and all the offal, blood, bones, skulls, etc., are thrown into a pit *in the barn*. No hogs are kept, and there was apparently no attempt to cover the refuse. The filthy stuff had been allowed to remain until it was black, and the stench was awful. From hearsay, I understand that the house is not much better. The owner drives a butcher's cart, and does considerable slaughtering when he can get the cattle. This is about the worst place yet seen.

A measure which would have given authority legally to bring about the changes necessary to place such establishments in a reasonably sanitary condition, failed of a passage at the last session of the Legislature. The same bill will be presented to the Legislature of 1911.

## Inspection of Summer Resorts.

During the past year the board began the inspection of summer-resort localities, hotels, boarding houses, etc., for the purpose of ascertaining the exact conditions pertaining thereto. A great majority of these hotels and boarding houses are not connected with municipal water supplies or sewers; therefore, serious sanitary problems have to be confronted in some instances, while in others entirely inadequate provisions have been made. Where such conditions have been found, a plan to remedy the defect has been suggested, and, if not agreed to without controversy, the executive authority of the local board of health has to be invoked to secure the needed reforms; but this has seldom been necessary. In most instances, the proprietors of the so-called summer hotels are desirous of maintaining good sanitary conditions, and welcome any suggestions to this end. A large section of the state has been covered in this work, and many suggestions have been made. A demand for some feasible plan of sewage disposal at places not within reach of public sewers, had caused the board to have prepared by its civil engineer, Prof. Robert Fletcher, plans, specifications, and explanatory text to meet such a situation. This will be found elsewhere in this report, and will also be published in a special bulletin for general distribution.

### THE STATE LABORATORY OF HYGIENE.

The large amount of work done in the State Laboratory of Hygiene s shown, in part, in the reports on the water supplies of the state, od and drugs analysis, and in the statistical tables showing the cteriological examinations made in that department.

A considerable portion of the work done in the chemical department s been published from time to time in the *Sanitary Bulletin*, but y a small portion of it appears in this report. No compilation of number of examinations made in the chemical department has h attempted although the number is large, as is shown in bulletins. he bacteriological department, the statistical report shows that 174 examinations were made during the fiscal period embraced in treport.

will, therefore, be seen that in the two branches of the laboratory a e amount of important analytical work has been accomplished. Thboratory has been removed from rented rooms, to the third flof the addition to the State House, and is well equipped for all kinf work legitimately belonging to a laboratory of hygiene. Follows a more detailed statement of its appointment:

### CHEMICAL DEPARTMENT.

Themical laboratories, located on the west side of the building, com two rooms 20 x 20 and 25 x 16 respectively, being separated fron bacteriological laboratory by the entrance lobby and a small roomd as an office. The latter contains a reference library of scienworks, journals, bulletins, etc., and here also are stored the recor analyses, with copies of reports, in the case of all the water, food trug samples examined since the laboratory was established.

Passing through the lobby, which serves as desk room for the inspector and the assistant chemist, the first laboratory entered is devoted to the examination of foods, drugs and work of miscellaneous character. This room, as well as the water laboratory, is provided with an asphalt floor, laid on cement over arched tiling; this makes not only an absolutely impervious floor but one that is unaffected by chemicals. Excellent overhead lighting and ventilation is afforded by a 6 x 8 transom skylight. Lockers and cupboards are provided for the storage of samples, apparatus and chemicals, and an enamel-lined refrigerator serves to receive perishable samples, culture media, etc.

The center of the floor is occupied by a large, L-shaped table fitted underneath with drawers and cupboards, and the top of which consists of white, 2 inch, vitrified, hexagonal tiling, laid in reinforced cement and edged by a "nosing" of soapstone. In one end of the main section is a small soapstone sink. From the latter,through the center of the table, extends a soapstone box,which does crombined service as a shelf for reagent bottles and as receptacle for th ee lines of pipe, sets of cocks on either side of this box affording convenient connections for gas, vacuum and air-blast. The two latter are provided by opening cocks at the sink, the water passing through a mechanism of pumps and cylinders, located beneath the table. Sockets are also provided for supplying electric current.

Adjoining one end of the above table is a small table of heavily timbered construction, anchored into the cement, which serves as a support for the centrifuge, with quarter horse-power motor. Another sink, supplied with hot and cold water and used for general washing-up purposes, is located in a corner of the room. Adjoining this is a drain cupboard 4 feet by 18 inches by 12 inches, provided with wire shelves and a bottom board draining into the sink.

The hood, ventilated by two flues leading above the roof, is situated in the partition adjoining the two rooms, there being two compartments in the food laboratory. The double compartment, common to both rooms, is provided with a water-bath, hot plate, igniting racks, etc. The hood tops are of wood, resting on a floor of alberene stone (a variety of soapstone), the whole being supported upon a pipe-frame base.

Communicating with the room just described, is the laboratory devoted to the analysis of waters and liquors. The equipment of this room consists principally of the fixtures from the old laboratory. There is a large, central working-table, 12 feet by 5 feet, one half of which has been tiled, the other half, of lesser height, serving as a bench for the reception of water samples. A 14-foot wall table, used for distillations, extractions, etc., is specially fitted up with numerous connections for gas, water, waste and current. Adjoining this table is the sink, provided with hot and cold water, a drain closet, and also with a special five-bottle washing device, which permits of the introduction into the bottles of powerful jets of water of any desired temperature.

A feature of both these rooms is the white-tiled window benches, which serve admirably for colorimetric and microscopical work. The equipment above described, includes practically all of the fixtures in use in the former quarters, and with the added new construction, the working facilities have been very nearly doubled, as well as greatly improved. While this will doubtless provide adequately for future growth in the lines of work above mentioned, there is, nevertheless, considerable need of an additional room—preferably in the basement—which might be used, not only for storage and for the rougher work of grinding and preparing samples, but also in a measure for the examination of such materials as asphalts, coals and paints,—a variety of work for which there is already some demand and which,—unless provided for by the establishment of a separate laboratory—is certain to increase largely in the future.

### Bacteriological Department.

Of the four rooms on the top floor of the new part of the State House, occupied by the Laboratory of Hygiene, the southwest corner room assigned to the bacteriological department. The room is 19 by feet with two large windows on south and west walls. On the th side at window, is small working desk for microscope and next this is the desk of the bacteriologist. The west side has a long king bench for microscopic and microtome work. The bench is red in part with hexagonal tile. On the north side, in corner, large soapstone sink with shelf, for use in preparing specimens doing the necessary stain work. The rest of this side of room is ied by large hood connected with roof by ventilation flue, sets apstone base and contains steam, and dry heat sterilizer, the ier and incubator. The entrance to the laboratory is from this f room. The east side of room is occupied by a large cabinet ring the outfits used by the physicans in sending specimens laboratory and also cabinet for filing records of the work done. Tnter of room contains working table for general work.

### Board of Commissioners of Lunacy.

The State Board of Health constitutes a board of Commissioners of Lunacy, under an act of the Legislature. Its duties are: To make inspections; to examine into the care and treatment of the insane; to keep correct records of the commitments, discharges, and deaths at the state and county asylums, with ages, sex, nationality, etc., and to report to the governor and council, which report is biennially submitted and printed, and may be referred to for detailed information concerning the duties devolving upon the board.

The board has authority to transfer indigent insane persons to the New Hampshire State Hospital, there to be supported by the state, provided that, after an investigation into the financial status of the patient, he shall be found to be entitled to such assistance. This applies to all indigent insane persons, whether or not they may have been supported in whole or in part from public or private sources.

An investigation of each case is required of the county commissioners, or of the mayor and the overseer of the poor in cities, or of the board of selectmen in towns, and they must report to the board upon proper blanks, under oath, regarding such facts as are called for, and which must embody full evidence of the inability of the patient, or of his relatives, legally chargeable with his support, to provide for his maintenance at the State Hospital; otherwise, state aid cannot be granted.

At the close of the fiscal year 1910, there were remaining at the several county institutions, 124 insane persons, and at the State Hospital, 909, a large majority of the latter belonging to the "indigent" class, having been admitted under orders of the Commissioners of Lunacy.

### The New Hampshire Sanitary Bulletin.

The New Hampshire *Sanitary Bulletin* has been issued quarterly for the past ten years, and that it is appreciated by the people of the state is shown by the fact that the demand for it has increased its circulation from 2,000 copies (the first edition), to 7,000. It is a medium through which local boards of health, physicians and others are given information relative to sanitary measures and regulations, food and drugs examinations, etc., aside from much general information relating to public and personal hygiene.

We believe that the *Bulletin* has accomplished great good in the line of public education on sanitation. Thousands of copies relative to the restriction and prevention of some of the communicable diseases have been distributed, and the demand is almost continuous for issues of this kind, for local distribution upon the outbreak of these diseases. The *Bulletin* is furnished free of expense to any citizen of New Hampshire who applies for it.



### The New Hampshire State Sanatorium.

A special report of the trustees of the State Sanatorium will be made to the Legislature, but it is not out of place to give that institution mention in this report as one of the agencies that bids fair to be of great public health service to the State of New Hampshire.

At the close of the year, the institution is filled and there is a demand for admission far beyond its present capacity. For the greatest good that such an institution can do, it is imperative that its capacity should be extended. Provision should be made by the Legislature for at least double its present capacity. In other words, two additional wards, one for males and the other for females, and of the capacity of the present wards, should be constructed.

The result of the two years' experience demonstrates beyond successful controversy, the value of this institution in the treatment of tuberculosis. The records show that 40 per cent. of the incipient cases have apparently been cured, and 60 per cent. arrested, showing 100 per cent. of improvement in this class of patients. In the moderately advanced cases, 49.9 per cent. have apparently been cured or arrested, and 21.5 per cent. of the far advanced cases have been improved. This record in itself is a sufficient justification of the establishment of the institution in New Hampshire.

### Vital Statistics.

The very important records of births, marriages, divorces and deaths which have been collected, classified and properly filed for immediate reference under the direction of the State Board of Health, are at last housed in ample, fireproof quarters, with every convenience for consultation and examination by the public. The collection aggregates, at the present time, a million and a half records, embracing all that have been recorded in the several towns in the state from its earliest settlement to the present time.

These records have become of great importance, aside from showing the movement of the population, for many legal and personal purposes: in the obtaining of pensions, the proving of ages for admission to certain occupations, civil service employment, the determination of property rights, the establishing of ancestral lines for admission to the various patriotic societies, for the compiling of family genealogies, etc.

It is to be hoped that sometime in the near future, provision may be made for transcribing the old church records, so that they may be added to the files of this department.



## Notes on the Vital Statistics of the State.

The Registration Report, which is published biennially, contains a mass of statistical information relative to births, marriages, deaths, and divorces, from which the student of the movement of the population can construct other special tables and can make deductions based upon the annual returns to the state. To make investigations of this kind covering a series of years, it would be necessary to consult the reports from the beginning and to devote considerable time to the arrangement of tables covering a series of years.

For the more ready information upon special causes of death, particularly some that merit greater study and more careful consideration, owing to their increasing mortality, than has heretofore been given to them, we are including a few special tables.

The number of births, marriages, divorces and deaths returned to the state for the years 1908 and 1909 was as follows:

| | 1908. | 1909. | Increase. | Decrease. |
|---|---|---|---|---|
| Births | 9,270 | 8,913 | ............ | 357 |
| Marriages | 4,098 | 4,079 | ............ | 19 |
| Divorces | 569 | 504 | ............ | 65 |
| Deaths | 7,161 | 7,282 | 121 | ............ |

The proportion of births, marriages, divorces and deaths to each 1,000 of the population for the two years mentioned was:

| Year. | Births. | Marriages. | Divorces. | Deaths. |
|---|---|---|---|---|
| 1908 | 21.72 | 9.60 (couples) | 1.33 (couples) | 16.77 |
| 1909 | 20.79 | 9.49 (couples) | 1.17 (couples) | 16.98 |

## Tuberculosis.

The one disease that has agitated the public mind more than any other, and to which more consideration has been given in the way of prevention and treatment, is tuberculosis. The results which have followed, largely from the education of the public in the campaign to suppress the ravages of this disease, are shown in the tables and diagram herewith submitted.

The reduction in the death rate from tuberculosis in New Hampshire, is practically paralleled by that in other states and communities where a campaign of education has been waged. The remarkable results that have been brought about, are an unanswerable argument in themselves for the continuation, more vigorous if possible, of the movement for the suppression of this disease, by educating the public as to its true nature, methods of prevention, etc., and in securing facilities for the proper care and treatment of infected persons.

The table herewith given shows the number of deaths from pulmonary tuberculosis, as returned to the state, by years, from 1884 to 1909, inclusive.

It will be seen that the number of deaths from consumption in 1909 was approximately only one half that of the earlier years included in the table. This reduction, as applied to the living population, is most graphically shown in the accompanying diagram.

Deaths from Consumption (Pulmonary Tuberculosis) in New Hampshire for Twenty-six Years, by Age Periods.



| Years. | Total. | 1 to 10. | 10 to 20. | 20 to 30. | 30 to 40. | 40 to 50. | 50 to 60. | 60 to 70. | 70 to 80. | Over 80. | Not stated. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1884 | 868 | 50 | 113 | 218 | 145 | 93 | 78 | 64 | 67 | 21 | 19 |
| 1885 | 857 | 49 | 98 | 219 | 161 | 109 | 75 | 75 | 43 | 19 | 9 |
| 1886 | 809 | 44 | 87 | 233 | 152 | 94 | 67 | 71 | 37 | 18 | 6 |
| 1887 | 766 | 34 | 88 | 193 | 145 | 101 | 78 | 55 | 46 | 21 | 5 |
| 1888 | 742 | 48 | 88 | 219 | 137 | 71 | 62 | 55 | 42 | 15 | 5 |
| 1889 | 651 | 36 | 81 | 147 | 120 | 77 | 56 | 65 | 53 | 10 | 6 |
| 1890 | 825 | 49 | 77 | 200 | 156 | 113 | 65 | 72 | 63 | 23 | 7 |
| 1891 | 695 | 47 | 87 | 174 | 131 | 89 | 67 | 37 | 43 | 10 | 10 |
| 1892 | 736 | 28 | 88 | 178 | 150 | 84 | 67 | 71 | 41 | 20 | 9 |
| 1893 | 737 | 45 | 71 | 204 | 139 | 92 | 65 | 64 | 34 | 14 | 9 |
| 1894 | 714 | 50 | 70 | 200 | 150 | 82 | 59 | 45 | 45 | 8 | 5 |
| 1895 | 693 | 31 | 66 | 210 | 129 | 85 | 60 | 49 | 51 | 10 | 2 |
| 1896 | 679 | 41 | 81 | 180 | 130 | 85 | 59 | 49 | 37 | 9 | 8 |
| 1897 | 697 | 36 | 79 | 225 | 143 | 70 | 46 | 49 | 32 | 12 | 5 |
| 1898 | 607 | 26 | 53 | 181 | 143 | 66 | 52 | 47 | 22 | 7 | 10 |
| 1899 | 582 | 26 | 57 | 169 | 103 | 80 | 65 | 38 | 28 | 10 | 6 |
| 1900 | 650 | 36 | 70 | 193 | 120 | 76 | 45 | 61 | 44 | 1 | 4 |
| 1901 | 629 | 42 | 57 | 178 | 130 | 71 | 53 | 48 | 40 | 7 | 3 |
| 1902 | 569 | 23 | 62 | 138 | 134 | 83 | 51 | 43 | 24 | 5 | 6 |
| 1903 | 530 | 26 | 47 | 141 | 107 | 66 | 54 | 49 | 31 | 7 | 2 |
| 1904 | 575 | 30 | 43 | 181 | 126 | 74 | 54 | 43 | 18 | 3 | 3 |
| 1905 | 571 | 28 | 54 | 143 | 131 | 95 | 49 | 45 | 20 | 3 | 3 |
| 1906 | 538 | 34 | 54 | 138 | 136 | 76 | 36 | 31 | 22 | 8 | 3 |
| 1907 | 465 | 19 | 39 | 125 | 111 | 67 | 46 | 29 | 21 | 6 | 2 |
| 1908 | 471 | 23 | 46 | 126 | 95 | 69 | 37 | 46 | 21 | 8 | ...... |
| 1909 | 466 | 19 | 41 | 116 | 121 | 68 | 42 | 34 | 19 | 5 | 1 |
| Total | 17122 | 920 | 1,797 | 4,629 | 3,445 | 2,136 | 1,488 | 1,335 | 944 | 280 | 148 |

While we all know, from observation that tuberculosis is a very prevalent disease, and that it has always been so recognized, its exact position as a cause of death in this state has been known only for a period of about twenty-five years.

The registration of deaths in every town and city in New Hampshire was not perfected to any degree of accuracy until about 1884, since which time our statistics are of great value as a guide in sanitary work. The information which these records give justifies not only the energetic campaign that is being waged against tuberculosis, but also shows what has been accomplished from year to year in the subjugation of this disease.



This is graphically shown in the diagram herewith given.

During the twenty-five years from 1884–1909, inclusive, there was returned to the state a total of 179,914 deaths from all causes. Of this number, 17,122 died of pulmonary tuberculosis. This would give an average of one death from consumption to every ten and a fraction deaths that occurred during that period.

These statistics, as fearful as they look and are, have another side, which represents most conclusively and emphatically what has been accomplished in the diminution of this disease during the past twenty-five years.

In 1884, at the commencement of the period now under consideration, there were returned 868 deaths from pulmonary tuberculosis; while for the year 1909 there were returned 466 deaths from the same cause. It will be seen that the mortality from consumption has been reduced nearly one-half.

The figures already quoted have dealt wholly with pulmonary tuberculosis, commonly known as "consumption;" but when the disease is to be considered *in toto*, there must be included the lesser phases of it, as tubercular meningitis, tuberculosis of the bowels, scrofula, "white swelling," and other more uncommon forms of the disease—all of which would somewhat increase the total of deaths due to tuberculosis.

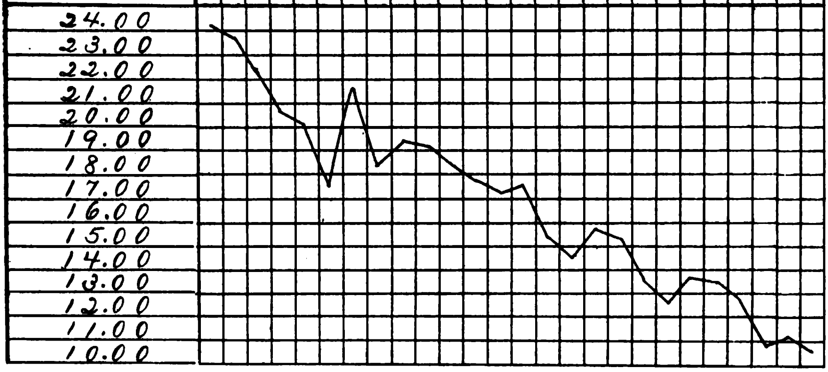
The great progress that has been made in a relatively few years in reducing the death-rate from consumption, is due largely to a better understanding of the nature of the disease; to the exercise of more or less precaution against infection (formerly neglected); to improved environments of the laboring classes; better hygienic conditions in homes, ventilations, etc., and, further, to the fact that in recent years many cases have been cured.

There is another factor, of undetermined magnitude, that is contributing to the reduction of the number of deaths from tuberculosis, and that is the increasing number of persons who are succumbing to diseases of the nervous and circulatory systems—heart disease, Bright's disease, apoplexy, etc., due to conditions apart from this immediate discussion, but which must, sooner or later, receive serious and careful consideration.

Diagram Showing the Reduction in the Mortality Rates from Pulmonary Tuberculosis (Consumption) from 1884 to 1909, Inclusive.



| Year | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 | 1890 | 1891 | 1892 | 1893 | 1894 | 1895 | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate per 10,000 Population | 24.10 | 23.68 | 22.17 | 20.82 | 20.01 | 17.42 | 21.91 | 18.31 | 19.24 | 19.13 | 18.38 | 17.71 | 17.22 | 17.55 | 15.16 | 14.43 | 15.79 | 15.21 | 13.69 | 12.70 | 13.71 | 13.56 | 12.71 | 10.94 | 11.03 | 10.87 |




### Bright's Disease.

The increase in the mortality from Bright's disease is of an almost startling nature. It will be seen by the table herewith presented, and also by the diagram, which is based upon the death rate from this disease to each 10,000 of the population, that the records of the past quarter of the century show a progressive increase, from 117 deaths registered in 1884, to 402 in 1909, with annual fluctuations of no great magnitude.

**Deaths from Bright's Disease by Age Periods, 1884 to 1909, Inclusive.**

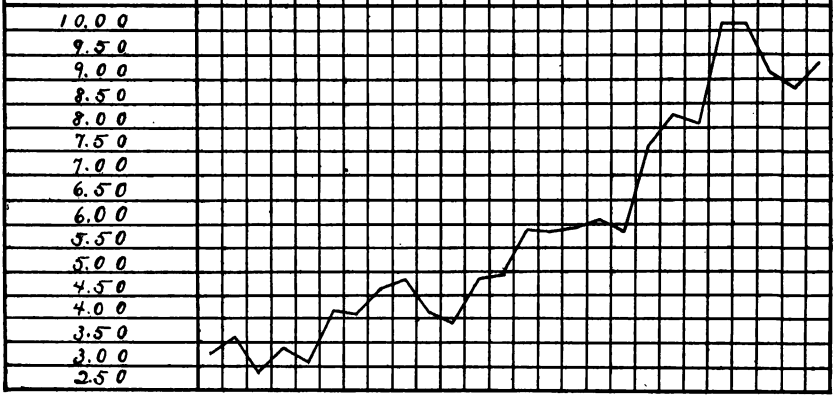
| Years. | 1 to 10. | 10 to 20. | 20 to 30. | 30 to 40. | 40 to 50. | 50 to 60. | 60 to 70. | 70 to 80. | Over 80. | Not stated. | Total. | Rate to total population. (Per 10,000.) | Male. | Female. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1884...... | 6 | 6 | 9 | 13 | 12 | 23 | 20 | 23 | 3 | 2 | 117 | 3.26 | 75 | 42 |
| 1885...... | 6 | 9 | 11 | 19 | 15 | 14 | 24 | 24 | 7 | 1 | 130 | 3.59 | 78 | 52 |
| 1886...... | 3 | 2 | 9 | 8 | 8 | 10 | 28 | 33 | 6 | 1 | 108 | 2.96 | 62 | 46 |
| 1887...... | 4 | 6 | 6 | 17 | 12 | 16 | 29 | 25 | 6 | 1 | 122 | 3.31 | 77 | 45 |
| 1888...... | 9 | 3 | 6 | 3 | 15 | 20 | 25 | 25 | 5 | 2 | 113 | 3.04 | 78 | 35 |
| 1889...... | 3 | 3 | 11 | 16 | 19 | 28 | 34 | 33 | 8 | 1 | 156 | 4.17 | 84 | 72 |
| 1890...... | 5 | 5 | 5 | 14 | 16 | 24 | 35 | 39 | 11 | 3 | 157 | 4.16 | 98 | 59 |
| 1891...... | 2 | 9 | 7 | 18 | 16 | 27 | 46 | 34 | 10 | 5 | 174 | 4.57 | 113 | 61 |
| 1892...... | 7 | 6 | 10 | 16 | 24 | 35 | 37 | 36 | 9 | 3 | 183 | 4.77 | 101 | 82 |
| 1893...... | 13 | 7 | 10 | 18 | 18 | 18 | 29 | 39 | 7 | ...... | 159 | 4.11 | 89 | 70 |
| 1894...... | 10 | 6 | 14 | 12 | 20 | 24 | 22 | 30 | 6 | 1 | 145 | 3.71 | 81 | 64 |
| 1895...... | 4 | 8 | 13 | 17 | 23 | 37 | 34 | 38 | 13 | 1 | 188 | 4.77 | 110 | 78 |
| 1896...... | 6 | 10 | 9 | 18 | 17 | 32 | 39 | 43 | 15 | 2 | 191 | 4.80 | 118 | 73 |
| 1897...... | 15 | 3 | 11 | 24 | 15 | 38 | 46 | 56 | 20 | 4 | 232 | 5.78 | 118 | 114 |
| 1898...... | 5 | 7 | 16 | 16 | 15 | 35 | 51 | 65 | 16 | 3 | 229 | 5.66 | 136 | 93 |
| 1899...... | 11 | 6 | 12 | 16 | 23 | 31 | 50 | 71 | 21 | 1 | 242 | 5.93 | 132 | 110 |
| 1900...... | 12 | 5 | 15 | 14 | 34 | 35 | 49 | 61 | 20 | 3 | 248 | 6.02 | 127 | 121 |
| 1901...... | 7 | 5 | 15 | 22 | 26 | 47 | 57 | 44 | 17 | 2 | 242 | 5.85 | 139 | 103 |
| 1902...... | 8 | 4 | 19 | 20 | 33 | 43 | 64 | 77 | 25 | 4 | 297 | 7.15 | 164 | 133 |
| 1903...... | 8 | 8 | 18 | 23 | 39 | 58 | 74 | 81 | 36 | 3 | 348 | 8.33 | 191 | 157 |
| 1904...... | 6 | 4 | 19 | 25 | 34 | 57 | 67 | 76 | 45 | 6 | 339 | 8.08 | 172 | 167 |
| 1905...... | 13 | 14 | 29 | 33 | 40 | 65 | 90 | 92 | 49 | 3 | 428 | 10.16 | 241 | 187 |
| 1906...... | 7 | 9 | 19 | 29 | 47 | 67 | 108 | 93 | 36 | 5 | 430 | 10.16 | 238 | 192 |
| 1907...... | 9 | 8 | 13 | 17 | 34 | 59 | 87 | 110 | 47 | 3 | 387 | 9.10 | 236 | 151 |
| 1908...... | 10 | 7 | 17 | 25 | 27 | 61 | 74 | 113 | 36 | 4 | 374 | 8.76 | 215 | 159 |
| 1909...... | 12 | 6 | 9 | 23 | 35 | 67 | 77 | 128 | 42 | 3 | 402 | 9.37 | 226 | 176 |
| Total... | 211 | 166 | 332 | 476 | 617 | 971 | 1,296 | 1,489 | 516 | 68 | 6,141 | ....... | 3,499 | 2,642 |

Diagram Showing Increase in the Mortality from Bright's Disease and Its Rate to Each 10,000 of the Population, from 1884 to 1909, Inclusive.



| Year | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 | 1890 | 1891 | 1892 | 1893 | 1894 | 1895 | 1896 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate to total Population Per 10,000 | 3.26 | 3.59 | 2.96 | 3.31 | 3.04 | 4.17 | 4.16 | 4.57 | 4.77 | 4.11 | 3.71 | 4.77 | 4.80 |

| Year | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate to total Population Per 10,000 | 5.78 | 5.66 | 5.93 | 6.02 | 5.85 | 7.15 | 8.33 | 8.08 | 10.16 | 10.16 | 9.10 | 8.76 | 9.37 |




Osler defines Bright's disease as "acute diffusive nephritis, due to the action of cold or of toxic agents upon the kidneys."

It is held that exposure to cold and wet is one of the most common causes of the acute form of the disease, while probably a more prolific cause is the resulting poison of specific diseases, like scarlet fever, typhoid fever, diphtheria, measles, and other acute febrile conditions. Interstitial alterations and degeneration of tissues, and other organic changes lead to the chronic form of the disease, which too frequently follows the acute stage. The chronic form, however, often develops insidiously, without manifestation of acute symptoms.

It would seem that the usual alleged causes of Bright's disease are not sufficient to account for its prevalence in an increasing ratio, far beyond the growth of the population. There must be other causes, not commonly recognized, and hidden, probably, in the daily habits of living, in personal environments, in overtaxing the nervous system, in the competitive struggle of life, in intemperance in eating, in the use of alcoholic liquors, in inadequate hours of rest, and in other habits not in accord with the best known principles of personal hygiene.

The kidney is an excretory organ, and upon it is placed the burden of eliminating many of the toxins following functional or organic disturbances, the non-assimilation of food, overburdened digestive organs, physical overwork, mental strain, and other conditions which should be seriously considered.



The table above referred to gives the mortality from this disease by age periods and by sex. In studying the latter, it will be seen that the mortality is considerably greater among males than among females, which possibly may be accounted for, in part, by the greater liability of the former to exposure to the vicissitudes of climate, and to the more intemperate habits of that sex.

It is not the purpose of these remarks to do more than to draw attention to the serious aspect of this disease.

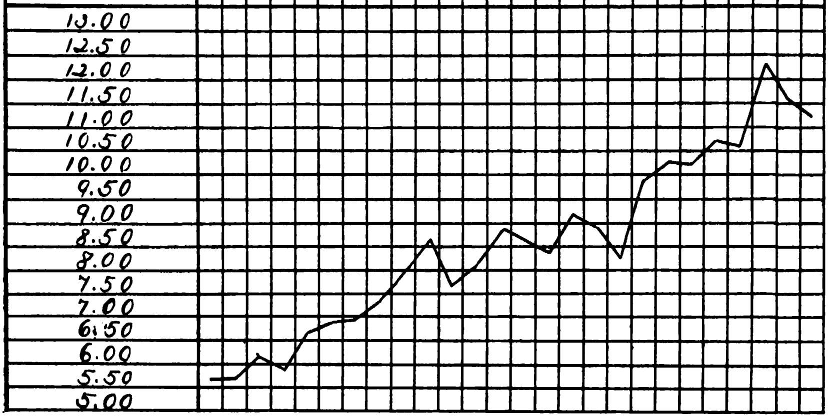
## Apoplexy.

Deaths from apoplexy during the past twenty-five years, as shown from the mortality returns, have been increasing at a rate that is little short of alarming. It is not the purpose here to discuss to any extent the causes which apparently contribute to make up the high death-rate from apoplexy. Doubtless, however, some of the comments made as to the causes of Bright's disease are applicable to apoplexy. Namely; the daily habits of living, the competitive struggle of life, overtaxing the nervous system, intemperance in eating, the use of alcoholic liquors, and any condition of living which tends to a weakening of the arteries. The diagram herewith presented, vividly illustrates the increase. The facts presented merit more than a passing consideration.

DIAGRAM SHOWING INCREASE IN THE MORTALITY FROM APOPLEXY, AND ITS RATE TO EACH 10,000 OF THE POPULATION, FROM 1884 TO 1909, INCLUSIVE.



| YEAR | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 | 1890 | 1891 | 1892 | 1893 | 1894 | 1895 | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate to total Population Per 10,000 | 5.68 | 5.69 | 6.03 | 5.71 | 6.55 | 6.93 | 6.98 | 7.44 | 8.03 | 8.55 | 7.53 | 8.15 | 8.98 | 8.60 | 8.48 | 9.21 | 8.79 | 8.22 | 9.91 | 10.32 | 10.25 | 10.75 | 10.54 | 12.30 | 11.50 | 11.29 |




## CANCER.

The increase in the number of deaths from cancer is attracting the attention of the civilized world. So marked has been its progress within the last few decades that institutes for the study of this disease have been established in several countries in charge of able and scientific investigators.

Progress of an encouraging nature towards its control is being made, but up to the present time no specific has been discovered. The early removal of the diseased conditions still affords, by far, the most promising method of treatment. A glance at the table herewith presented shows the mortality from cancer from 1884 to 1909, inclusive, by age periods and sex.

It will be seen that in this period of twenty-six years its mortality has nearly doubled. Its upward trend is most vividly shown in the diagram which illustrates its death-rate to each ten thousand of the population. While the line fluctuates a little from year to year, the upward trend of it is almost startling.

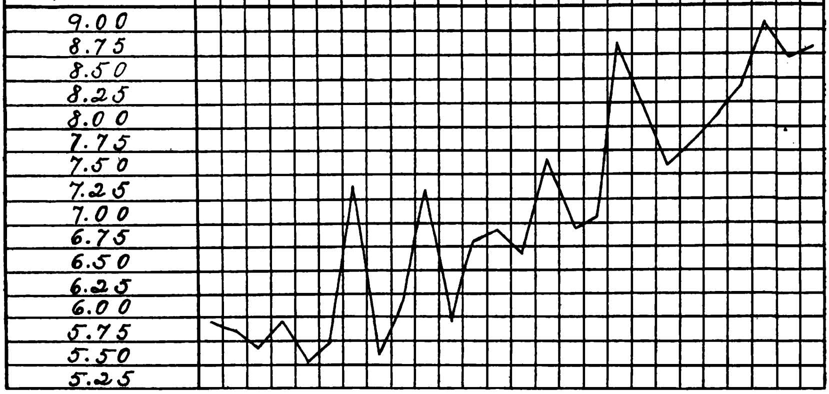
An analysis of the table herewith referred to shows that this disease is far more prevalent in women than in men. During the period mentioned, there were 7,376 deaths from cancer of which 2,442 were males and 4,934 were females.



DIAGRAM SHOWING THE INCREASE IN THE MORTALITY FROM CANCER, AND ITS RATE TO EACH 10,000 OF THE POPULATION, FROM 1884 TO 1909, INCLUSIVE.

| YEAR | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 | 1890 | 1891 | 1892 | 1893 | 1894 | 1895 | 1896 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate per 10,000 Population | 5.93 | 5.85 | 5.64 | 5.92 | 5.47 | 5.70 | 7.33 | 5.61 | 6.14 | 7.34 | 5.92 | 6.79 | 6.97 |

| YEAR | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate per 10,000 Population | 6.67 | 7.62 | 6.91 | 7.09 | 8.80 | 8.20 | 7.52 | 7.77 | 8.16 | 3.39 | 9.08 | 8.74 | 8.81 |




The theory advanced by some, that the increase in the mortality statistics of this disease may be due largely to a more accurate statement of cancer as a cause of death on the part of the physician making the return, and to the saving of lives from tuberculosis and other preventable diseases in early or middle life, thereby leaving more persons liable to cancer at the ages most subject to this disease, is, perhaps, correct to a limited extent, but it can hardly be accepted as accounting for more than a limited proportion of the increase.

The record of other states and countries practically parallels our own so far as the increase of this disease is concerned. The statistics of England, Ireland, and Scotland for the past fifty years show that there has been a gradually increasing mortality from cancer. Investigations into its cause, and the seeking to secure efficient methods of treatment are being so vigorously prosecuted scientifically, today, that there is great hope that this disease will be conquered in the not very distant future.



DEATHS FROM CANCER BY AGE PERIODS AND SEX FROM 1884 TO 1909, INCLUSIVE.

| Years. | 1 to 10. | 10 to 20. | 20 to 30. | 30 to 40. | 40 to 50. | 50 to 60. | 60 to 70. | 70 to 80. | Over 80. | Not stated. | Total. | Male. | Female. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1884 | 4 | 1 | 3 | 12 | 28 | 42 | 48 | 50 | 19 | 3 | 210 | 71 | 139 |
| 1885 | ...... | 1 | ...... | 11 | 30 | 42 | 57 | 56 | 13 | 3 | 213 | 74 | 139 |
| 1886 | ...... | ...... | 3 | 9 | 17 | 36 | 63 | 48 | 28 | 2 | 206 | 56 | 150 |
| 1887 | 2 | 1 | 3 | 11 | 31 | 46 | 50 | 46 | 23 | 5 | 218 | 70 | 148 |
| 1888 | ...... | 1 | 1 | 8 | 27 | 48 | 58 | 41 | 15 | 4 | 203 | 66 | 137 |
| 1889 | 2 | 1 | 3 | 12 | 24 | 36 | 55 | 57 | 22 | 1 | 213 | 70 | 143 |
| 1890 | 2 | ...... | 4 | 14 | 37 | 65 | 67 | 60 | 23 | 4 | 276 | 86 | 190 |
| 1891 | 1 | ...... | 4 | 17 | 24 | 43 | 64 | 47 | 21 | 1 | 222 | 74 | 148 |
| 1892 | 1 | ...... | 5 | 15 | 35 | 51 | 62 | 48 | 15 | 3 | 235 | 69 | 166 |
| 1893 | ...... | 1 | 4 | 9 | 48 | 63 | 66 | 55 | 31 | 6 | 283 | 106 | 177 |
| 1894 | ...... | 1 | 6 | 15 | 31 | 43 | 63 | 53 | 16 | 2 | 230 | 80 | 150 |
| 1895 | ...... | 2 | 2 | 12 | 38 | 49 | 62 | 76 | 25 | ...... | 266 | 100 | 166 |
| 1896 | 3 | 2 | 3 | 15 | 31 | 52 | 77 | 63 | 26 | 3 | 275 | 84 | 191 |
| 1897 | ...... | 2 | 4 | 25 | 30 | 54 | 62 | 62 | 21 | 5 | 265 | 87 | 178 |
| 1898 | ...... | ...... | 3 | 16 | 35 | 81 | 79 | 63 | 26 | 2 | 305 | 102 | 203 |
| 1899 | ...... | 3 | 3 | 11 | 36 | 69 | 69 | 56 | 28 | 4 | 279 | 89 | 190 |
| 1900 | 1 | 3 | 6 | 16 | 26 | 62 | 84 | 71 | 22 | 1 | 292 | 88 | 204 |
| 1901 | 1 | ...... | 5 | 20 | 46 | 74 | 104 | 87 | 24 | 3 | 364 | 114 | 250 |
| 1902 | 1 | 2 | 1 | 15 | 44 | 89 | 90 | 61 | 36 | 2 | 341 | 120 | 221 |
| 1903 | 1 | ...... | 2 | 20 | 25 | 74 | 96 | 67 | 27 | 2 | 314 | 110 | 204 |
| 1904 | ...... | 2 | 2 | 14 | 40 | 59 | 95 | 77 | 31 | 6 | 326 | 111 | 215 |
| 1905 | ...... | ...... | 4 | 15 | 48 | 71 | 90 | 93 | 23 | ...... | 344 | 126 | 218 |
| 1906 | 2 | ...... | 2 | 26 | 48 | 62 | 107 | 78 | 29 | ...... | 354 | 109 | 245 |
| 1907 | 2 | ...... | 3 | 24 | 60 | 78 | 93 | 81 | 42 | 3 | 386 | 123 | 263 |
| 1908 | 1 | ...... | 4 | 25 | 51 | 84 | 95 | 85 | 26 | 2 | 373 | 126 | 247 |
| 1909 | 2 | ...... | 2 | 17 | 49 | 79 | 107 | 89 | 36 | 2 | 383 | 131 | 252 |
| Total | 26 | 23 | 82 | 404 | 939 | 15552 | 1,963 | 1,670 | 648 | 69 | 7,376 | 2,442 | 4,934 |

## Pneumonia.

The table, herewith given, shows the number of deaths in New Hampshire from 1883 to 1909, inclusive, with age periods. It has become the leading cause of death, tuberculosis having fallen into second place.

Mortality from Pneumonia in New Hampshire from 1883 to 1909, Inclusive, by Ages.

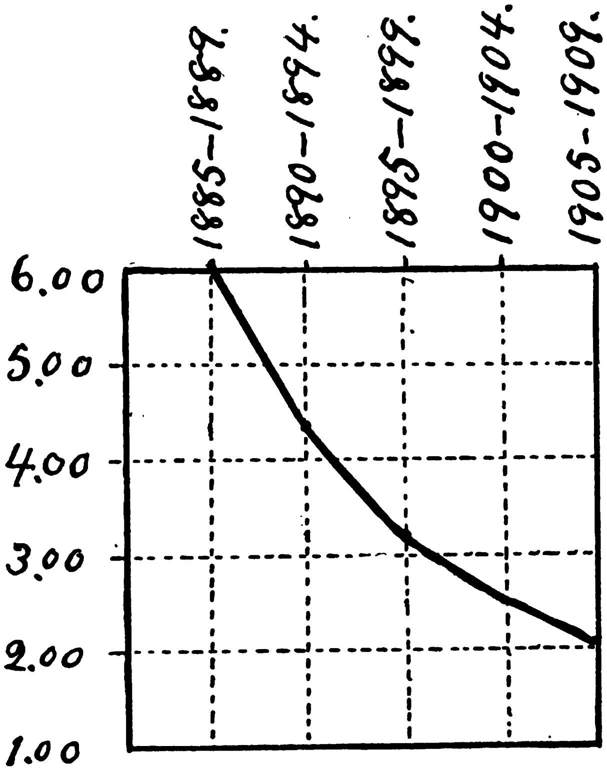
| Years. | Under 1. | 1 to 5. | 5 to 10. | 10 to 15. | 15 to 20. | 20 to 30. | 30 to 40. | 40 to 50. | 50 to 60. | 60 to 70. | 70 to 80. | Over 80. | Unknown. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1883....... | 82 | ...... | 5 | 8 | 12 | 30 | 21 | 36 | 45 | 86 | 94 | 66 | 13 | 498 |
| 1884....... | 51 | 48 | 3 | 3 | 6 | 27 | 23 | 30 | 36 | 50 | 97 | 54 | 8 | 436 |
| 1885....... | 69 | 49 | 8 | 4 | 11 | 15 | 27 | 32 | 37 | 72 | 105 | 74 | 1 | 504 |
| 1886....... | 57 | 38 | 13 | 6 | 13 | 17 | 24 | 29 | 49 | 68 | 92 | 53 | 7 | 466 |
| 1887....... | 68 | 33 | 7 | 5 | 13 | 28 | 32 | 30 | 48 | 89 | 121 | 68 | 4 | 556 |
| 1888....... | 67 | 45 | 6 | 10 | 19 | 40 | 49 | 51 | 62 | 67 | 123 | 81 | 8 | 628 |
| 1889....... | 61 | 50 | 8 | 12 | 17 | 29 | 36 | 40 | 48 | 98 | 100 | 79 | 4 | 582 |
| 1890....... | 73 | 48 | 9 | 10 | 11 | 35 | 46 | 45 | 79 | 106 | 127 | 107 | 7 | 703 |
| 1891....... | 73 | 43 | 15 | 6 | 11 | 43 | 31 | 38 | 74 | 109 | 126 | 95 | 9 | 673 |
| 1892....... | 77 | 49 | 13 | 6 | 12 | 41 | 61 | 60 | 95 | 147 | 190 | 128 | 11 | 890 |
| 1893....... | 86 | 65 | 15 | 5 | 15 | 36 | 39 | 55 | 60 | 95 | 120 | 88 | 6 | 685 |
| 1894....... | 88 | 62 | 13 | 4 | 11 | 29 | 38 | 48 | 63 | 87 | 103 | 83 | 4 | 633 |
| 1895....... | 69 | 62 | 11 | 8 | 16 | 27 | 32 | 46 | 57 | 101 | 127 | 74 | 9 | 639 |
| 1896....... | 103 | 96 | 8 | 5 | 10 | 22 | 29 | 35 | 34 | 68 | 82 | 63 | 2 | 557 |
| 1897....... | 122 | 82 | 13 | 7 | 9 | 22 | 36 | 33 | 56 | 78 | 100 | 87 | 5 | 650 |
| 1898....... | 84 | 68 | 12 | 7 | 9 | 25 | 35 | 34 | 31 | 59 | 101 | 55 | 4 | 524 |
| 1899....... | 130 | 97 | 19 | 9 | 19 | 25 | 39 | 46 | 50 | 85 | 129 | 99 | 6 | 753 |
| 1900....... | 142 | 125 | 14 | 11 | 18 | 48 | 64 | 76 | 95 | 112 | 141 | 88 | 8 | 942 |
| 1901....... | 105 | 82 | 13 | 3 | 9 | 41 | 35 | 65 | 55 | 78 | 136 | 89 | 5 | 716 |
| 1902....... | 118 | 86 | 14 | 7 | 10 | 35 | 31 | 32 | 51 | 76 | 82 | 73 | 3 | 618 |
| 1903....... | 127 | 87 | 19 | 11 | 17 | 26 | 42 | 40 | 54 | 85 | 95 | 78 | 5 | 686 |
| 1904....... | 94 | 68 | 12 | 6 | 12 | 27 | 46 | 40 | 60 | 65 | 116 | 84 | 5 | 635 |
| 1905....... | 110 | 86 | 13 | 6 | 16 | 26 | 36 | 51 | 54 | 76 | 110 | 100 | 6 | 690 |
| 1906....... | 63 | 46 | 9 | 7 | 10 | 18 | 25 | 37 | 61 | 80 | 97 | 63 | 9 | 525 |
| 1907....... | 72 | 47 | 11 | 9 | 14 | 26 | 36 | 47 | 47 | 89 | 128 | 74 | 2 | 602 |
| 1908....... | 62 | 48 | 11 | 5 | 4 | 24 | 23 | 40 | 44 | 73 | 84 | 71 | 2 | 491 |
| 1909....... | 85 | 53 | 12 | 7 | 17 | 31 | 47 | 33 | 44 | 85 | 91 | 71 | 4 | 580 |
| Total.... | 2,338 | 1,663 | 306 | 187 | 341 | 793 | 983 | 1,159 | 1,489 | 2,284 | 3,017 | 2,145 | 157 | 16,862 |

## Diptheria.

The reduction in the number of deaths from diptheria in this state during the past twenty-five years has been very marked. The number of deaths from this disease in 1908 was ninety-nine, and in 1909, seventy-two, as against the high rate which was annually reported in the earlier mortality periods of our registration reports. A glance at the pen sketch, herewith presented, shows graphically the reduction in the death-rate from this disease by five year periods from 1884 to 1909, inclusive. From 1895 to 1899, inclusive, the death-rate from diphtheria to each one thousand of the population was 6.13; from 1890 to 1894, inclusive, 4.39; from 1895 to 1899, inclusive, 3.10; from 1900 to 1904, inclusive, 2.51; from 1905 to 1909, inclusive, 2.01.



This great and gratifying reduction has been due to the prompt reporting of cases, the increasingly efficient management of local boards of health in quarantine and disinfection, and in the general use of antitoxin. To these agencies must be ascribed the diminishing mortality rate from diphtheria.



### Typhoid Fever.

The number of deaths from typhoid fever in the year 1908 was seventy-five; in 1909, forty-eight, the lowest figure reached in the record of this disease.

Since the year 1900 the mortality from typhoid fever for the entire state has not reached one hundred. From the earliest records up to 1895 its mortality always exceeded that figure. The diminution that has taken place is due almost wholly to improved sanitary conditions, better understanding of the nature of the disease and, consequently, disinfection and other restrictive measures have been carried out along lines that formerly were not recognized as necessary. The showing that has been made in the management of this disease is exceedingly gratifying, and with our present knowledge of its nature a still greater reduction is to be expected.

### Infantile Paralysis. (Anterior Poliomyelitis.)

During the year 1909, eleven deaths from infantile paralysis in this state, were reported to the Department of Vital Statistics, and for 1910, to November 1, seventeen such deaths were returned. The mortality does not, however, by any means represent the serious results or the economic loss to the state from this disease, which permanently cripples a large proportion of its victims.

From investigations made during the past year in twenty-three states, it has been established that there occurred more than 3,000 cases in those states during that time. In some localities it has existed as an epidemic, but in New Hampshire it has appeared only in isolated cases. The State Board of Health has requested that every case be reported to the local board of health as soon as it is recognized, and that quarantine measures be taken to prevent its spread, since its communicability has been established beyond question.

Isolation of the patient as completely as possible, with disinfection of sputum and all other excretions, has been and is recommended, together with a limited restriction of the movements of the family, prohibiting any one who is in contact with the patient from mingling with other children during the acute stage of the disease, which is usually from two to three weeks; and that, following a death from the disease, it is advisable to disinfect the premises, and not to hold a public funeral.

As the true nature of the disease becomes better understood, it is possible that other or different measures may be necessary for its control.

# WATER SUPPLIES OF TOWNS AND CITIES.

# EXAMINATION OF WATER SUPPLIES.

By Charles D. Howard, *Chemist.*

*Dr. Irving A. Watson, Secretary, State Board of Health:*

Dear Sir: The following report is submitted of the work of the laboratory in the examination of water supplies for the biennial period ending August 31, 1910.

During the two years which this report covers, a total of 1897 samples of water has been examined. These may be classified as follows: samples representing public (town or city) supplies, 437; semi-public supplies, 288; from private or individual sources, 1172.

## *Public Supplies.*

The total number of public supplies to date is 102, the ownership being very nearly equally divided between the town or precinct and private individuals or corporations.

One new supply added recently is that of the precinct of New Hampton. This is a pond of some size, located near the summit of a considerable elevation. It not only affords an abundant domestic supply of excellent character, but gives the village exceptional fire protection.

During the period mentioned no epidemic directly chargeable to the character of a public water supply has occurred, so far as the matter has come to our attention. In the autumn of 1908, the pond supply of the town of Antrim became very much impaired, due, as investigation proved, to low water and the wallowing of cattle in the pond. This condition was early detected, however, and it is not known that any serious illnesses resulted.

During December, 1909, several cases of typhoid fever occurred among office workers employed in one of the business blocks of Peterboro, supplied with the town water. It was at first supposed that the infection might have taken place as a result of drainage from a lumber camp situated on a brook flowing into the pond, although no cases of typhoid had been known to occur among these employees. Examination of this brook water failed to show the presence of sewage bacteria, however, and no satisfactory evidence could be secured indicating that the town water supply was the source of the infection.

The practice of periodic inspection of the public supplies has been continued, it being the aim to have submitted at least one or two samples annually from every important supply. The examination of some of the smaller supplies has not been kept up, largely for the reason that many of such are not ordinarily exposed to contamination and the local authorities have failed to evince any interest in having such analyses made. On the other hand, many of the larger supplies are subjected to frequent examination.

*Samples from Private Sources*

The work of examination of samples from private sources seems to show an increase for this period, notwithstanding that more stringent rules have been in force regulating such service. This work seriously interferes with other lines of inspection and it is regrettable that the idea should have become so generally established that the laboratory can be gotten to make analyses of private supplies under all sorts of circumstances, and as often as the owner may choose to ask. In this connection the following regulations are now in force:

*Regulations Governing the Examination of Private Water Supplies at the State Laboratory of Hygiene.*

It is not the practice of State Boards of Health to analyze private water supplies. Work of this kind is usually limited to the examination of public supplies of towns and villages, samples of which will be received only through the usual official channels.

Continuing the original policy of the Board, examinations of private supplies other than on request of physicians or members of Boards of Health will be made under the following restrictions:

1. A person desiring the analysis of a private water-supply must fill out the blank upon the face of this sheet, stating the reasons for this request fully and explicitly.

2. No water will be examined simply to satisfy the curiosity of any one, or to substantiate a belief that it is pure. There must be some valid reason given involving a question as to the quality.

3. Where the latter is based only upon the existence of sickness in the family, the request should either come through the attending physician, or this application should bear his endorsement.

4. No water sample will be accepted for analysis unless taken according to instructions and forwarded in the outfit supplied by the

Laboratory. An exception to this rule may be made at the discretion of the chemist in the case of samples to be examined for lead only.

5. Following the granting of an application, an outfit, with full instructions, will be sent to the applicant. No charge will be made for the analysis, but the recipient must pay all express charges.

IRVING A. WATSON,
*Secretary.*

January 1, 1910.

We have before called attention to the fact that many of the examinations made of private supplies would be totally unnecessary, were the owners to take ordinary pains to maintain these in good condition. Not only is the original examination unnecessary in cases where merely a foul condition of a well is reported—as for instance such as might be attributable to decaying leaves, dead toads, etc.—but very frequently a second examination is requested to "make certain that the water is now good," following the cleaning up that should have been done before the first sample was collected.

### *The Dangers of Lead Pipe.*

As in the past, requests for advice as to suitable forms of pipe for carrying water have been numerous. The following is contained in a recently adopted form reply:

"The examination of a supply for the purpose of determining its behavior toward lead pipe is held to be impracticable. As a matter of fact, the installation of lead pipe is uniformly advised against, experience having demonstrated not only that there is almost always some solution of this metal in any case, but that the presence of traces of such in drinking water may be held responsible for certain minor, and rather obscure ailments frequently exhibited by the users."

The report shows that of 699 examinations made for lead, 346, or approximately 50% showed the presence of considerable amounts of this metal. Nearly all of these samples, however, showed at least some lead, and in addition to the above number, very many more contained sufficient, in the writer's opinion, based upon the repeated statements of physicians, to cause impairment of health. Approximately one-fifth of the total number of private supplies examined were condemned because of their lead content, though of excellent quality in every other way. This involves a condemnation for this reason of 40% of all the waters found organically pure.

In a letter referring to a recent water report (Bulletin, July, 1910) Prof. Edwin J. Bartlett of Dartmouth College, thus expresses his opinion of lead pipe as a water conductor:



"I think you needlessly minimize the danger from lead. You base your percentage on the number of waters examined, whereas it might well be upon the number with lead conductors . . . If I make a correct count, of twenty-two with lead conductors, nineteen showed lead. That corresponds with my own experience that just about all the waters with lead conductors carry the metal, and that lead is an unfit conductor for New Hampshire waters.

"My own belief is that *any* detectable lead is excessive for habitual use, although it is very difficult to prove it. It is very slowly eliminated; its chronic effects are in the alimentary canal, the kidneys, the nervous system and the skin. Very few persons long subjected to a little lead are free from all perversions of the above mentioned functions. As very few persons long subjected to the conditions of life in general are absolutely normal anyway, it is exceedingly difficult to separate lead from other causes. Nevertheless I am very suspicious of it and believe there is no proper line to be drawn between 'lead' and 'excessive lead' in a drinking-water."

Personally, we are in accord with every word of the above. The 0.05 "safety limit" is one that has been generally recognized elsewhere, and it has long been the custom at this laboratory to guage to some extent by this the quality of a lead-contaminated water, although care has been observed in making reports to state that less than 0.05 parts might very well be objected to as being a not impossible course of impairment of health in the regular user. Nevertheless it has not thus far seemed quite practicable to formally condemn lead-conducted waters carrying but small amounts of lead, this because of the lack of decisive evidence to which Professor Bartlett himself refers. Though theoretically, the only proper course would be to rule absolutely against the use of any dangerous conductor, yet, to be consistent in this would involve a similar contest against a considerable number of substances now used or present in foods in minute amounts—an attack that would be futile at the present time.

### *Objection to Galvanized Pipe.*

In the report for 1907–08 reference was made to the proneness of our ground waters to dissolve the zinc coating, where galvanized pipe is used; this subject is also mentioned elsewhere in this report (see elsewhere. While there is still question as to the deleteriousness of small amounts of zinc in drinking water, it is certain that galvanized pipe is not a durable conductor for very many of the well and spring supplies of this state, and for some time we have been receiving inquiries as to a proper substitute. Block tin and tin-lined iron pipe are most desirable forms recommended to those to whom the relatively large expense is not a serious objection.

For the ordinary installation, however, the present evidence is greatly in favor of cement-lined iron—*providing it is properly jointed and laid,*—an early objection to this pipe, based on corrosion at the uncovered joints, being no longer a valid one. Unfortunately, cement-lined pipe is not a regular article of merchandise, it being necessary to secure such through some city or some firm of plumbers having the requisite outfit for applying the lining. The cost of this form of pipe may be roughly estimated at about double that of common galvanized iron.

## *Water Supplies of Towns and Cities.*



### *Summary of Examinations,* 1908–10, *by Towns.*

| Town | Private Supplies | | | | Total Excessive Lead | | Total Lead Tests | | Total Excessive Zinc | Total Private Exams | Total Public Exams | Total Semi-Public Exams |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pure | Pure but for Lead | Doubtful* | Polluted | Private | Public and Semi-Public | Private | Public and Semi-Public | | | | |
| Acworth | 5 | 4 | 5 | 2 | 5 | 0 | 10 | 0 | 0 | 16 | 0 | 0 |
| Alexandria | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Alstead | 3 | 2 | 1 | 0 | 3 | 0 | 4 | 0 | 0 | 6 | 1 | 0 |
| Alton | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 6 | 0 |
| Andover | 4 | 8 | 7 | 3 | 5 | 0 | 12 | 7 | 3 | 22 | 11 | 1 |
| Amherst | 0 | 0 | 0 | 3 | 1 | 1 | 2 | 1 | 0 | 3 | 0 | 3 |
| Antrim | 5 | 1 | 7 | 15 | 4 | 0 | 7 | 0 | 2 | 28 | 7 | 5 |
| Ashland | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 2 |
| Auburn | 1 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 4 | 1 | 1 |
| Barnstead | 1 | 3 | 1 | 4 | 4 | 0 | 5 | 0 | 1 | 9 | 0 | 0 |
| Barrington | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Bartlett | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 2 | 0 |
| Bath | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 1 | 0 |
| Bedford | 1 | 0 | 0 | 5 | 0 | 0 | 1 | 0 | 0 | 6 | 0 | 0 |
| Belmont | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Bennington | 6 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 9 | 3 | 0 |
| Benton | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Berlin | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 5 | 17 | 1 |
| Bethlehem | 3 | 0 | 2 | 1 | 1 | 1 | 5 | 5 | 0 | 6 | 3 | 10 |
| Boscawen | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 3 | 1 |
| Bow | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 4 | 0 | 0 |
| Bradford | 1 | 2 | 4 | 5 | 6 | 0 | 9 | 0 | 0 | 12 | 0 | 0 |
| Bristol | 1 | 4 | 2 | 1 | 5 | 0 | 6 | 0 | 0 | 8 | 2 | 0 |
| Brookline | 1 | 1 | 1 | 1 | 1 | 0 | 2 | 0 | 0 | 4 | 0 | 1 |
| Campton | 1 | 3 | 1 | 0 | 3 | 0 | 4 | 0 | 0 | 5 | 0 | 0 |
| Canaan | 2 | 2 | 3 | 2 | 3 | 0 | 4 | 0 | 0 | 9 | 1 | 0 |
| Candia | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 2 |
| Canterbury | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 |
| Center Harbor | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 3 | 1 | 14 |
| Charlestown | 3 | 1 | 0 | 1 | 2 | 0 | 5 | 0 | 0 | 5 | 5 | 0 |

*Summary of Examinations*, 1908–10, *by Towns.—Continued.*



| Town | Private Supplies | | | | Total Excessive Lead | | Total Lead Tests | | Total Excessive Zinc | Total Private Exams | Total Public Exams | Total Semi-Public Exams |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pure | *Pure but for Lead | Doubtful* | Polluted | Private | Public and Semi-Public | Private | Public and Semi-Public | | | | |
| Chatham | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Chester | 3 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 1 | 6 | 0 | 0 |
| Chesterfield | 1 | 0 | 4 | 0 | 0 | 0 | 2 | 0 | 1 | 5 | 0 | 0 |
| Chichester | 1 | 2 | 1 | 1 | 2 | 0 | 2 | 0 | 2 | 5 | 0 | 0 |
| Claremont | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 19 | 4 2ice |
| Colebrook | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 7 | 0 |
| Concord | 23 | 12 | 16 | 21 | 20 | 0 | 33 | 0 | 0 | 72 | 13 | 5 2ice |
| Conway | 5 | 2 | 1 | 1 | 2 | 2 | 3 | 7 | 1 | 9 | 38 | 7 |
| Cornish | 2 | 0 | 1 | 2 | 0 | 0 | 2 | 0 | 0 | 5 | 0 | 2 ice |
| Croydon | 2 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 | 0 |
| Danbury | 3 | 8 | 2 | 0 | 9 | 0 | 10 | 0 | 0 | 13 | 0 | 0 |
| Danville | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Deerfield | 0 | 0 | 1 | 2 | 2 | 0 | 2 | 0 | 0 | 3 | 0 | 0 |
| Derry | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 0 |
| Dover | 2 | 0 | 4 | 5 | 0 | 0 | 1 | 0 | 2 | 11 | 26 | 0 |
| Dublin | 3 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 5 | 1 | 0 |
| Durham | 2 | 0 | 4 | 2 | 0 | 0 | 0 | 1 | 0 | 8 | 1 | 12 |
| Eaton | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Elkins | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Enfield | 2 | 0 | 4 | 6 | 1 | 0 | 4 | 0 | 1 | 12 | 13 | 1 |
| Epping | 1 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 |
| Epsom | 1 | 2 | 2 | 0 | 2 | 0 | 3 | 0 | 0 | 5 | 0 | 0 |
| Exeter | 1 | 0 | 7 | 3 | 1 | 0 | 2 | 0 | 0 | 11 | 0 | 1 |
| Farmington | 0 | 1 | 1 | 4 | 3 | 0 | 3 | 0 | 0 | 6 | 5 | 1 |
| Fitzwilliam | 1 | 1 | 2 | 1 | 2 | 0. | 2 | 0 | 3 | 5 | 0 | 1 |
| Francestown | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 3 | 2 | 0 |
| Franconia | 4 | 1 | 1 | 2 | 2 | 1 | 7 | 3 | 0 | 8 | 2 | 7 |
| Franklin | 13 | 12 | 9 | 9 | 19 | 1 | 26 | 3 | 1 | 43 | 17 | 0 |
| Freedom | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Gilmanton | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 |
| Gilsum | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Goffstown | 2 | 2 | 2 | 3 | 3 | 0 | 3 | 0 | 0 | 9 | 3 | 0 |
| Gorham | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |

*Summary of Examinations*, 1908–10, *by Towns.—Continued.*



| Town | Private Supplies | | | | Total Excessive Lead | | Total Lead Tests | | Total Excessive Zinc | Total Private Exams | Total Public Exams | Total Semi-Public Exams |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pure | Pure but for Lead | Doubtful* | Polluted | Private | Public and Semi-Public | Private | Public and Semi-Public | | | | |
| Goshen | 3 | 3 | 0 | 0 | 3 | 0 | 6 | 0 | 0 | 6 | 6 | 0 |
| Grafton | 1 | 2 | 0 | 0 | 2 | 0 | 3 | 0 | 0 | 3 | 0 | 0 |
| Grantham | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Greenfield | 1 | 1 | 1 | 4 | 1 | 0 | 2 | 0 | 0 | 7 | 1 | 1 |
| Greenville | 2 | 2 | 0 | 4 | 5 | 0 | 7 | 0 | 0 | 8 | 2 | 0 |
| Groton | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Hampstead | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| Hampton | 2 | 1 | 4 | 6 | 1 | 0 | 3 | 0 | 0 | 13 | 1 | 12 } 4 ice } |
| Hampton Falls | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 |
| Hancock | 4 | 1 | 1 | 2 | 1 | 0 | 5 | 0 | 0 | 8 | 3 | 0 |
| Hanover | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| Harrisville | 3 | 0 | 2 | 3 | 2 | 0 | 3 | 0 | 0 | 8 | 0 | 0 |
| Haverhill | 1 | 1 | 4 | 1 | 3 | 2 | 3 | 3 | 0 | 7 | 2 | 4 |
| Henniker | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 3 | 0 |
| Hill | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 |
| Hillsborough | 1 | 2 | 4 | 5 | 3 | 0 | 5 | 0 | 0 | 12 | 2 | 0 |
| Hinsdale | 3 | 1 | 0 | 4 | 1 | 0 | 2 | 1 | 0 | 8 | 0 | 2 |
| Holderness | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 1 | 0 | 10 |
| Hollis | 1 | 1 | 1 | 1 | 1 | 0 | 2 | 0 | 0 | 4 | 0 | 0 |
| Hooksett | 1 | 4 | 4 | 1 | 6 | 0 | 7 | 0 | 1 | 10 | 0 | 3 |
| Hopkinton | 0 | 1 | 0 | 2 | 2 | 0 | 2 | 1 | 0 | 3 | 2 | 0 |
| Hudson | 0 | 1 | 2 | 2 | 1 | 0 | 1 | 0 | 1 | 5 | 4 | 0 |
| Jackson | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 5 |
| Jaffrey | 3 | 0 | 6 | 6 | 1 | 0 | 1 | 0 | 1 | 15 | 5 | 2 |
| Jefferson | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 5 | 1 |
| Keene | 1 | 1 | 6 | 1 | 1 | 0 | 2 | 0 | 1 | 9 | 6 | 0 |
| Kensington | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Kingston | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| Laconia | 2 | 4 | 2 | 1 | 5 | 1 | 5 | 2 | 0 | 9 | 12 | 8 |
| Lancaster | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 0 |
| Lebanon | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 4 | 18 | 7 |
| Lempster | 0 | 3 | 1 | 2 | 4 | 0 | 4 | 0 | 0 | 6 | 0 | 0 |
| Lincoln | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |

*Summary of Examinations, 1908–10, by Towns.—Continued.*



| Town | Private Supplies | | | | Total Excessive Lead | | Total Lead Tests | | Total Excessive Zinc | Total Private Exams | Total Public Exams | Total Semi-Public Exams |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pure | Pure but for Lead | Doubtful* | Polluted | Private | Public and Semi-Public | Private | Public and Semi-Public | | | | |
| Litchfield | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 |
| Littleton | 1 | 2 | 4 | 4 | 3 | 0 | 4 | 0 | 0 | 11 | 2 | 0 |
| Londonderry | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| Lyndeborough | 4 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 5 | 0 | 0 |
| Madbury | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Madison | 2 | 1 | 0 | 3 | 1 | 0 | 3 | 0 | 0 | 6 | 1 | 0 |
| Marlow | 1 | 4 | 0 | 2 | 4 | 0 | 5 | 0 | 0 | 7 | 0 | 0 |
| Manchester | 4 | 0 | 5 | 5 | 1 | 0 | 2 | 0 | 0 | 14 | 16 | 8 |
| Merrimack | 1 | 1 | 2 | 0 | 2 | 0 | 2 | 0 | 0 | 4 | 0 | 2 |
| Meredith | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 4 | 0 | 6 | 1 | 7 |
| Milton | 0 | 2 | 1 | 3 | 3 | 1 | 3 | 1 | 0 | 6 | 0 | 2 |
| Marlborough | 7 | 5 | 2 | 3 | 6 | 0 | 11 | 0 | 1 | 17 | 0 | 0 |
| Monroe | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Mason | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Mt. Vernon | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 1 |
| Milford | 2 | 0 | 4 | 8 | 0 | 0 | 4 | 1 | 1 | 14 | 11 | 4 |
| Moultonborough | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 5 |
| Milan | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Nashua | 1 | 1 | 1 | 3 | 1 | 0 | 1 | 1 | 0 | 6 | 3 | 1<br>2 ice |
| Nelson | 2 | 0 | 1 | 2 | 1 | 0 | 2 | 0 | 0 | 5 | 0 | 0 |
| New Boston | 1 | 0 | 2 | 1 | 0 | 4 | 2 | 4 | 0 | 4 | 0 | 4 |
| Newbury | 1 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 2 | 0 | 0 |
| New Durham | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Newfields | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 4 |
| New Hampton | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 4 | 0 |
| New Ipswich | 2 | 0 | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 3 | 0 | 1 |
| New London | 2 | 1 | 3 | 6 | 5 | 0 | 7 | 0 | 0 | 12 | 0 | 8 |
| Newmarket | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 0 |
| Newport | 7 | 8 | 2 | 2 | 11 | 1 | 15 | 2 | 1 | 19 | 1 | 4 |
| Newton | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 |
| Northfield | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| North Hampton | 2 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 1 | 6 | 0 | 3 |
| Northumberland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |

*Summary of Examinations*, 1908–10, *by Towns.—Continued.*

| Town | Private Supplies | | | | Total Excessive Lead | | Total Lead Tests | | Total Excessive Zinc | Total Private Exams | Total Public Exams | Total Semi-Public Exams |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pure | Pure but for Lead | Doubtful* | Polluted | Private | Public and Semi-Public | Private | Public and Semi-Public | | | | |
| Northwood | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Nottingham | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Orford | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Ossipee | 5 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 2 | 9 | 0 | 5 |
| Pembroke | 3 | 5 | 12 | 14 | 14 | 1 | 20 | 4 | 4 | 34 | 3 | 0 |
| Peterborough | 13 | 22 | 6 | 2 | 9 | 1 | 13 | 1 | 2 | 43 | 15 | 1 |
| Pittsfield | 0 | 2 | 3 | 1 | 3 | 0 | 3 | 0 | 0 | 6 | 3 | 0 |
| Plainfield | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 0 |
| Plaistow | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Crawford Notch District | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| Plymouth | 6 | 1 | 2 | 0 | 1 | 0 | 5 | 0 | 0 | 9 | 2 | 1 |
| Portsmouth | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 1 | 0 | 6 | 2 | 2 |
| Raymond | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 2 | 0 |
| Randolph | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Richmond | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Rindge | 6 | 1 | 4 | 10 | 1 | 0 | 3 | 0 | 5 | 21 | 0 | 0 |
| Rochester | 2 | 2 | 9 | 13 | 4 | 0 | 6 | 0 | 0 | 26 | 6 | 1 |
| Rollinsford | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Rumney | 1 | 2 | 6 | 0 | 5 | 0 | 6 | 0 | 0 | 9 | 0 | 0 |
| Rye | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 10 |
| Salem | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Salisbury | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Sanbornton | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 |
| Sandown | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Sandwich | 0 | 0 | 1 | 3 | 1 | 0 | 1 | 3 | 0 | 4 | 0 | 6 |
| Somersworth | 3 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 8 | 8 | 1 |
| Springfield | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 |
| Stark | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| Stratford | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| Stratham | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Sunapee | 5 | 4 | 4 | 1 | 6 | 0 | 8 | 0 | 0 | 14 | 3 | 5 |
| Sutton | 1 | 1 | 2 | 2 | 2 | 0 | 3 | 0 | 1 | 6 | 0 | 0 |
| Swanzey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |

*Summary of Examinations,* 1908–10, *by Towns.—Concluded.*



| Total | Private Supplies | | | | Total Excessive Lead | | Total Lead Tests | | Total Excessive Zinc | Total Private Exams | Total Public Exams | Total Semi-Public Exams |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pure | Pure but for Lead | Doubtful* | Polluted | Private | Public and Semi-Public | Private | Public and Semi-Public | | | | |
| Tamworth | 4 | 0 | 6 | 2 | 0 | 0 | 1 | 0 | 2 | 12 | 0 | 2 |
| Temple | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 1 |
| Tilton | 2 | 2 | 4 | 2 | 3 | 0 | 5 | 0 | 0 | 10 | 0 | 2 |
| Troy | 6 | 3 | 10 | 7 | 9 | 0 | 18 | 0 | 0 | 26 | 0 | 0 |
| Tuftonborough | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 5 |
| Unity | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Wakefield | 8 | 1 | 4 | 5 | 5 | 0 | 8 | 0 | 0 | 18 | 0 | 0 |
| Walpole | 3 | 2 | 4 | 2 | 3 | 0 | 4 | 0 | 0 | 11 | 8 | 0 |
| Warner | 11 | 8 | 9 | 3 | 11 | 0 | 15 | 0 | 0 | 31 | 3 | 1 |
| Warren | 4 | 7 | 5 | 1 | 8 | 1 | 11 | 2 | 1 | 17 | 2 | 2 |
| Washington | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Weare | 4 | 2 | 1 | 0 | 3 | 0 | 4 | 1 | 0 | 7 | 0 | 3 |
| Webster | 1 | 2 | 1 | 0 | 2 | 0 | 4 | 0 | 0 | 4 | 0 | 0 |
| Wentworth | 0 | 1 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 2 | 0 | 0 |
| Wendell | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Westmoreland | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| Whitefield | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 |
| Wilmot | 0 | 0 | 2 | 0 | 1 | 2 | 2 | 4 | 0 | 2 | 0 | 4 |
| Wilton | 5 | 9 | 1 | 3 | 9 | 0 | 15 | 1 | 1 | 18 | 2 | 2 |
| Winchester | 1 | 4 | 1 | 1 | 4 | 0 | 5 | 1 | 0 | 7 | 1 | 0 |
| Wolfeboro | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 2 |
| Woodstock | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| Woodsville | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Totals | 329 | 221 | 311 | 311 | 319 | 27 | 515 | 84 | 49 | 1172 | 437 | 288 |

The "semi-public" examinations mentioned in the preceding general summary represent analyses of samples collected from sources supplying hotels, factories, schools, railroad stations and other places of public character. The following special summary indicates the results of analyses of samples of water collected from summer hotels and farm resorts during July and August, 1910: (For details of this inspection see special report elsewhere).

*Denotes not only waters of questionable quality, but probable pure sources requiring attention.

## SUMMARY OF WATER SUPPLY INSPECTION OF SUMMER RESORTS, JULY–AUGUST, 1910.



| Town. | Acceptable. | Non-acceptable. | Excessive lead. | Total supplies examined. |
|---|---|---|---|---|
| Amherst | 2 | 1 | 1 | 3 |
| Ashland | 1 | 1 | 0 | 2 |
| Bethlehem | 7 | 2 | 1 | 9 |
| Center Harbor | 6 | 9 | 0 | 15 |
| Conway | 6 | 1 | 1 | 7 |
| Crawford Notch District | 6 | 0 | 0 | 6 |
| Franconia | 3 | 1 | 1 | 4 |
| Hampton | 4 | 6 | 0 | 10 |
| HamptonFalls | 2 | 0 | 0 | 2 |
| Holderness | 10 | 0 | 0 | 10 |
| Jackson | 5 | 0 | 0 | 5 |
| Laconia | 5 | 1 | 1 | 6 |
| Lincoln | 1 | 0 | 0 | 1 |
| Lisbon | 8 | 1 | 1 | 9 |
| Meredith* | 3 | 4 | 3 | 7 |
| Moultonborough | 1 | 3 | 0 | 4 |
| North Hampton | 2 | 1 | 0 | 3 |
| Ossipee | 1 | 3 | 0 | 4 |
| Rye | 5 | 5 | 0 | 10 |
| Sandwich | 4 | 2 | 0 | 6 |
| Sunapee | 2 | 1 | 0 | 3 |
| Tamworth | 1 | 0 | 0 | 1 |
| Tuftonborough | 1 | 3 | 0 | 4 |
| Wilton | 1 | 0 | 0 | 1 |
| Wolfeboro | 3 | 0 | 0 | 3 |
| Totals | 90 | 45 | 9 | 135 |
| Per cent | 67 | 33 | 6.7 | |

The details of water-supply examinations by cities and towns are here given. Results represent parts in 100,000. The following is given in explanation of the significance of the analytical figures:

*Odor, Turbidity, Sediment and Color.*—The best ground waters are free from any of these characters. Nevertheless, otherwise perfectly good water may at times show a slight earthy odor, or if the water issues from clay, there may be a slight clayey odor, accompanied by an opalescence. Good ground water may also contain a little earthy sediment. Color should be absent, or but very slight.

*Hardness.*—This will be somewhat greater than is the case with the average surface supply, for the reason that percolation through the soil involves solution of some of the mineral salts therein. In the case of our granitic soils, however, the latter is usually but slight. Unless issuing from limestone strata, any considerable degree of hardness or mineralization occurring in our shallow ground waters is to be attributed to pollution.

* Including Bear Island.

*Free and Albuminoid Ammonia.*—These factors are representative of the proportion of organic matter. They stand for the degree of active, or present pollution. Good ground water, being soil-filtered, will contain practically none of these elements.



*Chlorine.*—This term is expressive principally of common salt but it is also referable to the other forms of combination of chlorine with lime, magnesia and potash, such as occur both in sea water and in the body secretions. As chlorides are practically absent from New Hampshire soil, the finding of any appreciable quantity in a water is usually indicative of one or two things: (1) nearness to the ocean, or (2) sewage pollution. As the proportion of chlorine as influenced by proximity to the sea is a nearly constant factor and has been charted for any given locality, any quantity in excess of the normal is, when taken in connection with other factors, to be accepted as evidence of pollution. Thus it will be noted that the "normal chlorine" for the region comprising the mountains and beyond is very slight—rarely in excess of one tenth of one part, and generally less, even.

*Nitrates and Nitrites.*—When water subject to pollution and containing in consequence large amounts of nitrogen in the form of ammonia, percolates through the soil, the latter acts as a filter, removing color, organic matter and most of the bacteria. While partly a mechanical process, this filtration is largely bacterial in its operation, the naturally present soil-bacteria serving to oxidize the nitrogen present in the form of ammonia to nitrites and nitrates. If the process has not been complete or thorough, nitrites will be present. Such waters, being but partially purified, are unstable and unsafe. It is very common indeed for the laboratory to receive water the analysis of which, while showing practically no organic matter, does indicate the presence of considerable amounts of nitrates, accompanied usually by high solids, chlorine and hardness.

Though such "purified" (but not "pure") water is possibly fairly safe for drinking, its regular use is to be objected to,—for one reason, that any unusual draught upon the supply, or some other abnormal condition, may result in a disturbance or impairment of the filtering process. Thus it frequently happens with such waters that if the supply be drawn upon to an unusual degree, a disagreeable odor or taste temporarily occurs.

Another objection to the regular use of excessively nitrated waters, especially by children and in certain forms of invalidism, is that nitrate of potash (saltpetre) is to be classed as one of the poisons. When given over a long period of time this drug is said to cause "irritation of the stomach, a slow, weak pulse, and general depression." In large doses it has all the properties of an irritant poison and has been the cause of death. Manifestly, the use of pure water is preferable to the daily copious ingestion of a water charged with this drug, even though the quantity be not so very great.

*Colon (or Intestinal) Bacilli.*—While a test for these bacteria is uniformly made, a positive finding is of significance only when taken in connection with the other data. It is nothing unusual to find these bacilli in unpolluted supplies at times; when, however, their persistent presence is indicated as a result of two or more consecutive examinations it is then high time to investigate their origin and significance. Very frequently the entrance of a little pasture-wash following a shower is responsible; furthermore, it is not a difficult matter to contaminate a water-sample with colon bacilli in the taking. For these reasons, positive findings in samples from a few of the resorts, the supplies of which have otherwise given every evidence of being above suspicion, have been accorded no significance,—especially as the examination of samples subsequently taken has generally afforded negative results. In one instance, where the well is located but twelve feet from the privy and the samples have persistently shown the presence of coli, approval of the supply has not been granted, notwithstanding that the analysis in all other respects has been indicative of good water. In another case where a sample taken from a water-bottle at a hotel was found to contain coli, there is some ground for believing that the latter may have been present as a result of handling the bottle with unclean hands. The neglect on the part of hotel employees who have occasion to handle the food supply, to wash the hands following visits to the toilet, is known to have been responsible for at least one outbreak of typhoid fever, as it doubtless has been for numerous others.*

*Lead and Zinc.*—A favorable report has been denied in the case of supplies, the analysis of which has indicated the presence of as much as 0.050 parts of lead, and the owners have further been informed that they must either substitute some other form of pipe or else abandon the supply. While it seems very probable that in some cases a considerably less quantity than 0.050 parts lead may be capable of causing impairment of health, it has not been deemed advisable to condemn supplies carrying less than this amount.

At present we have practically no reliable information as to the toxic effects of small quantities of zinc in drinking water. While there seems some ground for the belief that quantities in excess of one to two-tenths of one part are capable of exerting an effect upon the regular user of the supply, yet we have thus far had no reliable means of proving this to be the case. Careful clinical observations upon this point are greatly needed. For these reasons, while no supplies have been condemned because of zinc content, the owners have been notified in a number of cases that the proportion of this metal is too great to permit of an unconditional verdict of "pure," and they have been advised to make some changes.

**Allenstown.**—(See Pembroke for analyses of public supply).

**Alstead.**

*Examination of Water from Stream, Proposed Public Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 5455 | 1908 July 27 | None | S. fine | S. earthy | 0.10 | 3.9 | 2.5 | .0016 | .0034 | .0100 | .0000 | .25 | 1.0 | .... | .. |

**Bulletin* Massachusetts Board of Health, September, 1909.

**Alton.**—The Alton & Alton Bay Water Works Company, established in 1892–93, supplies about 100 families (90 per cent. of the population), with water from a spring, except in dry weather, when it is pumped from Lake Winnipesaukee to a reservoir of 150,000 gallons' capacity.



*Examination of Water from Faucet of Supply of Alton & Alton Bay Water Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 782 | 1902 Sept. 6 | None | S. earthy | None | 0.00 | 7.4 | 3.5 | .0000 | .0030 | .0220 | .0000 | .27 | 3.1 | .... | .. |
| 1337 | 1903 July 16 | Slight | Con. fine | S. veg. | 0.15 | 4.7 | 3.0 | .0000 | .0000 | .0000 | .0000 | .15 | 2.6 | .... | .. |
| 1936 | 1904 May 9 | Slight | None | V. slight | 0.00 | 5.5 | 3.0 | .0010 | .0012 | .0050 | .0000 | .13 | 2.2 | .... | .. |
| 2109 | June 28 | Slight | None | S. earthy | 0.00 | 7.4 | 3.8 | .0000 | .0018 | .0000 | .0000 | .15 | 3.6 | .... | .. |
| 2655 | 1905 Jan. 23 | None | None | S. earthy | 0.10 | 5.8 | 3.8 | .0000 | .0014 | .0100 | .0000 | .12 | 2.2 | .... | .. |
| 2965 | July 7 | Slight | Con. floc. | S. foul | 0.30 | 5.7 | 3.7 | .0000 | .0012 | .0000 | .0000 | .12 | 2.0 | .... | .. |
| 3010 | July 24 | Slight | Slight | Earthy | 0.10 | 3.3 | 1.1 | .0010 | .0070 | .0000 | .0000 | .15 | 0.4 | .... | .. |
| 3023 | July 27 | V. slight | None | None | 0.10 | 5.3 | 3.2 | .0016 | .0028 | .0050 | .0040 | .17 | 2.4 | .... | * |
| 3058 | Aug. 7 | V. slight | Slight | Much veg. | 0.60 | 4.8 | 2.2 | .0000 | .0114 | .0050 | .0000 | .17 | 1.1 | .... | * |
| 3277 | Oct. 31 | Sl. opal | V. slight | Much veg. | 0.20 | 4.7 | 4.2 | .0014 | .0034 | .0180 | .0000 | .22 | 2.6 | .... | .. |
| 3914 | 1906 Aug. 29 | V. slight | V. slight | None | 0.10 | 2.2 | 1.2 | .0022 | .0078 | .0100 | .0000 | .15 | 0.9 | .... | * |
| 4155 | Nov. 14 | None | None | None | 0.05 | 5.3 | 3.6 | .0014 | .0034 | .0050 | .0000 | .10 | 3.2 | .... | .. |
| 4404 | 1907 Apr. 5 | None | None | S. veg. | 0.13 | 3.5 | 1.9 | .0016 | .0042 | .0000 | .0000 | .15 | 1.9 | .... | * |
| 4898 | Sept. 24 | V. slight | V. slight | None | 0.30 | 3.0 | 2.0 | .0012 | .0078 | .0000 | .0000 | .08 | 1.9 | .... | .. |
| 4912 | Oct. 2 | None | V. slight | V. m. veg. | 0.00 | 9.6 | 8.0 | .0010 | .0012 | .0300 | Ft. tr. | 2.51 | 3.2 | .... | a |
| 5167 | 1908 Mar. 13 | None | None | S. earthy | 0.00 | 5.0 | 3.0 | .0004 | .0040 | .0050 | .0000 | .21 | 2.6 | .... | .. |
| 5831 | Nov. 11 | None | None | Earthy | 0.00 | 4.0 | 2.7 | .0030 | .0055 | .0070 | .0002 | .12 | 1.5 | .... | .. |
| 7519 | 1909 Dec. 24 | ........ | ........ | ........ | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | * |
| 7522 | Nov. 19 | None | None | Earthy | 0.20 | 4.5 | 2.5 | .0002 | .0030 | .0100 | .0000 | .15 | 1.9 | .... | * |
| 7709 | 1910 Mar. 10 | None | None | S. earthy | 0.00 | 4.8 | 2.4 | .0004 | .0010 | .0050 | .0000 | .19 | 1.9 | .... | .. |

* B. Coli present.
*a* Town pump.

*Examination of Water Supplies in Alton Camp Ground.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 3973 | 1906 Sept.12 | None | V. slight | Veg. | 0.1 | ..... | .... | .0010 | .0048 | .0050 | .0000 | .10 | 1.2 | .... | *a* |
| 3985 | Sept.18 | None | None | None | 0.0 | ..... | .... | .0006 | .0010 | .0050 | .0000 | .60 | 2.4 | .... | *b* |

*a* Tap from spring.
*b* Camp Ground well.

**Amherst.**—Analyses of samples taken from four spring supplies of public character are here given:

*Examination of Water from Spring Supply of Abby Melendy.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 3093 | 1905 Aug. 17 | None | Slight | S. earthy | 0.00 | 5.5 | 3.7 | .0000 | .0000 | .0100 | .0000 | .15 | 1.5 | .070 | .. |
| 3504 | 1906 Mar. 6 | None | None | V. slight | 0.00 | 4.5 | 3.8 | .0008 | .0044 | .0100 | .0000 | .20 | 1.1 | ..... | .. |
| 4910 | 1907 Oct. 30 | None | None | Foul | 0.00 | 3.7 | 3.2 | .0014 | .0026 | .0050 | .0000 | .17 | 1.2 | .090 | .. |

*Examination of Water from Spring Supply of J. C. Taylor.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3109 | 1905 Aug. 22 | None | Slight | S. foul | 0.00 | 3.6 | 2.2 | .0010 | .0020 | .0080 | .0000 | .15 | .... | .020 | .. |
| 3505 | 1906 Mar. 7 | None | None | None | 0.00 | 4.1 | 2.1 | .0008 | .0044 | .0100 | .0000 | .20 | 0.9 | .020 | .. |
| 5177 | 1908 Mar.18 | None | None | None | 0.00 | 3.9 | 2.0 | .0002 | .0008 | .0040 | .0000 | .19 | 0.4 | .040 | .. |

*Examination of Water from Spring Supply of Elizabeth Nichols.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3085 | 1905 Aug. 15 | None | None | None | 0.00 | 5.8 | 3.0 | .0006 | .0008 | .0000 | .0000 | .05 | 1.8 | .010 | .. |
| 3326 | Dec. 6 | None | None | None | 0.20 | 6.5 | 3.9 | .0010 | .0066 | .0050 | .0000 | .29 | 0.6 | .... | .. |

*Examination of Water from Spring Supply of Herbert Belden.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 3273 | 1905 Oct. 30 | None | None | None | 0.05 | 5.3 | 2.9 | .0010 | .0016 | .0050 | .0000 | .07 | 1.6 | ...... |

**Andover.**—Water is furnished to about 30 families in Andover Center by C. E. Carr, from three reservoirs supplied by eight springs on the side of Ragged Mountain. The watershed is partly wooded and partly cleared; no inhabitants. The springs are dug from six to fifteen feet deep, and the water flows by gravity through about two miles of mains, one third iron and two-thirds lead pipe. The service pipes also are some lead and some iron. There are many private wells within the area of this supply. A part of the families of West Andover are supplied from springs on the west side of Ragged Mountain. Cilleyville is supplied from private wells. East Andover and all the rest of Andover also from wells, except five families which have water from springs.

*Examination of Water Supplied Andover Center.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 841 | 1902 Oct. 9 | None | Slight | None | 0.0 | 7.0 | 2.9 | .0000 | .0000 | .0000 | .0003 | .12 | 2.2 | ...... |
| 855 | Oct. 12 | None | None | None | 0.0 | 5.5 | 3.4 | .0000 | .0000 | .0000 | .0000 | .12 | 2.3 | ...... |
| 3078 | 1905 Aug. 14 | None | None | None | 0.00 | 6.4 | 3.7 | .0000 | .0010 | .0100 | .0000 | .12 | 1.9 | ...... |
| 4427 | 1907 Apr. 9 | None | None | None | 0.00 | 2.5 | 1.8 | .0008 | .0004 | .0100 | .0000 | .10 | 1.2 | ...... |
| 7833 | 1910 Apr. 25 | None | S. hair like | None | 1.05 | 3.5 | 2.1 | .0007 | .0050 | .0050 | .0000 | .12 | 1.5 | .005 |
| 7953 | June 9 | None | None | S. earthy | 0.00 | 2.4 | 2.0 | .0030 | .0010 | .0025 | .0000 | .04 | 1.2 | .025 |
| 7970 | June 16 | None | None | None | 0.00 | 3.0 | 2.0 | .0010 | .0010 | .0050 | .0000 | .05 | 1.2 | .012 |
| 7971 | June 16 | None | None | None | 0.00 | 3.3 | 2.3 | .0010 | .0020 | .0025 | .0000 | .04 | 1.2 | .012 |
| 7972 | June 16 | None | None | None | 0.05 | 2.1 | 1.8 | .0020 | .0010 | .0025 | .0000 | .04 | 1.2 | .012 |

## *Examination of Water from Pond of U. S. Hame Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7834 | 1910 Apr. 25 | None | V. S. earthy | Veg. | 0.10 | 2.3 | .8 | .0030 | .0090 | .0050 | .0000 | .17 | .6 | .... | .. |

## *Examination of Water from Spring of U. S. Hame Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6052 | 1909 Mar. 24 | None | None | S. earthy | 0.00 | ..... | .... | .0003 | .0005 | .0050 | .0000 | .05 | 1.6 | .025 | .. |

## *Examination of Water from Mud Pond, Proposed Public Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5738 | 1908 Sept. 8 | V. S. fine | S. Veg. | V. Slight | 0.50 | 3.6 | 0.5 | .0016 | .0180 | .0050 | .0000 | .05 | .4 | .... | .. |
| 5743 | Sept. 11 | V. faint | S. Veg. | S. marshy | 0.45 | 5.6 | 2.7 | .0065 | .0190 | .0050 | .0000 | .05 | .6 | .... | * |

* B. Coli present.

## *Examination of Water from Well of Congregational Society.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8335 | 1910 Aug. 18 | None | V. slight | Earthy | 0.00 | ..... | .... | Very high | .0050 | .250 | .0000 | 9.40 | 10.3 | Tr. | .. |

**Antrim.**—A water supply was installed by the town in 1893, the source being a pond of about 16 acres in area, and of an average depth of sixteen feet. It is a gravity system, employing three miles of pipe, wooden main, and iron service pipes. Ninety per cent. of the population take this water. (For special report on this supply, see elsewhere.)

*Examination of Water from Tap of Town Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 95 | 1901 July 30 | None | S. floc. | Strong veg. | 0.40 | 3.4 | .8 | .0000 | .0242 | .0000 | .0000 | .11 | .... | .... | .. |
| 96 | July 30 | None | Much floc. veg. | Dec. veg. & musty | 1.10 | 4.3 | 2.2 | .0036 | .0180 | .0000 | .0000 | .12 | .... | .... | * |
| 97 | July 30 | None | Slight | Dec. musty | 0.30 | 4.5 | 1.8 | .0074 | .0150 | .0080 | .0000 | .12 | .... | .... | .. |
| 98 | July 30 | None | Slight | Dec. aromat. | 0.40 | 3.2 | 1.2 | .0028 | .0184 | .0000 | .0000 | .13 | .... | .... | .. |
| 177 | Sept. 20 | None | Slight | Faint veg. | 0.25 | 3.5 | .6 | .0028 | .0180 | .0000 | .0000 | .09 | .... | .... | .. |
| 178 | Sept. 20 | None | Slight | Faint veg. | 0.25 | 4.4 | .9 | .0026 | .0180 | .0000 | .0000 | .09 | .... | .... | .. |
| 1950 | 1904 June 14 | Slight | V. slight | Dec. foul | 0.15 | 2.6 | .9 | .0000 | .0028 | .0000 | .0000 | .05 | .9 | .... | .. |
| 2663 | 1905 Jan. 28 | None | None | V. S. vg | 0.15 | 4.2 | 2.3 | .0236 | .0086 | .0200 | .0000 | .12 | 1.4 | .... | .. |
| 2963 | July 7 | None | Slight | S. earthy | 0.25 | 2.5 | 0.8 | .0000 | .0024 | .0000 | .0000 | .12 | 0.6 | .... | * |
| 3272 | Oct. 31 | None | None | None | 0.20 | 3.7 | 1.3 | .0014 | .0098 | .0050 | .0000 | .07 | 0.4 | .... | .. |
| 3845 | 1906 Aug. 15 | None | None | None | 0.10 | 2.5 | 1.0 | .0024 | .0140 | .0050 | .0000 | .05 | 0.7 | .... | .. |
| 4161 | Nov. 15 | V. slight | V. slight | Slight | 0.10 | 3.0 | 1.5 | .0016 | .0094 | .0050 | .0000 | .05 | 0.4 | .... | .. |
| 4401 | 1907 Apr. 4 | None | V. slight | Musty | 0.20 | 3.5 | 1.5 | .0066 | .0060 | .0000 | V. ft. tr. | .20 | 1.2 | .... | .. |
| 4896 | Sept. 25 | None | None | None | 0.00 | 1.8 | .6 | .0002 | .0054 | .0000 | .0000 | .07 | 0.4 | .... | .. |
| 5168 | 1908 Mar. 13 | None | None | None | 0.10 | 3.0 | 1.4 | .0150 | .0060 | .0060 | .0000 | .26 | 0.4 | .... | .. |
| 5700 | Oct. 28 | Marked | Con. | Putrid | V. cloudy | ...... | .... | Very high | Very high | .0030 | .0000 | 1.10 | 1.9 | .... | * |
| 5704 | Oct. 29 | Marked | Con. | Putrid | Cloudy | ...... | .... | Very high | Very high | .0050 | .0000 | 1.10 | 1.2 | .... | * |
| 5772 | Oct. 20 | V. S. | None | None | 0.15 | 1.9 | .2 | .0035 | .0050 | .0000 | .0000 | .10 | .2 | .... | .. |
| 5805 | Oct. 28 | V. S. | None | Earthy | 0.10 | 1.7 | .6 | .0010 | .0100 | .0000 | .0000 | .08 | .4 | .... | .. |
| 6016 | 1909 Mar. 3 | None | None | None | 0.10 | 2.2 | 1.1 | .0140 | .0100 | .0100 | .0000 | .11 | .4 | .... | .. |
| 7711 | 1910 Mar. 11 | None | None | None | 0.05 | 3.9 | 1.6 | High | .0070 | .0100 | .0000 | .20 | .7 | .... | .. |

* B. Coli present.

*Examination of Water from Well of G. Duncan.*



| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 5701 | 1908 Sept. 29 | None | None | None | 0.00 | 11.0 | .... | .0020 | .0038 | .0600 | Ft. tr. | .25 | 3.1 | .... | .. |

*Examination of Water from Well of Lyman Tenney.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5702 | 1908 Sept. 29 | None | None | None | 0.05 | 38.3 | .... | .0014 | .0052 | .1500 | Moderate | 9.20 | 6.3 | .... | * |

*Examination of Water from Well of S. G. Wallace.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5703 | 1908 Sept. 29 | Consid. | S. Iron | Veg. | Consid. Cloudy | 15.8 | .... | Very high | Very high | .0750 | Heavy | 1.40 | 3.8 | .... | .. |

*Examination of Water from Well of N. C. Jameson.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5705 | 1908 Sept. 29 | None | None | None | 0.00 | ..... | .... | .0104 | .0036 | .0750 | .000 | .80 | 2.0 | .... | .. |

*Examination of Water from Spring beside Highway.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5718 | 1908 Oct. 4 | None | None | None | 0.00 | 3.5 | .... | .0040 | .0012 | .0500 | .0000 | .20 | 1.2 | .... | * |

* B. Coli present.

**Ashland.**—The town operates a public water supply derived from a pond.

*Examination of Water from Tap of Town Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 840 | Oct. 9 | None | None | Veg. | 0.25 | 6.5 | 1.0 | .0000 | .0064 | .0000 | .0000 | .07 | 1.00 | .... | .. |
| 1426 | 1903 Aug. 10 | None | V. slight | Dec. vg | 0.30 | 7.4 | 2.1 | .0000 | .0084 | .0000 | .0000 | .07 | 1.60 | .... | .. |
| 1943 | 1904 May 9 | None | None | None | 0.15 | 4.0 | 1.1 | .0000 | .0014 | .0000 | .0000 | .15 | 1.10 | .... | * |
| 2659 | 1905 Jan. 24 | None | None | V.S.veg | 0.10 | 5.5 | 1.7 | .0054 | .0054 | .0050 | .0000 | .12 | 0.7 | .... | .. |
| 2964 | July 6 | None | None | None | 0.25 | 3.5 | 1.7 | .0000 | .0104 | .0000 | .0000 | .07 | 0.7 | .... | * |
| 3274 | Oct. 31 | None | None | S. veg. | 0.20 | 3.4 | 2.0 | .0014 | .0060 | .0050 | .0000 | .07 | 0.7 | .... | .. |
| 3847 | 1906 Aug. 15 | V. slight | V. slight | Slight | 0.30 | 3.8 | 1.7 | .0018 | .0134 | .0050 | .0000 | .07 | 1.2 | .... | .. |
| 4151 | Nov. 13 | V. slight opal | V. slight | Sl. veg. | 0.20 | 4.5 | 2.1 | .0014 | .0064 | .0050 | .0000 | .07 | 1.2 | .... | .. |
| 4162 | Nov. 15 | Slight | Consid. floc. | Sl. veg. | 0.20 | 4.0 | .... | .0030 | .0264 | .0050 | .0000 | .07 | 1.2 | .... | .. |
| 4403 | 1907 Apr. 15 | Slight | Slight | M. veg. | 0.15 | 3.2 | 1.4 | .0026 | .0068 | .0200 | .0000 | .06 | 0.9 | .... | * |
| 4930 | Oct. 7 | None | None | None | 0.50 | 5.0 | 3.1 | .0046 | .0104 | .0040 | .0000 | .14 | 1.9 | .... | .. |
| 5138 | 1908 Feb. 19 | None | None | Sl. woody | 0.20 | 3.7 | 2.3 | .0012 | .0076 | .0100 | .0000 | .25 | 1.2 | .. | .. |
| 5175 | Mar. 18 | None | None | Sl. earthy | 0.20 | 1.7 | 1.0 | .0004 | .0048 | .0060 | .0000 | .19 | 0.4 | .... | .. |
| 5847 | Nov. 18 | None | None | S. earthy | 0.10 | 2.9 | 1.3 | .0020 | .0050 | .0000 | .0000 | .08 | .4 | .... | .. |
| 7716 | 1910 Mar. 15 | None | None | S. earthy | 0.05 | 3.1 | 1.6 | .0008 | .0078 | .0020 | .0000 | .17 | .9 | .... | .. |

* B. Coli present.

*Examination of Water from Harvard Camp (Spring).*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8211 | 1910 July 27 | None | None | None | 0.05 | ..... | .... | .0005 | .0005 | .005 | .0000 | .05 | 2.6 | .... | .. |

*Examination of Water from Harvard Camp (Pumping Station).*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8215 | 1910 July 27 | Slight | Mod. ferrug | Mark'd veg. | 0.20 | ..... | .... | .0030 | .0070 | .0050 | .0000 | .40 | 2.6 | .... | .. |

**Auburn.**—No public water supply. There is one private supply from which seven families are furnished, and one public watering trough for the town.



*Examination of Water from Well Supplying Auburn.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 3027 | 1905 July 27 | None | None | None | 0.00 | 4.9 | 3.2 | .0014 | .0014 | .0000 | .0000 | .25 | 1.6 | .... | .. |
| 3280 | Nov. 1 | None | S.ferrug. | S. earthy | 0.05 | 3.0 | 1.0 | .0014 | .0024 | .0050 | .0000 | .30 | 0.9 | .... | * |
| 3851 | 1906 Aug. 16 | Consid. ferrug. | S.ferrug. | Earthy | 0.08 | 4.1 | 3.4 | .0040 | .0028 | .0100 | .0001 | .40 | 2.3 | .... | .. |
| 4163 | Nov. 15 | Sl. opal | Slight | M. veg. | 0.50 | 6.0 | 3.4 | .0010 | .0134 | .0050 | .0000 | .07 | 1.2 | .... | .. |
| 4410 | 1907 Apr. 8 | Mod. | Mod. ferrug. | Slight | 0.40 | 2.2 | 1.5 | .0006 | .0072 | .0050 | .0000 | .28 | 1.2 | .... | .. |
| 5173 | 1908 Mar. 18 | None | V. slight | S. earthy | 0.20 | 2.2 | .9 | .0002 | .0026 | .0060 | .0000 | .37 | 0.4 | .... | .. |
| 5838 | Nov. 16 | None | None | None | 0.00 | 5.8 | 3.5 | .0010 | .0020 | .3000 | .0002 | .25 | 1.5 | .... | .. |

* B. Coli present.

*Examination of Water from Well of Congregational Church.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7610 | 1910 Jan. 20 | None | Slight | None | 0.05 | ..... | .... | .0010 | .0008 | .0200 | trace | 2.40 | 3.9 | .... | .. |

**Bartlett.**—The public water supply, owned by the village precinct, was installed about the year 1888 by the Bartlett Water Company. The source is a stream having a watershed of two square miles, wooded land, no inhabitants.



*Examination of Water from Tap of Bartlett Water Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 880 | 1902 Oct. 21 | None | None | V.S.vg. | 0.01 | 4.9 | .8 | .0000 | .0020 | .0000 | .0000 | .07 | .6 | .... | .. |
| 1339 | 1903 July 15 | None | None | S. veg. | 0.15 | 5.3 | 1.2 | .0000 | .0020 | .0000 | .0000 | .10 | 0.9 | .... | .. |
| 1991 | 1904 May 24 | None | None | V.slight | 0.05 | 5.4 | 1.9 | .0000 | .0014 | .0000 | .0000 | .05 | 1.2 | .... | .. |
| 2677 | 1905 Jan. 31 | None | None | None | 0.00 | 5.0 | 2.6 | .0000 | .0000 | .0000 | .0000 | .10 | 1.1 | .... | .. |
| 2978 | July 11 | None | V. slight | None | 0.12 | 4.0 | 2.0 | .0006 | .0006 | .0000 | .0000 | .05 | 0.7 | .... | .. |
| 3286 | Nov. 9 | None | V. slight | None | 0.15 | 2.7 | 2.0 | .0010 | .0048 | .0050 | .0000 | .10 | 0.3 | .... | .. |
| 3852 | 1906 Aug. 16 | None | V. slight | None | 0.08 | 4.0 | 2.9 | .0010 | .0080 | .0050 | .0000 | .12 | 1.0 | .... | .. |
| 4179 | Nov. 21 | None | None | None | 0.10 | 3.5 | 1.9 | .0008 | .0048 | .0050 | .0000 | .05 | 0.4 | .... | .. |
| 4428 | 1907 Apr. 10 | None | None | None | 0.12 | 2.5 | 1.9 | .0008 | .0014 | .0050 | .0000 | .05 | 0.9 | .... | .. |
| 4928 | Oct. 7 | None | None | None | 0.05 | 2.3 | .8 | .0010 | .0022 | .0040 | .0000 | .10 | 0.4 | .... | .. |
| 5201 | 1908 Apr. 1 | None | V. slight | Earthy | 0.05 | 3.7 | 1.5 | .0002 | .0018 | .0200 | .0000 | .11 | 0.4 | .... | .. |
| 5428 | July 20 | None | Consid. floc. | Earthy | 0.05 | 3.3 | 2.5 | .0014 | .0026 | .0100 | .0000 | .07 | 0.4 | .... | *a* |
| 5429 | July 20 | V slight | Consid. floc. | S. earthy | 0.05 | 2.8 | 2.0 | .0012 | .0008 | .0080 | .0000 | .08 | 0.4 | .... | **b* |
| 5836 | Nov. 13 | None | Slight | None | 0.20 | 1.9 | 1.2 | .0005 | .0010 | .0000 | .0000 | .06 | .10 | .... | .. |
| 7733 | 1910 Mar. 17 | None | None | None | 0.20 | 2.5 | 1.3 | .0006 | .0036 | .0060 | .0000 | .10 | .30 | .... | .. |

* B. Coli present.
*a* South Branch, Albany Brook.
*b* East Branch, Albany Brook.

**Bath.**—Water is supplied by two private companies, from springs, dug in a clay soil. The water runs by force of gravity, with about two miles of iron main and service pipes. There are 12 or 15 wells within the area supplied.

*Examination of Water from Faucet of Bath Aqueduct Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 802 | 1902 Sept. 13 | None | None | None | 0.00 | 7.3 | 3.6 | .0000 | .0014 | .0150 | .0002 | .15 | 3.6 | .... | .. |
| 2999 | 1905 July 20 | None | Slight | S. earthy | 0.05 | 6.2 | 4.9 | .0000 | .0014 | .0200 | .0000 | .15 | 3.2 | .... | * |
| 4418 | 1907 Apr. 9 | None | None | Slight | 0.00 | 10.5 | 7.6 | .0008 | .0004 | .0000 | .0000 | .25 | 5.3 | .... | .. |
| 4906 | Sept. 30 | None | S. earthy | S. earthy | 0.05 | ..... | .... | .0002 | .0010 | .0050 | .0000 | .26 | 5.3 | .... | .. |
| 5180 | 1908 Mar. 20 | None | None | None | 0.05 | 6.1 | 3.5 | .0010 | .0010 | .0300 | .0000 | .29 | 3.2 | .... | .. |
| 7757 | 1910 Mar. 28 | None | None | None | 0.05 | 7.5 | 4.8 | .0010 | .0046 | .0020 | .0000 | .16 | .4 | .... | † |

* B. Coli present.
† Trace zinc.

**Belmont.**—The Belmont Water Works, owned by the town, were installed in 1893. Water is obtained from wells, supplemented by a steam in dry seasons. There is a pumping station for use in dry seasons, by which water is pumped from a stream to the reservoir. There is also a private supply in the town. The pipes are of wood mains, and galvanized iron service.

*Examination of Water from Tap of Belmont Water Company.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 864 | 1902 Oct. 15 | None | None | None | 0.00 | 5.6 | 3.0 | .0000 | .0030 | .0000 | .0000 | .12 | 3.0 | .... | .. |
| 1327 | 1903 July 13 | Slight | Slight | Dec. foul | 0.05 | 5.1 | 2.6 | .0014 | .0012 | .0300 | .0000 | .25 | 1.2 | .... | a |
| 1328 | July 13 | None | None | V.slight | 0.05 | 4.6 | 2.0 | .0000 | .0010 | .0300 | .0000 | .20 | 1.5 | .... | .. |
| 1329 | July 13 | None | None | None | 0.05 | 4.3 | 2.9 | .0000 | .0000 | .0150 | .0000 | .20 | 1.2 | .... | .. |
| 1931 | 1904 May 7 | None | None | Slight | 0.00 | 2.5 | .9 | .0008 | .0034 | .0000 | .0000 | .125 | .7 | .... | .. |
| 2162 | July 18 | None | None | None | 0.10 | 3.2 | 2.1 | .0000 | .0000 | .0000 | .0000 | .075 | 1.9 | .... | .. |
| 2481 | Oct. 25 | None | V. S. fine | S. veg. | 0.30 | 4.3 | 2.3 | .0000 | .0014 | .0000 | .0000 | .10 | 1.8 | .... | .. |
| 2482 | Oct. 25 | None | Con. floc. | V.slight | 0.00 | 3.3 | 2.0 | .0000 | .0000 | .0000 | .0000 | .07 | 1.9 | .... | .. |
| 2518 | Nov. 7 | None | Con. floc. | Dec.vg. | 0.25 | 4.6 | 2.7 | .0010 | .0058 | .0000 | .0000 | .12 | 1.9 | .... | a* |
| 2560 | Nov. 28 | None | None | None | 0.10 | 4.0 | 3.2 | .0000 | .0000 | .0000 | .0000 | .17 | 0.9 | .... | .. |
| 2657 | 1905 Jan. 23 | None | None | Slight | 0.20 | 4.4 | 2.7 | .0000 | .0000 | .0100 | .0000 | .15 | 0.7 | .... | .. |
| 2986 | July 17 | None | None | Slight | 0.20 | 4.5 | 2.7 | .0000 | .0010 | .0100 | .0000 | .15 | 0.7 | .... | * |
| 3279 | Nov. 1 | None | V. slight | Veg. | 0.20 | 5.1 | 3.6 | .0014 | .0058 | .0050 | .0000 | .22 | 0.7 | .... | .. |
| 3636 | 1906 May 24 | None | V. slight | S. veg. | 0.25 | 4.8 | 2.6 | .0010 | .0060 | .0100 | .0000 | .10 | .... | .... | * |
| 3651 | May 30 | ........ | ........ | ....... | .... | ..... | .... | ..... | ..... | ..... | ..... | .... | .... | .... | * |
| 3856 | Aug. 17 | None | V. slight | None | 0.20 | 5.0 | 2.7 | .0010 | .0044 | .0050 | .0000 | .10 | 1.1 | .... | .. |
| 4158 | Nov. 14 | V.S. opal | Slight | Veg. | 0.15 | 6.0 | 3.5 | .0014 | .0042 | .0050 | .0000 | .05 | 1.2 | .... | .. |
| 4416 | 1907 Apr. 8 | None | None | Earthy | 0.15 | 2.4 | 1.5 | .0012 | .0026 | .0100 | .0000 | .17 | 0.9 | .... | .. |
| 4907 | Sept. 30 | None | None | None | 0.35 | 4.3 | 2.8 | .0012 | .0104 | .0050 | .0000 | .32 | 1.2 | .... | * |
| 5189 | 1908 Mar. 25 | Consid. | M. earthy | Slight | 0.40 | 3.0 | 1.5 | .0002 | .0114 | .0020 | .0000 | .12 | 0.4 | .... | .. |
| 5828 | Nov. 5 | None | None | None | 0.15 | 2.3 | 1.3 | .0005 | .0030 | .010 | .0000 | .11 | .9 | .... | .. |
| 7720 | 1910 May 15 | None | None | None | 0.00 | 2.6 | 2.3 | .0004 | .0040 | .005 | .0000 | .19 | .9 | .... | .. |

*a* Stream at pumping station. The quality of this water varies according to the use of the auxiliary stream supply.
* Colon B. present.

**Bennington.**—No public supply. The Bennington Water Works Company, a private company, in 1900 installed a system supplied from springs, with a supplementary supply from a stream.



*Examination of Water from a Faucet of the Bennington Water Works Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 751 | 1902 Aug. 27 | None | V. slight | None | 0.15 | 6.5 | 2.8 | .0000 | .0000 | .0000 | .0000 | .10 | 1.5 | .... | .. |
| 1334 | 1903 July 15 | None | None | V. slight | 0.10 | 3.7 | 2.3 | .0000 | .0030 | .0000 | .0000 | .05 | 1.5 | .... | .. |
| 341 | July 16 | None | None | Veg. | 0.10 | 3.4 | 2.7 | .0000 | .0034 | .0000 | .0000 | .05 | 2.0 | .... | .. |
| 2262 | 1904 Aug. 9 | Very marked | Much floc. red | None | 0.60 | 6.1 | 1.7 | .0000 | .0034 | .0050 | .0000 | .10 | 1.4 | .... | * |
| 3069 | 1905 Aug. 9 | None | Slight | S. earthy | 0.05 | 4.5 | 2.3 | .0000 | .0026 | .0050 | .0000 | .10 | 1.2 | .... | .. |
| 3287 | Nov. 8 | None | None | None | 0.00 | 5.4 | 3.9 | .0010 | .0044 | .0050 | .0000 | .12 | 0.9 | .... | .. |
| 3885 | 1906 Aug. 23 | None | None | Slight | 0.05 | 4.2 | 3.6 | .0010 | .0032 | .0050 | .0000 | .12 | 1.5 | .... | .. |
| 3960 | Sept. 11 | None | Ferrug. | ....... | 0.10 | 6.6 | 4.7 | .0014 | .0060 | .0000 | .0000 | .20 | 1.1 | .... | .. |
| 3961 | Sept. 11 | V. slight | V. slight | Veg. | 0.10 | 5.2 | 2.1 | .0008 | .0110 | .0000 | .0000 | .05 | 1.1 | .... | † |
| 4925 | 1907 Oct. 6 | Mod. slight | Slight | S. earthy | 0.40 | 5.0 | 2.9 | .0020 | .0130 | .0060 | .0000 | .88 | 1.9 | .... | .. |
| 5182 | 1908 Mar. 23 | V. slight | Slight | None | 0.05 | 5.7 | 2.5 | .0024 | .0018 | .0080 | .0000 | .11 | 0.4 | .... | * |
| 5841 | Nov. 16 | None | V. slight | Earthy | 0.10 | 3.8 | 2.4 | .0008 | .0015 | .0100 | .0000 | .15 | .7 | .... | .. |
| 7139 | 1909 June 28 | S. coarse | S. coarse | None | 0.00 | ..... | .... | .0015 | .0015 | .0050 | .0000 | .05 | .9 | .... | .. |
| 7746 | 1910 Mar. 22 | Slight | Mod. earthy | Earthy | 0.10 | 4.2 | 1.6 | .0014 | .0054 | .0020 | .0000 | .41 | 1.2 | .... | .. |

* Colon B. present.
† Reservoir.

**Benton.**

*Examination of Water from Stream Used as a Supply by Camp 4, Champlain Realty Company.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7508 | 1909 Nov. 7 | None | None | None | 0.05 | ..... | .... | .0010 | .0015 | .0750 | .0000 | .10 | 0.4 | .... | .. |

**Berlin.**—There are two private supplies, the Berlin Water Company, established in 1892, and the A. B. Forbush supply (1905). The latter consists of springs dug ten feet deep and supplies about twenty families on the east side of the Androscoggin River. This supply is apt to go dry during the summer.

The Berlin Water Company derives its supply from a stream with a wooded and uninhabited watershed of three and one-half square miles. There are three reservoirs supplied by gravity, known respectively as the Bean Brook (3,000,000 gallons), the Anderson (10,000,000 gallons) and the Stewart (2,500,000 gallons). Twenty-one miles of cast iron distributing pipe with about 1,200 services (galvanized) supplying practically the whole population. During 1909, for use in times of drought, and for increasing the fire protection of the city, the Berlin Water Company installed a two-stage D'Olier pump at the Burgess Sulphite Fibre Company's plant. The water passes through sand filters and is supplied to the filters from the Androscoggin River by a pump of about 1,500 gallons capacity per minute, with eighty pounds pressure.

Quite a number of the inhabitants at Berlin Mills are supplied from wells, the water of which flows to the dwellings by gravity.

*Examination of Water from Berlin Water Company.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 843 | 1902 Oct. 9 | None | None | V. slight | 0.75 | 6.5 | 1.4 | .0000 | .0112 | .0000 | .0000 | .05 | 1.4 | .... | .. |
| 1061 | 1903 Feb. 22 | None | None | None | 0.00 | 12.3 | 6.6 | .0000 | .0000 | .0150 | .0000 | .07 | 2.0 | .... | .. |
| 1326 | July 13 | None | None | V. slight | 0.65 | 4.6 | 1.8 | .0000 | .0104 | .0000 | .0000 | .05 | 0.7 | .... | .. |
| 1491 | Sept. 3 | None | None | V. slight | 0.40 | 3.6 | 1.4 | .0000 | .0044 | .0000 | .0000 | .07 | 1.1 | .... | .. |
| 1828 | 1904 Feb. 1 | Slight | M. fine | V. slight | 0.00 | 9.8 | 7.2 | .0016 | .0008 | .0000 | .0000 | .10 | 5.8 | .... | *l* |
| 2179 | July 20 | None | None | None | 0.00 | 12.4 | 9.3 | .0000 | .0000 | .0200 | .0000 | .35 | 7.4 | .... | .. |
| 2383 | Sept. 16 | None | Slight | None | 1.10 | 8.0 | 2.6 | .0006 | .0166 | .0700 | .0000 | .05 | 1.4 | .... | .. |
| 2680 | 1905 Feb. 4 | None | None | V. slight | 0.25 | 4.8 | 2.4 | .0000 | .0000 | .0150 | .0000 | .05 | 0.6 | .... | .. |
| 3117 | Aug. 25 | None | S. floc. | Veg. | .25 | 4.0 | 1.8 | .0008 | .0072 | .0050 | trace | .05 | .... | .... | *a |
| 3118 | Aug. 25 | None | None | None | 0.05 | 5.4 | 2.7 | .0006 | .0026 | .0450 | .0000 | .07 | .... | .... | *b |
| 3389 | 1906 Jan. 10 | None | None | S. veg. | 0.20 | 6.3 | 3.3 | .0008 | .0040 | .0250 | .0000 | .07 | 1.2 | .... | .. |
| 3562 | Apr. 20 | ........ | ........ | ....... | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .... | *c |
| 3565 | Apr. 23 | V. slight | None | S. veg. | 0.05 | 20.5 | 14.8 | .0086 | .0084 | .3000 | .0005 | 2.00 | 5.4 | .... | *d |
| 3566 | Apr. 23 | V. slight | V. slight | M. veg. | 0.05 | 8.5 | 4.0 | .0136 | .0154 | .0100 | .0000 | 0.10 | 1.6 | .... | *e |
| 3567 | Apr. 23 | None | None | Slight | 0.20 | 7.5 | 3.5 | .0020 | .0080 | .0100 | .0000 | 0.10 | 1.8 | .... | *f |
| 3568 | Apr. 23 | Slight | S. floc. | M. veg. | 0.60 | 7.8 | 4.2 | .0006 | .0134 | .0100 | .0000 | .07 | 1.6 | .... | .. |
| 3571 | Apr. 23 | None | V. slight | ....... | 0.40 | 6.8 | 4.5 | .0034 | .0110 | .0100 | .0000 | .05 | 1.4 | .... | *g |
| 3573 | Apr. 25 | None | None | None | 0.20 | 4.7 | 2.7 | .0010 | .0070 | .0750 | .0000 | .05 | 0.6 | .... | *h* |
| 3574 | Apr. 25 | None | V. slight | S. veg. | 0.05 | 4.2 | 2.0 | .0014 | .0074 | .0100 | .0000 | .05 | 0.3 | .... | *i* |
| 3659 | June 5 | None | None | None | 0.00 | 5.1 | 3.5 | .0012 | .0014 | .0150 | .0000 | .10 | 1.4 | .... | .. |
| 3660 | June 5 | V. slight | None | Slight | 0.00 | 5.6 | 4.2 | .0012 | .0028 | .0050 | .0000 | .10 | .... | .... | *b* |
| 3661 | June 5 | V. slight | V. slight | S. veg. | 0.50 | 4.6 | 2.2 | .0022 | .0064 | .0050 | .0000 | .07 | 0.6 | .... | *i* |
| 3662 | June 5 | None | None | V.S.vg. | 0.30 | 5.0 | 2.8 | .0008 | .0050 | .0000 | .0050 | .05 | 1.4 | .... | *j* |

* Colon B. present; *a* Bean and Horn brooks; *b* Cold Spring; *c* represents five samples, taken from St. Giles aqueduct, Green Street aqueduct, Western Avenue aqueduct, Berlin Mills aqueduct, East Side aqueduct, all show Colon B.; *d* Brown and Main Streets spring; *e* Damars reservoir; *f* Stahl reservoir; *g* East Side reservoir; *h* Horn Brook; *i* Bean Brook; *j* Green Spring; *l* artesian well of Water Company.

*Examination of Water from Berlin Water Company—Concluded.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid. | Nitrates. | Nitrites. | | | | |
| 4318 | 1907 Jan. 31 | None | None | None | 0.25 | ..... | .... | .0016 | .0054 | .0250 | .0000 | .15 | 1.1 | .... | .. |
| 4319 | Jan. 30 | None | None | Veg. | 0.25 | ..... | .... | .0026 | .0046 | .0250 | .0000 | .12 | 1.2 | .... | .. |
| 4406 | Apr. 5 | None | V. slight | S. musty | 0.38 | 4.9 | 2.8 | .0010 | .0104 | .0250 | .0000 | .05 | 2.0 | .... | .. |
| 5163 | 1908 Mar. 9 | None | None | None | 0.25 | 3.2 | 1.3 | .0008 | .0050 | .0250 | .0000 | .07 | 1.2 | .... | .. |
| 5234 | Apr. 15 | V. slight | V. slight | None | 0.55 | 3.7 | 1.4 | .0004 | .0054 | .0120 | .0000 | .04 | 0.4 | .... | .. |
| 5247 | Apr. 22 | Mod. opal | Heavy earthy | S. earthy | Cl-ou-dy | 12.0 | 10.0 | .0002 | .0010 | .0040 | .0000 | .37 | 1.5 | .... | .. |
| 5678 | Sept.23 | V. slight | Slight | Earthy | 0.05 | 4.7 | 2.0 | .0002 | .0054 | .0050 | .0000 | .08 | .4 | .... | * |
| 5679 | Sept.23 | V. slight | V. slight | Rank | 0.05 | 5.1 | 2.6 | .0008 | .0060 | .0060 | .0000 | .07 | .4 | .... | * |
| 5680 | Sept.23 | V. slight | Slight | Slight | 0.05 | 5.7 | 2.8 | .0002 | .0030 | .0060 | .0000 | .10 | .4 | .... | * |
| 5722 | Oct. 5 | None | V. slight | None | 0.05 | 5.3 | 2.5 | .0030 | .0090 | .0050 | .0000 | .05 | .4 | .... | .. |
| 5751 | Oct. 13 | None | V. slight | Musty | 0.25 | 2.9 | 2.0 | .0018 | .0060 | .0070 | .0000 | .15 | .3 | .... | .. |
| 5723 | Oct. 5 | None | Slight | None | 0.20 | 3.0 | 1.5 | .0020 | .0730 | .0050 | .0000 | .05 | .3 | .... | *k |
| 5724 | Oct. 5 | None | None | None | 0.05 | 5.0 | .... | .0008 | .0006 | .005 | .000 | .16 | .9 | .... | b |
| 5790 | Oct. 22 | None | None | None | 0.25 | 3.2 | 1.7 | .0002 | .0015 | .0090 | .0000 | .12 | .9 | .... | .. |
| 5827 | Nov. 6 | V. slight | None | S. musty | 0.35 | 5.1 | 3.1 | .0010 | .0000 | .015 | .000 | .09 | .7 | .... | .. |
| 6034 | 1909 Mar.16 | None | V. slight | S. earthy | 0.30 | .5 | .... | .0005 | .0030 | .030 | .000 | .05 | .7 | .... | .. |
| 6069 | Mar.31 | None | None | None | 0.40 | 4.7 | 2.3 | .0005 | .0070 | .020 | .000 | .06 | 1.1 | .... | .. |
| 6070 | Mar.31 | None | None | None | 0.40 | 4.6 | 2.5 | .0008 | .0060 | .020 | .000 | .05 | .9 | .... | .. |
| 7370 | Sept.22 | V. slight | V. slight | None | 0.20 | 4.0 | 2.0 | .0010 | .0060 | .005 | .000 | .08 | .6 | .... | .. |
| 7374 | Sept.22 | Slight | S. floc. | None | 0.30 | 3.8 | 1.5 | .0030 | .0100 | .005 | .000 | .07 | .7 | .... | .. |
| 7726 | 1910 Mar.15 | None | None | None | 0.40 | 3.5 | 1.9 | .0004 | .0068 | .004 | .000 | .14 | 1.1 | .... | .. |
| 8132 | July 15 | None | V. slight | None | 0.35 | ..... | .... | .0038 | .0064 | .005 | .000 | .10 | 1.4 | .... | .. |

* Colon B. present. *b* Cold Spring. *k* Androscoggin River at intake pipe.

*Examination of Water from Spring of Burgess Sulphite Fibre Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5544 | 1908 Aug. 26 | None | None | None | 0.05 | 9.7 | 6.3 | .0006 | .0024 | .1000 | .0000 | 1.00 | 3.2 | .... | .. |

*Examination of Filtered River Water of the Burgess Sulphite Fibre Company's Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 5545 | 1908 Aug. 21 | None | V. slight | Slight | 0.40 | 4.8 | 1.9 | .0004 | .0054 | .0020 | .0000 | .15 | 1.2 | .... | .. |
| 1031 | 1909 Mar. 16 | None | V. slight | S. earthy | 0,30 | ..... | .... | .0008 | .0035 | .020 | .000 | .07 | 1.8 | .... | .. |

*Burgess Sulphite Fibre Company, Artesian Well.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8103 | 1910 July 9 | Slight | S. floc. | None | 0.55 | ..... | .... | .0036 | .0025 | .0025 | trace | .60 | 12.4 | .... | .. |

**Bethlehem.**—The precinct supply, completed in 1898, is from a stream. The watershed is wooded several miles each side. The water is delivered by gravity through about twelve miles of iron service and main pipes. Ninety-eight per cent. of the population take this water.



*Examination of Water Supplied by the Crystal Springs Water Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 347 | 1902 Jan. 3 | Slight | Slight vg and min | Earthy veg. | 0.20 | 5.3 | 3.8 | .0074 | .0076 | .0400 | .0000 | .06 | 1.6 | ..... | .. |
| 2998 | 1905 July 19 | None | None | Slight | 0.05 | 3.5 | 2.2 | .0000 | .0020 | .0100 | .0000 | .05 | 1.5 | ..... | .. |
| 3360 | 1906 Jan. 3 | None | None | None | 0.00 | 3.9 | 1.7 | .0006 | .0022 | .0300 | .0000 | .05 | 1.4 | ..... | .. |
| 3883 | Aug. 22 | None | V. slight | S. foul | 0.20 | 4.0 | 1.5 | .0008 | .0024 | .0100 | .0000 | .05 | 0.4 | ..... | .. |
| 4184 | Nov. 21 | None | None | None | 0.20 | 2.0 | 1.0 | .0010 | .0044 | .0200 | .0000 | .15 | 0.4 | ..... | .. |
| 4415 | 1907 Apr. 8 | None | None | S. veg. | 0.13 | 3.4 | 1.7 | .0004 | .0044 | .0100 | .0000 | .07 | 1.6 | ..... | .. |
| 4991 | Oct. 31 | None | None | None | 0.30 | 3.3 | 1.5 | .0010 | .0054 | .0100 | .0000 | .08 | 0.4 | ..... | .. |
| 5176 | 1908 Mar. 18 | None | None | None | 0.10 | 2.3 | .8 | .0002 | .0014 | .0100 | .0000 | .08 | 0.4 | ..... | .. |
| 5832 | Nov. 11 | V. slight | None | None | 0.10 | 2.5 | 1.5 | .0002 | .0015 | .010 | .000 | .03 | 0.1 | ..... | .. |
| 7728 | 1910 Mar. 16 | None | None | None | 0.10 | 3.5 | .7 | .0060 | .0030 | .005 | .0000 | .05 | .4 | ..... | .. |
| 8099 | July 6 | None | V. slight | None | 0.05 | ..... | .... | .0015 | .0010 | .0025 | .0000 | .05 | .4 | ..... | .. |

**Boscawen.**—Water is from the public supply, Penacook & Boscawen Water Precinct, constructed in 1892. The source is a pond of 340 acres; greatest depth, 36 feet; soil, largely gravel. The water shed is nearly seven square miles, both wooded and cleared. There are five or six houses on the shores of the pond. It is a gravity system, through thirteen miles of wooden and galvanized iron pipe. About two hundred families are supplied.

*Examination of Water from Tap of Penacook & Boscawen Water Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 789 | 1902 Sept. 9 | None | None | S. veg. | 0.45 | 10.10 | 1.80 | .0000 | .0142 | .0000 | .0000 | .11 | 1.5 | .... | .. |
| 1944 | 1904 May 9 | V. slight | Slight | Dec. veg. | 0.3 | 4.20 | 1.70 | .0000 | .0032 | .0000 | .0000 | .15 | 1.6 | .... | .. |
| 2690 | 1905 Feb. 9 | None | None | None | 0.25 | 6.4 | 2.4 | .0000 | .0010 | .0000 | .0000 | .10 | 0.9 | .... | .. |
| 3096 | Aug. 18 | Consid. | Slight | Earthy | 0.30 | 4.9 | 1.9 | .0000 | .0140 | .0100 | .0000 | .17 | 1.1 | .... | * |
| 3194 | 1906 Jan. 13 | None | None | S. veg. | 0.50 | 5.0 | 2.5 | .0024 | .0084 | .0100 | .0000 | .17 | 1.1 | .... | .. |
| 3860 | Aug. 18 | ........ | ........ | ....... | 0.40 | 5.3 | 2.9 | .0028 | .0114 | .0050 | .0000 | .07 | 1.4 | .... | .. |
| 4171 | Nov. 20 | None | V. slight | Earthy | 0.30 | 5.0 | 3.0 | .0040 | .0094 | .0300 | .0000 | .10 | 1.2 | .... | .. |
| 4440 | 1907 Apr. 16 | Sl. opal | Slight | Woody | 0.30 | 6.5 | 2.4 | .0008 | .0086 | .0040 | .0000 | .07 | 1.2 | .... | .. |
| 4957 | Oct. 15 | V.S. opal | None | None | 0.50 | 5.5 | 2.8 | .0010 | .0108 | .0100 | .0000 | .14 | 0.4 | .... | .. |
| 5198 | 1908 Mar. 30 | None | V. slight | S. veg. | 0.40 | 2.7 | 1.7 | .0002 | .0068 | .015 | .0000 | .20 | 1.2 | .... | .. |
| 5865 | Nov. 26 | None | None | Earthy | 0.20 | 2.5 | 1.8 | .0001 | .0085 | .0000 | .0000 | .07 | .4 | .... | .. |
| 7516 | 1909 Nov. 16 | None | None | S. earthy | 0.10 | 3.0 | 1.0 | .0005 | .0090 | .0050 | .0000 | .05 | .9 | .... | .. |
| 7744 | 1910 Mar. 22 | Mod. | S. fibr. | Swam-py | 0.20 | 3.7 | 2.7 | .0004 | .0094 | .012 | .0000 | .22 | 1.5 | .... | .. |

* Colon B. present.

*Examination of Water from a Spring at North Boscawen, Owned by Boston & Maine Railroad.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7062 | 1909 May 24 | None | None | Mod. foul | 0.20 | ..... | .... | .0010 | .0020 | .030 | .0000 | .10 | .9 | .... | † |

† .6 Zinc.

**Bradford.**

*Examination of Water from Lake Massasecum.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 3749 | 1906 July 12 | V. slight | S. veg. | None | 0.2 | 4.2 | 1.8 | .0028 | .0154 | .0030 | .0000 | .07 | 0.6 | .... | .. |

**Bristol.**—Bristol Aqueduct Company, incorporated in 1886, supplies water from Newfound Lake, the area of which is about nine square miles. The watershed is largely wooded, some cleared land. It is a gravity system, with about six miles of pipe, mostly cement, but some cast iron mains, and galvanized iron, lead and tin-lined service pipes. About three-fourths of the population of the village use the aqueduct water, while there are a few wells, mostly located back on the hills, away from buildings.

*Examination of Water from a Faucet of the Bristol Aqueduct Company.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 747 | 1902 Aug. 26 | None | V. slight | S. veg. | 0.15 | 3.90 | 1.50 | .0016 | .0050 | .0000 | .0000 | .06 | .4 | .... | .. |
| 1321 | 1903 July 13 | V. slight | Slight | Dec. veg. | 0.1 | 3.00 | .90 | .0028 | .0044 | .0000 | .0000 | .075 | 1.2 | .... | .. |
| 1945 | 1904 May 5 | Slight | None | S. veg. | 0.1 | 4.20 | 1.80 | .0000 | .0014 | .0000 | .0000 | .075 | 1.5 | .... | * |
| 2664 | 1905 Jan. 30 | None | None | S. veg. | 0.15 | 4.2 | 2.1 | .0000 | .0014 | .0050 | .0000 | .10 | 0.6 | .... | .. |
| 2998 | July 18 | None | None | Veg. | 0.10 | 3.9 | 1.9 | .0000 | .0024 | .0000 | .0000 | .12 | 0.9 | .... | .. |
| 3351 | 1906 Jan. 2 | None | V. slight | S. veg. | 0.10 | 2.5 | 1.1 | .0014 | .0066 | .0050 | .0000 | .07 | 0.7 | .... | .. |
| 3853 | Aug. 17 | None | V. slight | Veg. | 0.10 | 4.1 | 2.2 | .0014 | .0070 | .0050 | .0000 | .15 | 0.4 | .... | .. |
| 4170 | Nov. 20 | None | None | None | 0.10 | 4.0 | 2.5 | .0010 | .0044 | .0050 | .0000 | .07 | 0.4 | .... | .. |
| 4417 | 1907 Apr. 9 | None | None | None | 0.13 | 2.8 | 2.4 | .0010 | .0030 | .0050 | .0000 | .14 | 0.4 | .... | * |
| 4909 | Oct. 30 | None | None | None | 0.05 | 2.4 | 1.8 | .0014 | .0048 | .0050 | .0000 | .05 | 0.9 | .015 | .. |
| 5174 | 1908 Mar. 16 | None | None | S. earthy | 0.15 | 2.9 | 1.7 | .0020 | .0030 | .0040 | .0000 | .16 | 0.4 | .... | .. |
| 5856 | Nov. 25 | None | None | None | 0.10 | 2.6 | 1.7 | .0010 | .0030 | None | .0003 | .08 | .4 | .... | .. |
| 7717 | 1910 Mar. 15 | None | V. slight | Slightly swampy | 0.05 | 2.5 | 1.1 | .0012 | .0060 | .004 | .0000 | .12 | .4 | .... | .. |

* B. Coli present.

**Brookline.**—No public supply. A well on the east side of the town is the source of the fountain and faucet in public square.

*Examination of Water from Public Fountain Supplied by a Well.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 327 | 1901 Dec. 10 | None | None | S. foul | 0.0 | 9.30 | 7.00 | .0000 | .0076 | .1250 | .0002 | .80 | 2.00 | .... | .. |

*Examination of Water from Well Supplying Congregational Society.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 8102 | 1910 July 13 | None | None | None | .10 | ..... | .... | .0012 | .0020 | .075 | trace | .70 | 1.9 | ...... |

**Canaan.**—No public supply. A private supply from Hart's Pond was introduced by the Crystal Lake Water Company in 1891.

*Examination of Water from Crystal Lake Water Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites | | | |
| 868 | 1902 Oct. 16 | Marked | M. floc. | Dec. veg. | 0.2 | 5.50 | 2.10 | .0000 | .0168 | .0000 | .0000 | .07 | 2.0 | ...... |
| 3026 | 1905 July 28 | V. slight | Slight | Earthy | 0.20 | 4.8 | 2.0 | .0022 | .0080 | .0050 | .0000 | .12 | 1.2 | ...... |
| 3510 | 1906 Mar. 6 | None | None | None | 0.10 | 5.3 | 3.0 | .0014 | .0074 | .0050 | .0000 | .05 | 1.4 | .... * |
| 4087 | Oct. 22 | None | V. slight | Musty | 0.05 | 6.2 | 4.5 | .0010 | .0060 | .0050 | .0000 | .05 | 1.2 | ...... |
| 4432 | 1907 Apr. 12 | V. slight | Slight | V. slight | 0.15 | 2.5 | 1.2 | .0026 | .0108 | .0080 | .0000 | .12 | 1.2 | ...... |
| 5235 | 1908 Apr. 15 | V. slight | Slight | Sl. veg. | 0.15 | 3.8 | 1.5 | .0006 | .0078 | .0100 | .0000 | .10 | 1.2 | ...... |
| 7885 | 1910 May 13 | Slight | Sl. floc. | Mark earthy | 0.20 | 2.7 | 1.4 | .0015 | .0135 | .0054 | .0000 | .10 | 1.1 | ...... |

* B. Coli present.

**Candia.**—There are two private supplies, the John H. Holt and the D. H. Baker, each built in 1893. The first is from an artesian well 100 feet deep, pumped by windmill to a reservoir of 7,000 gallons' capacity, 10 feet diameter and 12 feet deep. This supplies 16 houses and two shoe shops.

The Baker supply is from a spring about eight feet square and six feet deep, boxed up with plank and covered by a shed roof. This water is also pumped by a windmill to a reservoir of 3,000 gallons' capacity, eight feet diameter and eight feet deep. This system furnishes water to five houses.



Both systems deliver through about one-fourth mile of galvanized pipe, main and service.

There are two public wells, one at Candia Village and one at Candia Depot.

*Examination of Water from Supply of John A. Holt, East Candia.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 869 | 1902 Oct. 16 | None | None | None | 0.0 | 14.10 | 10.6 | .0000 | .0000 | .4800 | .0000 | 1.45 | 4.7 | ..... | .. |
| 2733 | 1905 Mar. 2 | None | None | None | 11.2 | 11.2 | 8.0 | .0000 | .0000 | .3000 | .0000 | 1.40 | 3.9 | ..... | .. |
| 3033 | Aug. 1 | Slight | Slight | S. earthy | 0.15 | 16.8 | 9.8 | .0000 | .0000 | .3000 | .0000 | 1.67 | 5.2 | ..... | .. |
| 3371 | 1906 Jan. 5 | V. slight | V. slight | S. foul | 0.00 | 16.7 | 11.3 | .0024 | .0038 | .5000 | .0003 | 1.95 | 6.0 | ..... | .. |
| 3908 | Aug. 27 | None | V. slight | None | 0.10 | 15.6 | 8.8 | .0010 | .0024 | .1000 | .0000 | 2.40 | 4.7 | ..... | .. |
| 4194 | Nov. 28 | None | None | None | 0.05 | 19.0 | 13.5 | .0010 | .0014 | .5000 | .0000 | 2.25 | 5.6 | .4160 | .. |
| 7748 | 1910 Mar. 24 | V. slight | V. slight | None | No | 25.6 | 22.3 | .0010 | .0030 | .200 | .002 | 4.14 | 8.4 | ..... | .. |

*Examination of Water from Supply of D. H. Baker.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4437 | 1907 Apr. 15 | V. slight opal | Sl. coarse | Slight | 0.00 | 6.3 | 4.0 | .0014 | .0026 | .0300 | .0000 | .38 | 1.9 | .... | .. |
| 4929 | Oct. 7 | None | V. slight | None | 0.00 | 9.3 | 7.5 | .0002 | .0022 | .0050 | .0000 | .31 | 2.3 | .... | .. |

*Examination of Water from Well of Free Baptist Church Society.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5991 | 1909 Feb. 16 | None | None | None | 0.00 | ..... | .... | .0020 | .0060 | .200 | .0016 | 9.4 | 7.7 | .... | .. |

*Examination of Water from Well of Congregational Society.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7249 | 1909 Aug. 6 | Slight | S. ferrug | None | .05 | ..... | .... | .0015 | .0020 | .0025 | .0006 | .40 | 3.9 | .... | .. |

**Canterbury.**

*Examination of Water from a Spring Supplying Canterbury Shakers.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7318 | 1909 Aug. 30 | None | V. slight | None | 0.00 | ..... | .... | .0005 | .0008 | .0300 | .0000 | .90 | 3.9 | .... | .. |

*Examination of Water from an Artificial Pond Supplying Canterbury Shakers.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7320 | Aug. 30 | V. slight | Sl. floc. | None | 0.05 | 3.5 | 1.0 | .0015 | .0100 | .0050 | .0000 | .05 | .9 | .03 | .. |

**Center Harbor.**—During 1900 a supply derived from springs was inaugurated by J. S. Graves. This has since been discontinued, being succeeded by a system recently installed by S. F. Emery. The source of the latter is an artificial reservoir fed by springs. Most of the houses on the main street are now supplied from this source and the system, which represents water of excellent quality, is being extended.

This town has many natural springs, a number of which are rather extensively used as supply for the houses of the village. An analysis of water from the Sibley Spring, a supply of some local repute, is here given. At the time this sample was collected the water showed a distinct foul odor, suggestive of some abnormal condition. A number of samples of well water collected by the State Board of Health during August, 1910, were found to represent polluted supplies.

*Examination of Water from Spring Supply of S. F. Emery.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7955 | 1910 June 12 | None | S. earthy | S. earthy | 0.05 | 6.5 | 4.0 | .0016 | .0010 | .0150 | .0000 | .12 | 3.6 | .... | .. |

*Examination of Water from Sibley Spring.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 8275 | 1910 Aug. 3 | None | V. S. floc | Dist. foul | 0.00 | ..... | .... | .0050 | .0035 | .0025 | .0000 | .10 | 3.2 | .... | .. |

**Charlestown.**—A new gravity system from Mill Brook was completed during 1906. There are two reservoirs on the same brook, about 60 rods apart and two miles from the village. The water is mostly from springs. About six miles of galvanized iron service pipe are in use. Cost of system, $53,000. One hundred families are supplied—about two thirds of the population.

*Examination of Water from Brook, Proposed Public Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 2940 | 1905 July 1 | None | S. floc. | None | 0.28 | 4.9 | 2.0 | .0000 | .0030 | .0200 | .0000 | .07 | 1.2 | .... | .. |
| 4040 | 1906 Oct. 8 | None | V. slight | None | 0.20 | 7.0 | 4.5 | .0014 | .0062 | .0050 | .0000 | .10 | 2.6 | .... | .. |
| 4444 | 1907 Apr. 18 | V. slight | V. slight | Sl. veg. | 0.12 | 3.7 | 1.5 | .0004 | .0024 | .0100 | .0000 | .07 | .7 | .... | .. |
| 4946 | Oct. 12 | V. slight | V. slight | None | 0.40 | 4.2 | 2.5 | .0016 | .0080 | .0020 | .0000 | .19 | .4 | .... | * |
| 5211 | 1908 Apr. 2 | None | V. slight | None | 0.15 | 2.8 | 1.8 | .0050 | .0048 | .0050 | .0000 | .12 | 0.4 | .... | .. |
| 5622 | Sept. 7 | V. faint opal. | Slight | Mark veg. | 0.00 | 6.8 | 4.3 | .0034 | .0050 | .006 | .0000 | .10 | 2.6 | .... | .. |
| 5858 | Nov. 25 | None | None | None | 0.20 | 4.5 | 2.5 | .0015 | .0060 | .0025 | .0004 | .18 | 1.4 | .... | * |
| 7057 | 1909 May 24 | None | Sl. veg. | V.S. vg. | 0.20 | 4.9 | 2.3 | .0030 | .0035 | .005 | .0000 | .10 | .7 | .... | .. |
| 7404 | Sept. 30 | Slight | V. slight | None | 0.30 | 4.8 | 2.5 | .0010 | .0010 | .005 | .0000 | .10 | 1.4 | .... | * |
| 7749 | 1910 Mar. 22 | V. slight | Slight | Swampy | 0.15 | 3.4 | 1.1 | .0008 | .0032 | .0040 | .0000 | .16 | .6 | .... | .. |

* B Coli present.

**Claremont.**—The town owns a water supply derived from streams situated on Green Mountain, together with an auxiliary system of wells dug along the bank of Sugar River. The latter, which are about fifteen feet deep and covered with five feet of earth, afford an abundant reserve supply, the water being pumped to the lowest of the stream reservoirs as needed. The main supply is drawn from the three brook reservoirs, the combined capacity of which is 32,000,000 gallons. Twenty and one-half miles of distributing mains are of cement and cast iron. Service pipes are of galvanized and cement-lined iron, supplying about twelve hundred families. The watershed drained by this supply is mainly wooded, with some pasturage, and with but one or two dwellings.

Besides the public supply there are two private systems of water works in Claremont; one, the Bible Hill Aqueduct, was built in 1870, the source being springs and a brook. The springs are excavated about a reservoir and the latter is also fed by springs in the bottom. Lead service pipes. About one hundred and sixty families are supplied by this system.

The other private system, known as the Grannis Water Works, built about 1892 and owned and operated by Herman Holt, Esq., is also supplied by springs. There are two small reservoirs from which this water is taken: one some 30 feet in diameter, and about three feet deep on an average; the other some 75 feet in diameter and of an average depth of about three feet. (See special report elsewhere.)

*Examination of Water from Town Supply Reservoir.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 797 | 1902 Sept.11 | None | None | S. veg. | 0.15 | 6.30 | 2.30 | .0000 | .0056 | .0000 | .0000 | .12 | 1.9 | .... | .. |
| 1323 | 1903 July 13 | None | None | S. musty | 0.:2 | 4.30 | 2.20 | .0000 | .0056 | .0000 | .0000 | 1.07 | 1.9 | .... | .. |
| 1942 | 1904 May 9 | Slight | None | None | 0.1 | 5.60 | 4.40 | .0000 | .0030 | .0000 | .0000 | .07 | 2.6 | .... | .. |
| 2668 | 1905 Jan. 30 | None | None | Pec. | 0.15 | 5.1 | 3.0 | .0000 | .0010 | .0100 | .0000 | .12 | 1.5 | .... | .. |
| 3028 | July 28 | V. slight | S. fine | Slight | 0.15 | 4.9 | 3.1 | .0014 | .0050 | .0100 | .0000 | .10 | 1.9 | .... | .. |
| 3873 | 1906 Aug. 21 | None | V. slight | Veg'ble | 0.30 | 5.5 | 4.0 | .0006 | .0060 | .0000 | .0000 | .05 | 1.2 | .... | .. |
| 4082 | Oct. 22 | None | Sl. floc. | Earthy | 0.05 | 4.7 | 3.3 | .0018 | .0070 | .0050 | .0001 | .40 | 2.3 | .... | .. |
| 4496 | 1907 May 2 | None | Slight | M. veg. | 0.20 | 2.8 | 2.1 | .0010 | .0048 | .0050 | .0000 | .19 | 0.9 | .... | .. |
| 4935 | Oct. 8 | Slight | V. slight | None | 0.30 | 5.5 | 3.4 | .0036 | .0074 | .0070 | .0000 | .20 | 2.3 | .... | .. |
| 5205 | 1908 Apr. 3 | Slight | V. slight | S. earthy | 0.25 | 4.8? | 1.5 | .0008 | .0036 | .0080 | .0000 | .21 | 1.2 | .... | .. |
| 5444 | July 20 | Marked | Consid. gel. | None | .00 | 4.6 | 2.9 | .0020 | .0028 | .0040 | .0000 | .09 | 1.2 | .... | .. |
| 5482 | Aug. 6 | Sl. opal | Mod. gel | None | 0.60 | 4.8 | 3.2 | .0032 | .0054 | .0070 | .0000 | .13 | 1.8 | .... | * |
| 5506 | Aug. 13 | V. slight | V. slight | Forei'n | 0.15 | 5.5 | 2.5 | .0014 | .0090 | .0000 | .0000 | .04 | 1.5 | .... | * |
| 5507 | Aug. 13 | Slight | M. floc. | None | 0.30 | 5.5 | 3.0 | .0008 | .0004 | .0050 | .0000 | .14 | 1.1 | .... | .. |
| 5571 | Aug.28 | V. slight | Sl. fine | Sl. foul | 0.15 | 5.3 | 2.3 | .0004 | .0060 | .0030 | .0000 | .12 | 1.9 | .... | * |
| 5639 | Sept.15 | Mod. | S. fibr. | None | 0.05 | 4.7 | 2.8 | .0042 | .0004 | .0020 | .0000 | .14 | 1.9 | .... | * |
| 5792 | Oct. 22 | None | V. slight | Woody | 0.04 | 9.5 | 7.8 | .0040 | .0010 | .050 | .0014 | .21 | 1.4 | .... | .. |
| 5868 | Nov.30 | Sl. opal | Slight | None | 0.10 | 3.4 | 2.1 | .0001 | .0015 | .0000 | .0000 | .23 | 1.1 | .... | .. |
| 7079 | 1909 June 3 | None | V. slight | None | 0.10 | ..... | .... | .0015 | .0060 | .0050 | .0000 | .11 | 1.5 | .... | [1] |
| 7242 | Aug. 4 | None | None | None | 0.20 | 3.5 | 1.8 | .0020 | .0040 | .005 | .0000 | .10 | 1.9 | .... | [1] |
| 7324 | Aug. 30 | None | None | None | 0.00 | 6.0 | .... | .0002 | .0010 | .005 | .0000 | .20 | 2.0 | .... | .. |
| 7403 | Sept.30 | V. faint | V. slight | None | 0.05 | 4.1 | 2.6 | .0010 | .0015 | .005 | .0000 | .10 | 1.8 | .... | [2] |
| 7741 | ....... | V. slight | None | Earthy | 0.05 | 2.9 | 1.4 | .0060 | .0050 | .004 | .0000 | .21 | .9 | .... | .. |
| 8111 | 1910 July 14 | V. slight | V. slight | Sl. foul | 0.05 | 3.9 | 2.3 | .0000 | .0010 | .0025 | .0000 | .10 | 1.9 | .... | * |

* B. Coli present; [1] Drinking Fountain at Tremont Square; [2] Pump from wells on Kelsey's Islands.

*Examination of Water from Bible Hill Aqueduct.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 895 | 1902 Oct. 29 | None | None | None | 0.0 | 8.70 | 5.30 | .0000 | .0022 | .0150 | .0000 | .09 | 3.1 | V.S. | .. |
| 3378 | 1906 Jan. 7 | None | None | None | 0.00 | 8.8 | 5.8 | .0008 | .0016 | .0200 | .0000 | .15 | 3.9 | Tr. | .. |
| 3975 | Sept. 13 | None | None | None | 0.05 | 11.1 | 8.0 | .0010 | .0074 | .0100 | .0000 | .05 | 3.2 | .015 | .. |
| 4476 | 1907 Apr. 29 | None | None | V. slight | 0.00 | 5.6 | 4.0 | .0010 | .0014 | .0500 | .0000 | .14 | 2.6 | .... | .. |
| 4934 | Oct. 8 | V. slight | V. slight | None | 0.00 | 6.2 | 4.2 | .0004 | .0050 | .0050 | .0000 | .15 | 3.2 | .... | .. |
| 5573 | 1908 Aug. 28 | None | Mod. earthy | None | 0.05 | 5.3 | 3.8 | .0002 | .0002 | .0020 | .0000 | .12 | 2.8 | Hgh | |

*Examination of Water Supplied by Grannis Water Works. (Holt System.)*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 236 | 1901 Oct. 28 | None | None | None | 0.0 | 7.10 | 4.40 | .0028 | .0044 | .0200 | .0003 | .07 | .... | .... | .. |
| 237 | Oct. 28 | None | None | None | 0.0 | 9.20 | 5.30 | .0028 | .0054 | .0200 | .0003 | .07 | .... | .... | .. |
| 241 | Oct. 31 | None | None | None | 0.0 | 7.80 | 5.70 | .0010 | .0040 | .0200 | .0004 | .07 | 2.4 | .... | .. |
| 3042 | 1905 Aug. 1 | Consid. earthy | Slight. | Earthy | 0.30 | 8.2 | 6.6 | .0000 | .0026 | .0100 | .0000 | .07 | 3.9 | S. tr. | .. |
| 3364 | 1906 Jan. 4 | None | None | None | 0.00 | 7.5 | 5.2 | .0010 | .0010 | .0100 | .0000 | .10 | 5.0 | 0150 | .. |
| 7675 | 1909 Feb. 25 | None | V. Sl. ferrug. | S. earthy | 0.05 | 7.3 | 5.9 | .0008 | .0004 | .0050 | .0000 | .09 | 5.3 | .... | .. |
| 7985 | 1910 June 23 | None | Slight | None | 0.05 | 5.8 | 4.0 | .0010 | .0020 | .0025 | .0000 | .06 | 3.9 | .... | .. |

*Examination of Water from Sugar River.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5749 | 1908 Oct. 12 | None | V. slight | None | 0.15 | 4.3 | 2.9 | .0032 | .0080 | .0030 | .0000 | .25 | 1.2 | .... | *a |
| 5818 | Nov. 3 | None | S. veg. | None | 0.20 | 3.5 | 1.6 | .0005 | .0060 | .0030 | .0000 | .22 | 0.9 | .... | *c |
| 5819 | Nov. 3 | V. slight | S. veg. | S. earthy | 0.10 | 5.4 | 3.1 | .0010 | .0035 | .0030 | .0000 | .23 | 2.5 | .... | *b |

* B. Coli present; *a* Just above wells; *b* Near Banner Ice House; *c* Above upper dam.

## *Examination of Water from Marshall Pond.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 5737 | 1908 Oct. 8 | Slight | Slight | Slight | 0.20 | 3.3 | 1.5 | .0020 | .0214 | .0050 | .0000 | .05 | .1 | .... | * |

## *Examination of Water from Tap, Supply of S. P. Flint.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7322 | 1909 Aug. 30 | V. slight | Sl. veg. | Sl. veg. | 0.00 | ..... | .... | .0002 | .0030 | .0050 | .0000 | .05 | 3.2 | .... | .. |
| 7742 | 1910 Mar. 21 | None | S. earthy | S. earthy | 0.00 | 6.3 | 4.3 | .0004 | .0034 | .0080 | .0000 | .16 | 4.0 | .... | .. |

## *Examination of Water from Red Water Brook.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7514 | 1909 Nov. 23 | Slight | Sl. floc. | faint | 1.20 | ..... | .... | .0020 | .0200 | .0050 | .0000 | .15 | 1.8 | .... | .. |

## *Examination of Water from Spring of Sullivan Machinery Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5564 | 1908 Aug. 28 | None | None | None | 0.00 | 9.8 | 6.7 | .0006 | .0024 | .0300 | .0001 | 1.28 | 4.2 | .... | * |
| 5580 | Sept. 1 | None | V. slight | None | 0.00 | ..... | .... | .0008 | .0010 | .0800 | .0000 | 1.26 | 4.6 | .... | .. |

## *Examination of Water from Spring Leased by Claremont Aqueduct Association.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5789 | 1908 Oct. 21 | V. slight | Mod. earthy | None | 0.00 | 6.3 | 4.3 | .0010 | .0002 | .0000 | .0000 | .08 | 2.8 | Tr. | * |

* B. Coli present.

*Examination of Ice Cut from Sugar River.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5936 | 1909 Jan. 14 | None | None | Faint sewage | 0.00 | 1.0 | .... | .0015 | .0020 | .0000 | .0000 | .03 | .0 | .... | .. |
| 5937 | Jan. 14 | None | V. slight | S. earthy | 0.00 | 1.2 | .... | .0008 | .0005 | .0000 | .0000 | .03 | .0 | .... | .. |

*Examination of Water Supply of Camp Ground Association, Claremont Junction.*

| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5159 | 1908 Mar. 5 | V. slight | S. earthy | Earthy | 0.10 | .... | .... | .0100 | .0096 | .0100 | .0000 | .63 | 4.6 | .... | *c* |
| 5160 | Mar 5 | None | None | None | 0.00 | .... | .... | .0004 | .0024 | .0120 | .0000 | .40 | 1.2 | .... | *d* |
| 5161 | Mar. 5 | None | None | None | 0.05 | .... | .... | .0036 | .0024 | .0080 | .0000 | .19 | 8.9 | .... | *e* |

*c* Brook; *d* Pump in ravine; *e* Spring under pumphouse.

**Colebrook.**—This town does not own a public water supply. There are two private systems, the J. E. Lombard Water Works, supplying about forty families with water from springs, and the Colebrook Water Company, which constitutes the principal supply. The source of the latter is a stream and springs, and the water flows about four miles through iron pipes, both main and service. Three fourths of the watershed is cleared, and one fourth wooded. There are many private wells within the radius reached by these supplies.



*Examination of Water from Colebrook Water Company's Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| | 1904 | | | | | | | | | | | | | | |
| 2378 | Sept. 15 | Marked | Slight | None | 0.4 | 10.40 | 3.90 | .0000 | .0044 | .0050 | .0000 | .050 | 5.5 | .... | .. |
| 2379 | Sept. 15 | None | V. much floc. veg. | None | 1.1 | 11.00 | 2.80 | .0000 | .0001 | .0000 | .0001 | .05 | 4.4 | .... | .. |
| 2380 | Sept. 15 | None | None | None | 0.0 | 10.00 | 5.20 | .0000 | .0000 | .0300 | .0000 | .07 | 2.7 | .... | .. |
| 2381 | Sept. 15 | None | V. much floc. veg. | None | 0.5 | 11.70 | 5.00 | .0000 | .0072 | .0000 | .0000 | .05 | 4.8 | .... | .. |
| | 1905 | | | | | | | | | | | | | | |
| 2636 | Jan. 9 | None | V. much | Veg. | 0.05 | 8.7 | 5.9 | .0000 | .0020 | .0150 | .0006 | .07 | 2.7 | .... | * |
| 3089 | Aug. 15 | None | None | None | 0.28 | 10.3 | 6.8 | .0006 | .0038 | .0150 | .0000 | .05 | 5.5 | .... | .. |
| | 1906 | | | | | | | | | | | | | | |
| 3363 | Jan. 3 | None | None | S. veg. | 0.15 | 9.3 | 6.7 | .0006 | .0014 | .0300 | .0000 | .05 | 4.9 | .... | .. |
| 3866 | Aug. 18 | None | None | None | 0.40 | 9.3 | 7.3 | .0014 | .0080 | .0000 | .0000 | .12 | 4.5 | .... | * |
| | 1907 | | | | | | | | | | | | | | |
| 4430 | Apr. 10 | None | None | Slight | 0.33 | 6.7 | 4.2 | .0016 | .0044 | .0200 | .0000 | .07 | 3.2 | .... | .. |
| 4945 | Oct. 11 | None | V. slight | None | 0.70 | 6.0 | 3.3 | .0014 | .0084 | .0040 | .0000 | .19 | 3.2 | .... | .. |
| | 1908 | | | | | | | | | | | | | | |
| 5210 | Apr. 3 | None | None | None | 0.10 | 7.0 | 5.6 | .0014 | .0030 | .0080 | .0000 | .05 | 3.2 | .... | .. |
| 5635 | Sept. 14 | V. slight | V. slight | Earthy | 0.10 | ..... | ..... | .0012 | .0042 | .0020 | Tr. | .06 | 6.0 | .... | .. |
| 5636 | Sept. 14 | None | V. slight | Earthy | 0.00 | 11.3 | 9.5 | .0002 | .0002 | .0100 | .0000 | .08 | 7.6 | .... | .. |
| | 1909 | | | | | | | | | | | | | | |
| 7427 | Oct. 7 | None | V. slight | None | 0.05 | 9.2 | 5.2 | .0010 | .0100 | .0050 | .0000 | .10 | 4.4 | .... | .. |
| | 1910 | | | | | | | | | | | | | | |
| 7781 | Apr. 10 | None | S. coarse | None | 0.70 | 1.7 | .6 | .0032 | .0085 | .0150 | .0000 | .07 | 2.2 | .... | .. |

* B. Coli present.

*Examination of Water from the J. E. Lombard Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 3057 | 1905 Aug. 6 | None | S. ferrug. | S. earthy | 0.05 | 10.80 | 5.6 | .0006 | .0010 | .0300 | .0000 | .05 | 3.9 | .... | .. |
| 3367 | 1906 Jan. 4 | None | None | None | 0.05 | 5.3 | 3.0 | .0006 | .0018 | .0230 | .0000 | .05 | 2.6 | .... | .. |
| 3869 | Aug. 20 | None | Slight | None | 0.05 | 5.0 | 3.3 | .0008 | .0010 | .0050 | .0000 | .05 | .... | .... | .. |
| 7425 | 1909 Oct. 7 | None | None | None | 0.00 | 6.0 | 3.0 | .0010 | .0010 | .010 | .0000 | .05 | 3.2 | .... | * |

* B. Coli present.

**Concord.**—The Concord Water Works, owned and operated by the city, were installed in 1871–72; extended to Penacook and St. Paul's School in 1882; high service extension in 1891; high service extended to Penacook in 1904. The source of the supply is Penacook Lake, with an area at high water of 337 acres; greatest area of good depth running from 10 to 75 feet; very little shallow water; bottom gravelly. The watershed, about 3 1-8 square miles, is partly wooded and partly cleared. The shores, excepting Penacook Park, which is well policed, are now rarely frequented by picnic parties. A few cottages, occupied during the summer, have been built on the shores, but they are under sanitary supervision of the city health officer. The State Board of Health has also established rules and regulations for the protection of the purity of this body of water. The city owns and controls four fifths of the shore.

The Plains Water Company, established in 1895, furnishes water to Concord Plains from a well six feet in diameter and dug in the sand to a depth of fifty feet. This well has been extended to a further depth of twelve feet by sinking an iron pipe at the bottom. The water is pumped to a wooden storage tank of 8,000 gallons' capacity.

## *Examination of Water from City Supply.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1901 | | | | | | | | | | | | | | |
| 1 | May 22 | V. slight | Slight | Dec.vg. | 0.0 | 2.90 | 1.80 | .0015 | .0163 | .0048 | .0000 | .13 | .... | .... | .. |
| 2 | May 22 | V. slight | Slight | Faint veg. | 0.0 | ..... | .... | .0013 | .0122 | .0048 | .0000 | .12 | .... | .... | .. |
| 3 | May 22 | Slight | Consid. | Dec.vg. | 0.0 | ..... | .... | .0013 | .0149 | .0048 | .0000 | .12 | .... | .... | .. |
| 4 | May 23 | Slight | Consid. | Dec.vg. | 0.0 | 2.50 | 1.20 | .0014 | .0137 | .0050 | .0000 | .12 | .... | .... | .. |
| 107 | Aug. 6 | None | None | Dec.vg. | 0.12 | 3.30 | 1.90 | .0000 | .0154 | .0000 | .0000 | .11 | .... | .... | .. |
| 113 | Aug. 12 | Slight | Sl. floc. | Dec.vg. | 0.1 | 4.00 | 1.40 | .0014 | .0156 | .0000 | .0000 | .10 | .... | .... | .. |
| | 1902 | | | | | | | | | | | | | | |
| 357 | Jan. 11 | None | None | Veg. | 0.1 | 3.20 | 1.20 | .0030 | .0138 | .0000 | .0000 | .14 | 1.1 | .... | .. |
| 398 | Feb. 10 | V. slight | V. slight | Veg. | 0.12 | 3.70 | 1.90 | .0044 | .0136 | .0000 | .0000 | .12 | .9 | .... | .. |
| 591 | June 13 | V. slight | V. slight | Dec.vg. | 0.15 | 5.30 | 1.50 | .0016 | .0146 | .0000 | .0000 | .11 | .7 | .... | .. |
| 592 | June 13 | V. slight | Slight | Dec.vg. | 0.1 | 6.20 | 1.60 | .0000 | .0124 | .0000 | .0000 | .11 | .7 | .... | .. |
| 593 | June 13 | V. slight | V. slight | Slight | 0.15 | 5.50 | 2.10 | .0006 | .0072 | .0000 | .0000 | .11 | .7 | .... | .. |
| 594 | June 13 | V. slight | V. slight | Veg. | 0.15 | 6.10 | 1.70 | .0006 | .0126 | .0000 | .0000 | .11 | .7 | .... | .. |
| 595 | June 13 | V. slight | V. slight | Veg. | 0.15 | 6.70 | 1.70 | .0006 | .0108 | .0000 | .0000 | .12 | .7 | .... | .. |
| 596 | June 13 | None | None | Veg. | 0.15 | 6.20 | 1.60 | .0000 | .0112 | .0000 | .0000 | .11 | .7 | .... | .. |
| 775 | Sept. 4 | None | None | Dec.vg. | 0.1 | 4.30 | 1.50 | .0000 | .0102 | .0000 | .0000 | .12 | 1.5 | .... | .. |
| 13 | Nov. 11 | None | None | Sl. veg. | 0.05 | 5.80 | 1.60 | .0000 | .0094 | .0000 | .0000 | .14 | 1.5 | .... | .. |
| | 1903 | | | | | | | | | | | | | | |
| 966 | Jan. 1 | None | None | Sl. veg. | 0.12 | 5.40 | 1.60 | .0000 | .0086 | .0000 | .0000 | .17 | 1.5 | .... | .. |
| 983 | Jan. 12 | None | None | Sl. veg. | 0.05 | ..... | .... | ..... | ..... | .0000 | .0000 | .... | .... | .... | .. |
| 1078 | Mar. 7 | None | None | V.slight | 0.05 | ..... | .... | .0006 | .0056 | .0050 | .0000 | .15 | 1.8 | .... | .. |
| 1153 | Apr. 21 | Slight | Fine | Dec.vg. | 0.05 | 2.90 | 1.40 | .0000 | .0030 | .0000 | .0000 | .15 | 1.4 | .... | .. |
| 1269 | June 19 | None | None | Sl. veg. | 0.05 | ..... | .... | ..... | ..... | ..... | ..... | .... | .... | .027 | .. |
| | 1904 | | | | | | | | | | | | | | |
| 1924 | May 6 | Slight | Slight | Sl. veg. | 0.05 | 3.10 | 1.60 | .0006 | .0054 | .0000 | .0000 | .15 | 1.5 | .... | .. |
| 2371 | Sept.15 | None | None | Sl. veg. | 0.05 | 3.80 | 0.90 | .0000 | .0044 | .0000 | .0000 | .13 | 1.5 | .... | * |
| 2584 | Dec. 13 | V. slight | Slight | Slight | 0.05 | 2.3 | 1.3 | .0000 | .0114 | .0000 | .0000 | .15 | 0.4 | .... | * |
| | 1905 | | | | | | | | | | | | | | |
| 3025 | July 27 | None | V. slight | S. earthy | 0.20 | 3.7 | 1.5 | .0020 | .0134 | .0050 | .0000 | .12 | 0.9 | .... | .. |
| | 1906 | | | | | | | | | | | | | | |
| 3413 | Jan. 25 | None | None | Sl. veg. | 0.05 | 4.3 | 2.3 | .0014 | .0074 | .0050 | .0000 | .15 | 0.6 | .... | .. |
| 3918 | Aug. 31 | None | V. slight | S. musty | 0.05 | 3.0 | 1.5 | .0006 | .0084 | .1000 | .0000 | .12 | 0.4 | .... | .. |
| 3999 | Sept.19 | S. opal | V. slight | Slight | 0.10 | 3.2 | 1.2 | .0020 | .0100 | .0050 | .0000 | .15 | 0.4 | .... | .. |

* B Coli present.

*Examination of Water from City Supply.—Concluded.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1907 | | | | | | | | | | | | | | |
| 4413 | Apr. 8 | None | V. slight | Sl. veg. | 0.10 | 2.8 | 0.7 | .0012 | .0062 | .0000 | .0000 | .14 | 0.9 | .... | .. |
| 4718 | July 16 | None | V. slight | Earthy | 0.05 | 3.6 | 1.1 | .0014 | .0090 | .0050 | .0000 | .16 | 0.4 | .... | * |
| 4762 | July 25 | None | None | Earthy | 0.05 | ..... | .... | .0010 | .0048 | .0050 | .0000 | .20 | 1.2 | .... | .. |
| | 1908 | | | | | | | | | | | | | | |
| 5221 | Apr. 10 | V. slight | Slight | Swam-py | 0.10 | 3.0 | 1.5 | .0002 | .0058 | .0030 | .0000 | .15 | 0.4 | .... | .. |
| 5346 | June 12 | V. slight | Sl. floc. | Veg. | 0.10 | ..... | .... | .0006 | .0044 | .0030 | .0000 | .10 | 1.2 | .... | .. |
| 5866 | Nov. 27 | None | V. slight | S. Mar-shy | 0.05 | 2.4 | 1.0 | .0010 | .0080 | .0000 | .0000 | .10 | .30 | .... | .. |
| | 1909 | | | | | | | | | | | | | | |
| 7251 | Aug. 9 | V.S. opal | V. slight | S. earthy | 0.30 | 4.0 | 3.0 | .0010 | .0040 | .005 | Tr. | .12 | 1.20 | .... | *1 |
| 7270 | Aug. 12 | None | None | None | 0.05 | 3.4 | 1.8 | .0008 | .0040 | .005 | .0000 | .12 | .40 | .... | .. |
| 7423 | Oct. 7 | None | None | None | 0.00 | 2.7 | 1.2 | .0002 | .0060 | .005 | .0000 | .14 | .30 | .... | .. |
| 7501 | Nov. 3 | None | V. slight | None | 0.05 | ..... | .... | .0002 | .0050 | .0000 | .0000 | .15 | .9 | .... | 2 |
| 7502 | Nov. 3 | None | None | Slight | 0.05 | 2.2 | .7 | .0001 | .0070 | .0000 | .0000 | .16 | .9 | .... | 3 |
| | 1910 | | | | | | | | | | | | | | |
| 7740 | Mar. 22 | Slight | V. slight | None | 0.05 | 3.5 | 1.9 | .0026 | .0050 | .0020 | .0000 | .10 | .60 | .... | .. |
| 8176 | July 24 | V. slight | Med. floc | Stale | 0.10 | ..... | .... | High | .0098 | .005 | .0000 | .10 | 1.0 | .... | 4 |

* B. Coli present; [1] Tap, Contoocook River Park; deadend of line; [2] Tap, St. Paul's School; Tap in lower school kitchen, St. Paul's School; [4] Taken from foul pipe.

*Examination of Water from Concord Plains Supply.*

| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1908 | | | | | | | | | | | | | | |
| 5711 | Sept. 30 | Slight | V. slight | S. earthy | 0.20 | ..... | .... | High | .0066 | .1000 | .0008 | .70 | .... | .... | .. |
| 5764 | Oct. 16 | None | V. S. earthy | S. earthy | 0.00 | 2.5 | .... | .0025 | .0028 | .0080 | .0000 | .25 | .4 | .... | .. |
| 5765 | Oct. 16 | S. opal. | S. earthy | M. earthy | 0.20 | 5.0 | .... | .0172 | .0025 | .0100 | .0002 | .52 | 1.4 | .... | .. |
| 5793 | Oct. 23 | V. slight | V. slight | None | 0.20 | 4.1 | 1.9 | .0075 | .0001 | .2250 | .0010 | .38 | 1.9 | .... | .. |

*Examination of Water from Well in Penacook Park.*

| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1906 | | | | | | | | | | | | | | |
| 3906 | Aug. 27 | None | V. slight | Sl. veg. | 0.10 | 8.2 | 4.6 | .0010 | .0016 | .0050 | .0000 | .35 | .... | .... | * |
| | 1907 | | | | | | | | | | | | | | |
| 4619 | June 15 | None | None | Woody | 0.05 | ..... | .... | .0008 | .0002 | .0050 | .0000 | .31 | 2.5 | .... | .. |
| 4666 | June 26 | None | None | Slight | 0.00 | ..... | .... | .0002 | .0002 | .0050 | .0000 | .25 | 2.4 | .... | .. |

* B. Coli present.

*Examination of Water from Well in White's Park.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 3917 | 1906 Aug. 31 | None | None | None | 0.35 | 11.5 | 7.0 | .0010 | .0020 | .2000 | .0000 | .97 | .... | .... | .. |
| 7153 | 1909 July 1 | None | None | None | 0.00 | ..... | .... | .0020 | .0015 | .400 | .0000 | 1.00 | 2.9 | .... | .. |
| 7230 | Aug. 3 | None | None | S. Distinct foul | 0.00 | 11.5 | .... | .0010 | .0010 | .450 | .0000 | 1.00 | 3.2 | .... | .. |
| 8175 | 1910 July 21 | None | V. slight | None | 0.05 | 12.2 | 5.6 | .0014 | .0028 | .200 | .0000 | .95 | 3.9 | .... | .. |

*Examination of Ice from Eddy Pond, Owned by Concord Ice Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7760 | 1910 Mar. 29 | None | Slight | S. foul | 0.05 | 4.5 | 2.2 | .0020 | .0048 | .006 | .0000 | .06 | .3 | .... | *a* |
| 7761 | Mar. 29 | None | V. slight | Slight | 0.00 | 2.8 | 1.1 | .0024 | .0026 | .002 | .0000 | .06 | .3 | .... | *b* |

*a* Snow in surface layer; *b* Clear in lower layer.

*Examination of Water from Spring on Property of the State Prison.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6084 | 1909 Apr. 5 | None | None | None | 0.00 | 4.4 | 2.4 | .0002 | .0001 | .0050 | .0000 | .10 | .10 | .... | .. |

*Examination of Water from Spring, Proposed Supply of East Concord Schools.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7101 | 1909 June 10 | None | V. slight | None | 0.00 | 5.5 | .... | .0014 | .0050 | .0300 | .0000 | .24 | 3.9 | .... | .. |

**Conway.**—The Conway Aqueduct Company supplies Conway Village with water from a system of natural springs about two and one-half miles from the Center.

The village of North Conway and, except during the winter, the villages of Intervale and Kearsarge are furnished with water by the North Conway Water & Improvement Company, the source being three brooks located on Hurricane Mountain and the water of which is stored in three separate reserviors, known as the Hurricane, the Middle and the Artist Falls reservoirs. Commencing at the Fairview in Intervale, all the houses to the southern limits of North Conway are supplied by this system.



*Examination of Water from Faucet of Conway Aqueduct Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| | 1904 | | | | | | | | | | | | | | |
| 2396 | Oct. 2 | None | Slight | Sl. veg. | 0.25 | 2.6 | 2.2 | .0000 | .0000 | .0000 | .0001 | .07 | 0.9 | .... | .. |
| 2402 | Oct. 2 | None | Slight | None | 0.20 | 6.8 | 3.4 | .0000 | .0000 | .0000 | .0000 | .05 | 1.8 | .... | .. |
| | 1905 | | | | | | | | | | | | | | |
| 3050 | Aug. 4 | None | None | S. earthy | 0.10 | 2.6 | 1.1 | .0000 | .0024 | .0050 | .0000 | .07 | 0.6 | .... | .. |
| 3405 | Jan. 21 | None | None | None | 0.10 | 4.4 | 1.2 | .0010 | .0014 | .0100 | .0000 | .12 | 0.3 | .... | .. |
| | 1907 | | | | | | | | | | | | | | |
| 4579 | May 29 | None | None | None | 0.10 | 2.3 | 1.3 | .0006 | .0018 | .0750 | .0000 | .11 | 0.4 | .... | .. |
| 4938 | Oct. 9 | None | None | None | 0.80 | 3.2 | 2.0 | .0008 | .0068 | .0030 | .0000 | .14 | 1.2 | No | .. |
| | 1908 | | | | | | | | | | | | | | |
| 5226 | Apr. 13 | V. slight | V. slight | None | 0.20 | 2.3 | 1.5 | .0000 | .0010 | .0030 | .0000 | .05 | 0.4 | No | .. |
| 5808 | Oct. 28 | None | None | S. earthy | 0.15 | 1.7 | .6 | .0030 | .0010 | .0000 | .0000 | .05 | .3 | .025 | .. |
| 5849 | Nov. 17 | None | None | None | 0.10 | 2.5 | 1.7 | .0020 | .0001 | .0100 | .0000 | .04 | .1 | 0 | .. |
| 5850 | Nov. 17 | None | None | None | 0.10 | 2.4 | 1.4 | .0010 | .0005 | .010 | .0000 | .04 | .1 | 0 | .. |
| | 1909 | | | | | | | | | | | | | | |
| 6014 | Feb. 23 | None | None | None | 0.05 | 2.5 | 1.8 | .0001 | .0010 | .020 | .0000 | .05 | .1 | .... | .. |
| 7310 | Aug. 20 | None | Slight | Faint fishy | 0.05 | .... | .... | .0010 | .0008 | .005 | .000 | .10 | .3 | .... | * |
| 7334 | Sept. 1 | V. slight | V. slight | None | 0.05 | 3.0 | .... | .0002 | .0008 | .005 | .0000 | .05 | .3 | .... | * |
| 7372 | Sept. 20 | None | None | None | 0.05 | 3.8 | 2.0 | .0010 | .0012 | .005 | .0000 | .08 | .9 | .... | * |
| 7535 | Dec. 1 | None | None | None | 0.00 | 2.3 | 1.6 | .0010 | .0020 | .005 | .0000 | .08 | .4 | .... | .. |
| | 1910 | | | | | | | | | | | | | | |
| 7753 | Mar. 24 | Slight | Slight | Earthy | 0.20 | 4.2 | 2.3 | .0004 | .0036 | .004 | .0000 | .08 | .6 | .... | .. |
| 8133 | July 15 | None | V. slight | Musk | 0.05 | 2.5 | 2.2 | .0024 | .0006 | .005 | .0000 | .05 | .9 | .... | .. |
| 8134 | July 15 | None | V. slight | None | 0.05 | 2.4 | 1.7 | .0002 | .0004 | .005 | .0000 | .05 | .9 | .... | .. |
| 8265 | Aug. 2 | None | V. slight | None | 0.00 | .... | .... | .0010 | .0013 | .020 | .0000 | .04 | .9 | 0 | .. |
| 8276 | Aug. 4 | Mod. | Med. floc | Musk | 0.70 | 5.0 | 3.0 | .0010 | High | .005 | .0000 | .05 | 1.6 | .... | * |
| 8342 | Aug. 22 | None | S. floc. | S. earthy | 0.00 | 2.5 | 1.0 | .0010 | .0015 | .005 | .0000 | .08 | 0.4 | .... | .. |

* B. Coli present. Six special examinations for colon bacilli made during the period September 1, 1908, to August 31, 1910, resulted in six positive and three negative findings.

*Examination of Water Supplying North Conway.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| | 1905 | | | | | | | | | | | | | | |
| 3159 | Sept. 12 | None | None | Slight | 0.10 | 2.7 | 0.8 | .0008 | .0042 | .0100 | .0000 | .07 | 0.3 | .... | .. |
| 3206 | Sept. 29 | None | None | Veg. | 0.15 | 4.5 | 2.5 | .0020 | .0030 | .0100 | .0000 | .05 | 0.6 | .... | *b* |
| 3207 | Sept. 29 | None | None | Earthy | 0.10 | 3.3 | 2.0 | .0020 | .0024 | .0100 | .0000 | .05 | 0.1 | .... | **c* |
| | 1906 | | | | | | | | | | | | | | |
| 3508 | Mar. 5 | None | None | Veg. | 0.05 | 2.4 | 1.0 | .0008 | .0034 | .0100 | .0000 | .05 | 0.4 | .... | .. |
| 3714 | June 28 | None | None | None | 0.10 | 2.5 | 1.0 | .0026 | .0020 | .0050 | .0000 | .05 | 0.3 | .... | **c* |
| 3715 | June 28 | None | V. slight | None | 0.10 | 3.0 | 1.0 | .0014 | .0020 | .0030 | .0000 | .05 | 0.3 | .... | **d* |
| 3716 | June 28 | Slight | Consid. floc. | Veg. | 0.40 | 8.3 | 1.7 | .0192 | .0800 | .0000 | .0000 | .10 | .... | .... | **e* |
| | 1910 | | | | | | | | | | | | | | |
| 7927 | May 25 | None | V. slight | None | 0.05 | 2.7 | 1.6 | .0030 | .0035 | .0025 | .0000 | .07 | .7 | .... | .. |
| 7965 | June 14 | None | V. slight | None | 0.10 | 2.4 | 1.9 | .0015 | .0020 | .0025 | .0000 | .04 | .7 | .... | .. |
| 7966 | June 14 | V. slight | V. slight | None | 0.05 | 3.4 | 2.2 | .0025 | .0020 | .0025 | .0000 | .05 | .6 | .... | * |
| 8055 | July 7 | None | V. slight | None | 0.05 | ..... | .... | .0005 | .0020 | .0050 | .0000 | .04 | .4 | .... | * |

* B. Coli present; *b* Reservoir No. 1; *c* reservoir No. 2; *d* reservoir No. 3; *e* Shingle Pond.

**Cornish.**

*Examination of Ice from Blow-me-down Brook.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1909 | | | | | | | | | | | | | | |
| 7581 | Dec. 23 | None | V. slight | Earthy | 0.00 | ..... | .... | .0002 | .0010 | .0000 | .0000 | .05 | 1.5 | .... | .. |
| 7583 | Dec. 26 | V. faint | S. fibrous | S. earthy | 0.00 | ..... | .... | .0045 | .0030 | .0000 | .0000 | .05 | .3 | .... | .. |

**Croydon.**—One private supply is from a spring, the water being brought one-half mile through lead pipe, from which eight families are furnished.

**Dalton.**

*Examination of Water from Forest Lake.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1907 | | | | | | | | | | | | | | |
| 4657 | June 21 | None | None | Slight | 0.20 | ..... | .... | .0046 | .0130 | .0050 | .0000 | .17 | 0.6 | .... | .. |

**Derry.**—During 1910 the town of Derry purchased the Derry Water Works. This supply, built in 1890, consists of about 40 wells driven to a depth of fifty feet. The water is pumped to a stand pipe of 180,000 gallons' capacity.

The former  practice of pumping from a polluted auxiliary (a brook) during times of low water or fire has been discontinued, it having been agreed that future resort to the brook supply shall be made only in case of a great emergency.

*Examination of Water from Faucet of Derry Water Works Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 794 | 1902 Sept. 4 | None | Slight | V. slight | 0.0 | 6.40 | 4.80 | .0000 | .0012 | .0120 | .0000 | .60 | 3.1 | .... | .. |
| 1372 | 1903 July 24 | None | None | S. musty | 0.0 | 7.00 | 3.60 | .0000 | .0010 | .1500 | .0000 | .65 | 2.3 | .... | .. |
| 1532 | Sept. 2 | None | V. slight | None | 0.1 | 12.40 | 6.80 | .0000 | .0038 | .0700 | .0000 | .55 | 2.4 | .... | .. |
| 1946 | 1904 Mar. 10 | None | None | S. veg. | 0.05 | 6.90 | 4.90 | .0000 | .0014 | .1500 | .0000 | .65 | 2.6 | .... | .. |
| 2676 | 1905 Feb. 1 | None | None | None | 0.00 | 8.7 | 6.5 | .0000 | .0000 | .1000 | .0000 | .72 | 2.6 | .... | .. |
| 3068 | Aug. 9 | None | None | Slight | 0.00 | 8.0 | 4.7 | .0000 | .0008 | .0850 | .0000 | .62 | 2.7 | .... | .. |
| 3362 | 1906 Jan. 4 | None | None | None | 0.05 | 7.5 | 4.8 | .0006 | .0024 | .1000 | .0000 | .25 | 2.9 | .... | .. |
| 3855 | Aug. 17 | None | V. slight | S. earthy | 0.20 | 7.0 | 4.0 | .0006 | .0064 | .0050 | .0000 | .55 | 2.2 | .... | .. |
| 4205 | Dec. 5 | None | None | None | 0.05 | 7.4 | 4.3 | .0006 | .0030 | .1000 | .0000 | .75 | 2.6 | .... | .. |
| 4206 | Dec. 5 | V. slight | V. slight | S. veg. | 0.30 | 6.2 | 3.2 | .0046 | .0214 | .0050 | .0000 | .30 | 2.2 | .... | * |
| 4207 | Dec. 5 | None | None | Earthy | 0.03 | 7.4 | 4.2 | .0010 | .0030 | .1400 | .0000 | .67 | 2.3 | .... | * |
| 4429 | 1907 Apr. 11 | None | V. slight | None | 0.10 | 8.8 | 5.9 | .0016 | .0010 | .2500 | .0000 | .85 | 2.6 | .... | .. |
| 4831 | Aug. 26 | ........ | ........ | ....... | 0,20 | ..... | .... | .0014 | .0064 | .0050 | .0000 | .51 | 1.9 | .... | .. |
| 4933 | Oct. 7 | V. slight | V. slight | None | 0.30 | 6.5 | 3.8 | .0002 | .0074 | .0150 | .0000 | .38 | 2.6 | .... | * |
| 5171 | 1908 Mar. 16 | None | None | None | 0.15 | 7.3 | 4.6 | .0010 | .0012 | .0200 | .0000 | .40 | 3.2 | .... | .. |
| 5196 | Mar. 30 | None | None | None | 0.00 | ..... | .... | .0004 | .0010 | .0350 | .0000 | .86 | 2.6 | .... | .. |
| 5219 | Apr. 8 | None | None | None | 0.00 | 4.7 | 3.1 | High | .0028 | .0150 | .0000 | .72 | 3.2 | .... | .. |
| 5925 | 1909 Jan. 6 | None | None | None | 0.05 | 8.3 | 4.5 | .0001 | .0008 | .350 | .0000 | .92 | 2.6 | .... | .. |
| 7271 | Aug. 11 | None | None | None | 0.00 | 9.0 | 5.0 | .0005 | .0010 | .150 | .0000 | .70 | 2.4 | .... | .. |
| 7754 | 1910 Apr. 5 | None | None | None | 0.05 | 8.7 | 5.7 | .0016 | .0042 | .075 | .0000 | .92 | 3.7 | .... | .. |
| 7908 | May 20 | None | S. earthy | S. earthy | 0.10 | 9.6 | 6.6 | .0010 | .0020 | .150 | .0010 | .95 | 3.9 | .... | † |

* B. Coli present. † .4 Zinc.

**Dover.**—The public water supply originally installed by the city (in 1888) was taken from Willand's Pond, the original area of which (78 3-4 acres) has of late been greatly reduced. In 1905 a system of springs, known as the Hussey Springs, was added to the supply. The latter has proved quite unsatisfactory, one objection being the excessive quantity of iron appearing in this supply as a result of the solvent action of the carbonic acid derived from the peaty surface soil, upon the underlying ferruginous sand. A second serious objection has arisen in the rather frequently occurring acid condition of the springs water apparently due to some form of non-volatile soil acid derived from the peat.

During 1909 a modern and extensive slow and filtration plant was installed, its object being partly the removal of the iron from the spring water, partly to insure the safety of the pond supply. While these filters are doing excellent work it has been found necessary to discontinue use of certain of the iron springs and an attempt is at present being made to supplant these and the shortage from the diminishing pond supply by securing other sources.

*Examination of Water from Willand's Pond.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Iron. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 246 | 1901 Nov. 4 | None | None | Faint | 0.0 | 5.50 | 2.40 | .0010 | .0080 | .0000 | .0000 | .19 | .... | .... | .. |
| 985 | 1903 July 13 | None | None | S. fishy | 0.1 | 7.00 | 2.40 | .0000 | .0036 | .0000 | .0000 | .30 | 1.8 | .... | .. |
| 1356 | July 20 | Slight | Floc. vg. | V. dec. veg. | 0.1 | 6.20 | 2.50 | .0010 | .0146 | .0000 | .0000 | .25 | 1.1 | .... | .. |
| 1422 | Aug. 10 | Marked | M. floc. | Veg. | 0.1 | 7.30 | 2.00 | .0000 | .0084 | .0000 | .0000 | .37 | 1.6 | .... | .. |
| 2031 | 1904 June 9 | Marked | M. floc. veg. | S. earthy | 0.1 | 4.50 | 2.90 | .0008 | .0034 | .0000 | .0000 | .30 | 2.4 | .... | .. |
| 2035 | June 9 | Marked | V. much red | None | 0.05 | 5.50 | 4.10 | .0006 | .0042 | .0000 | .0000 | .30 | 2.8 | .... | .. |
| 2037 | June 9 | Slight | Slight | Slight | 0.05 | 5.20 | 2.80 | .0006 | .0036 | .0000 | .0000 | .30 | 2.6 | .... | .. |
| 2150 | July 12 | Slight | M. floc. | Dec. musty | 0.05 | 4.10 | 2.30 | .0000 | .0092 | .0000 | .0000 | .28 | 1.6 | .... | * |
| 2151 | July 12 | Marked | Consid. | V. marked aromatic | 0.8 | 4.30 | 2.70 | .0010 | .0074 | .0000 | .0000 | .25 | 2.6 | .... | * |
| 2671 | 1905 Jan. 30 | None | V. slight | Veg. | 0.15 | 5.6 | 3.6 | .0000 | .0034 | .0100 | .0000 | .35 | 0.9 | .... | .. |
| 3443 | 1906 July 11 | None | Slight | M. veg. | 0.20 | 5.0 | 2.5 | .0014 | .0084 | .0150 | .0000 | .25 | 0.6 | .... | .. |
| 3744 | July 11 | V. slight | Slight | Veg. | 0.20 | 4.1 | 2.5 | .0018 | .0090 | .0100 | .0000 | .25 | 0.6 | .... | * |
| 5267 | 1908 Mar. 29 | V. slight | Slight | S. earthy | 0.05 | 3.7 | 2.2 | .0004 | .0080 | .0080 | .0000 | .29 | 0.9 | .008 | .. |
| 5327 | May 28 | None | V. slight | None | 0.05 | 3.6 | 1.6 | .0010 | .0054 | .0040 | .0000 | .30 | 0.4 | .01 | .. |

* B. Coli present.

*Examination of Water from Taps in the City.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Iron. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3558 | 1906 Apr. 13 | None | Ferrug. | None | 0.20 | 10.6 | 8.2 | .0014 | .0144 | .0200 | .0000 | .70 | 3.7 | ..... | .. |
| 3654 | June 5 | Opal | Slight | None | 0.10 | 12.6 | 9.0 | .0014 | .0140 | .0050 | Tr. | .60 | 3.6 | ..... | .. |
| 3655 | June 5 | Opal | M. fer. | Sl. veg. | 0.13 | 11.0 | 8.5 | .0012 | .0040 | .0050 | Tr. | .60 | 3.2 | ..... | .. |
| 3701 | June 21 | Mod'ate | Con. fer. | V.slight | .03 | 12.8 | 9.3 | .0094 | .0024 | .0050 | .0002 | .75 | 5.7 | .66 | .. |
| 4298 | 1907 Jan. 28 | Mod. opal | Mod. fer. | Sl. veg. | 0.30 | ..... | .... | .0030 | .0036 | .0050 | .0000 | .42 | 2.3 | .40 | * |
| 4311 | Jan. 29 | Mod. opal | V. slight | Sl. veg. | 0.15 | ..... | .... | .0044 | .0016 | .0080 | .0000 | .37 | 2.4 | .15 | .. |
| 4312 | Jan. 29 | None | None | None | 0.00 | ..... | .... | .0038 | .0014 | .0050 | .0000 | .40 | 1.9 | .04 | .. |
| 4318 | Jan. 29 | Sl. opal | V. slight | Sl. veg. | 0.10 | ..... | .... | .0044 | .0016 | .0080 | .0000 | .45 | 2.9 | .10 | .. |
| 4323 | Feb. 1 | V. slight | V. slight | Veg. | 0.10 | ..... | .... | .0040 | .0040 | .0030 | Ft. tr. | .37 | 1.6 | .035 | .. |
| 4324 | Feb. 1 | Slight | V. slight | Sl. veg. | 0.10 | ..... | .... | .0064 | .0048 | .0030 | Ft. tr. | .38 | 1.9 | .15 | .. |
| 4325 | Feb. 1 | Slight | V. slight | Sl. veg. | 0.10 | ..... | .... | .0060 | .0042 | .0030 | Ft. tr. | .39 | 1.9 | .13 | .. |
| 4326 | Feb. 1 | Slight | V. slight | Sl. veg. | 0.10 | ..... | .... | .0079 | .0054 | .0070 | Tr. | .39 | 1.6 | .15 | .. |
| 4330 | Feb. 6 | Slight | Sl. floc. | Slight | 0.05 | ..... | .... | .0050 | .0016 | .0200 | .0000 | .45 | 2.2 | .17 | .. |
| 4331 | Feb. 6 | Mod'ate | Sl. fer. | Slight | 0.15 | ..... | .... | .0050 | .0026 | .0080 | .0000 | .40 | 2.2 | .09 | .. |
| 4364 | Mar. 7 | V.sl.opal | V. slight | V.slight | 0.20 | 5.2 | .... | .0060 | .0070 | .0080 | Tr. | .45 | 1.9 | .12 | .. |
| 7013 | 1909 Apr. 28 | None | None | None | 0.05 | 8.9 | 7.6 | .0060 | .0020 | .005 | .0000 | .50 | 3.2 | .01 | .. |
| 7419 | Oct. 7 | S. opal | None | None | 0.00 | 11.3 | 6.6 | .0008 | .0020 | .005 | .0000 | .45 | 3.2 | .02 | .. |
| 7573 | Dec. 22 | S. opal | Slight | None | 0.00 | 12.5 | 9.0 | .0025 | .0040 | .005 | .0000 | .55 | 4.7 | .... | † |
| 7574 | Dec. 22 | None | V. slight | None | 0.00 | 8.5 | 6.0 | .0020 | .0070 | .005 | .0000 | .55 | 3.9 | ..... | .. |
| 7612 | 1910 Jan. 21 | None | Slight | None | 0.00 | 6.0 | 4.0 | .0045 | .0025 | .005 | .0000 | .60 | 1.9 | Tr. | .. |
| 7722 | Mar. 15 | None | None | None | 0.00 | 16.2 | 9.9 | .0312 | .0054 | .005 | .0000 | .79 | 9.3 | .088 | .. |
| 7723 | Mar. 15 | None | None | None | 0.05 | 9.7 | 7.2 | .0004 | High | .004 | .0000 | .74 | 4.4 | .035 | .. |
| 7724 | Mar. 15 | Slight | Mod. | None | 0.05 | 11.1 | 8.3 | .0012 | .0120 | .005 | .0000 | .66 | 5.7 | .... | *a* |
| 8045 | July 7 | None | S. white | None | 0.10 | 7.2 | 4.8 | .0010 | .0015 | .005 | .0000 | .60 | 3.5 | .05 | .. |

* B. Coli present. † .8 Zinc. *a* Distinct trace of Copper.

*Examination of Water from Hussey Springs.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Iron. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid. | Nitrates. | Nitrites. | | | | |
| 3699 | 1906 June 21 | Sl. opal | Sl.ferrug | None | 0.03 | 11.0 | 8.0 | .0052 | .0026 | .0100 | .0000 | .90 | 3.6 | 1.44 | .. |
| 3941 | Sept. 6 | None | Mod. earthy | None | 0.05 | 5.7 | 3.0 | ..... | ..... | .0200 | .0000 | .50 | 1.4 | .... | .. |
| 4136 | Nov. 7 | M.ferrug | M.ferrug | None | 0.10 | 10.5 | 8.0 | .0050 | .0040 | .0080 | .0000 | .77 | 3.7 | .... | .. |
| 4275 | 1907 Jan. 9 | Sl. opal | V. slight | Sl. veg. | 0.05 | ..... | .... | .0082 | .0012 | .0050 | .0000 | .46 | 1.5 | .048 | .. |
| 4360 | Mar. 6 | V. Sl. opal | V. slight | None | 0.20 | ..... | .... | .0010 | .0084 | .0050 | .0000 | .65 | 4.6 | .70 | .. |
| 4384 | Mar.27 | Consid. opal | Mod. fine | Sl. earthy | 0.12 | 5.2 | 3.9 | .0030 | .0040 | .0200 | .0000 | .43 | 1.2 | .20 | .. |
| 4386 | Mar.27 | Sl. opal | Sl. fine | Sl. foreign | 0.05 | 4.8 | 3.7 | .0030 | .0126 | .0150 | Tr. | .55 | 1.6 | .06 | * |
| 4690 | July 9 | Sl. opal | Sl.ferrug. | Sl. earthy | 0.10 | 4.8 | 3.0 | .0010 | .0028 | .0050 | Very high | .40 | 1.9 | 1.25 | * |
| 4734 | July 19 | None | Sl. mod. | None | 0.05 | 5.8 | 4.3 | .0018 | .0002 | .0100 | .0000 | .66 | 2.2 | .06 | .. |
| 4790 | Aug. 6 | V. Sl. opal | V. slight | None | 0.05 | 7.8 | 5.5 | .0028 | .0010 | .0050 | .0000 | .80 | 1.2 | .055 | .. |
| 4791 | Aug. 6 | V. Sl. opal | Sl. ferrug | None | 0.10 | 5.2 | 4.4 | .0024 | .0014 | .0050 | .0000 | .48 | 1.2 | .125 | * |
| 4886 | Sept.17 | None | V.slight | None | 0.05 | 5.5 | 4.5 | .0010 | .0014 | .0050 | .0000 | .48 | 1.9 | .016 | .. |
| 4887 | Sept.17 | None | V. slight | None | 0.10 | 5.2 | 4.3 | ..... | ..... | ..... | ..... | .... | .... | .... | .. |
| 5266 | 1908 Apr. 29 | None | V. slight | V.slight | 0.08 | 6.9 | 4.8 | .0030 | .0024 | .0150 | .0000 | .52 | 2.4 | .04 | .. |
| 5325 | May 28 | None | V. slight | None | 0.10 | 8.8 | 5.2 | .0018 | .0002 | .0020 | .0000 | .42 | .26 | .20 | .. |
| 7012 | 1909 Apr. 27 | Sl. ferrug | Consid. ferrug. | None | 0.20 | 11.0 | 8.8 | .0120 | .0020 | .0050 | .0000 | .59 | 4.3 | .50 | .. |

* B. Coli present.

*Examination of Water from Various Sources, on Public Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Iron. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 1420 | 1903 Aug. 10 | Marked | V. much floc. | Veg. | 0.04 | 6.20 | 3.00 | .0054 | .0056 | .0300 | .0000 | .38 | 2.8 | .... | *a* |
| 1994 | 1904 May 27 | Slight | V. much red floc. | V.slight | 0.03 | 4.60 | 3.20 | .0022 | .0040 | .0100 | .0000 | .43 | 1.6 | .... | **a* |
| 3170 | 1905 Sept.15 | Consid. | Con. fer. | Earthy | 0.25 | 7.4 | 6.4 | .0114 | .0154 | .0150 | .0000 | .42 | 3.1 | .... | *b* |
| 3172 | Sept.14 | Mod. op. | Mod'rate | Earthy | 0.45 | 7.2 | 4.7 | .0028 | .0084 | .0200 | .0000 | .57 | 1.5 | .... | **c* |
| 3281 | Nov. 1 | Opal | Consid. earthy | None | 0.10 | 5.4 | 4.4 | .0014 | .0024 | .0050 | .0000 | .57 | 1.4 | .... | *d* |
| 3282 | Nov. 1 | None | S. floc. | None | 0.05 | 5.8 | 4.6 | .0060 | .0044 | .0050 | .0000 | .57 | 1.5 | .... | *e* |
| 3283 | Nov. 1 | Slight | Con. fer. | Veg. | 0.15 | 8.0 | 6.3 | .0144 | .0034 | .0050 | .0000 | .50 | 1.6 | .... | *f* |
| 3599 | May 8 | S. opal | Heav. fer. | S. veg. | 0.30 | 10.9 | 8.4 | .0090 | .0024 | .0500 | .0000 | 2.48 | .... | .... | *g* |
| 3600 | May 8 | None | V. S. floc. | M. foul | 0.00 | 6.5 | 5.0 | .0014 | .0010 | .0100 | .0000 | .55 | .... | .... | *h* |
| 3602 | May 8 | V. S. op. | Con. floc. | Foul | 0.10 | 9.5 | 6.7 | .0036 | .0020 | .0300 | Tr. | 1.52 | .... | .... | *g* |
| 3695 | 1906 June 21 | Mod. op. | Con. fer. | S. veg. | 0.10 | 15.5 | 10,7 | .0102 | .0044 | .0250 | .0009 | 2.50 | 4.7 | 1.25 | *i* |
| 3696 | June 21 | None | None | None | 0.03 | 7.0 | 5.0 | .0018 | .0014 | .0100 | .0000 | .65 | 2.7 | 0.07 | *j* |
| 3697 | June 21 | None | V. slight | None | 0.03 | 6.2 | 4.6 | .0010 | .0014 | .0100 | .0000 | .65 | 1.6 | 0.10 | *k* |
| 3698 | June 21 | S. opal | Mod. fer. | S. veg. | 0.03 | 17.2 | 12.7 | .0074 | .0026 | .0100 | .0000 | 1.60 | 6.3 | 2.15 | *l* |
| 4242 | Dec. 21 | None | V. slight | None | 0.05 | ..... | .... | .0014 | .0042 | ..... | .0000 | .42 | 1.5 | .035 | *n* |
| 4243 | Dec. 21 | None | None | None | 0.00 | ..... | .... | .0016 | .0020 | ..... | .0000 | .42 | 1.9 | .001 | *m* |
| 4245 | Dec. 21 | None | V. slight | None | 0.00 | ..... | .... | .0010 | .0020 | ..... | .0000 | .65 | 1.2 | .005 | *o* |
| 4276 | 1907 Jan. 9 | None | V. slight | None | 0.00 | ..... | .... | .0008 | .0000 | .0086 | .0000 | .38 | 0.7 | .006 | *g* |
| 4277 | Jan. 9 | None | S. coarse | S. veg. | 0.00 | ..... | .... | .0005 | .0006 | .0300 | Tr. | .40 | 0.9 | .010 | *g* |
| 4278 | Jan. 9 | S. opal | V. slight | None | 0.05 | ..... | .... | .0008 | .0020 | .0300 | .0000 | 2.70 | 6.0 | .160 | *p* |
| 4279 | Jan. 9 | ........ | ........ | ....... | 0.15 | ..... | .... | ..... | ..... | .0400 | Tr. | .80 | 2.8 | .080 | *q* |
| 4691 | July 9 | Mod. op. | Heav. fer. | None | 0.50 | 9.3 | 7.0 | .0008 | .0014 | .0100 | .0000 | .88 | 3.2 | .900 | *j* |
| 4732 | July 19 | None | None | None | 0.00 | 8.5 | 3.5 | .0010 | .0002 | .0400 | .0000 | 1.24 | 1.9 | .002 | *m* |
| 5973 | 1909 Feb. 5 | None | V. slight | None | 0.00 | 4.8 | 2.7 | .0095 | .0010 | .0000 | Tr. | .65 | .70 | 0 | *r* |
| 5974 | Feb. 5 | None | Slight | None | 0.00 | 4.5 | 2 3. | .0100 | .0090 | .0000 | .0000 | .62 | .90 | 0 | *s* |

*a* Brook in Hussey field; *b* Easterly Brook; *c* Westerly Brook; *d* west branch new collecting gallery; *e* spring near catch basin; *f* east braneh new collecting gallery; *g* catch basins Nos. 1 and 2; *h* Cate Spring; *i* catch basin No. 4 on long line; *j* catch basin No. 5 on long line; *k* catch basin No. 6 on long line; *l* catch basin No. 3; *m* catch basin No. 10; *n* catch basin No. 11; *o* Red Spring; *p* catch basin No. 12; *q* catch basin No. 13; *r* outlet from filter bed No. 1; *s* Aërating chamber (raw).

*Examination of Water from Various Sources on Public Supply.—Concluded.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Iron. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1909 | | | | | | | | | | | | | | |
| 6025 | Mar. 10 | None | Mod. ferrug. | None | 0.20 | 15.3 | 6.8 | .0075 | .0040 | .0200 | .0000 | .52 | .20 | .6 | *t* |
| 6026 | Mar. 10 | None | None | None | 0.05 | 6.5 | 4.5 | .0075 | .0008 | .030 | .0000 | .43 | 1.8 | 0 | *u* |
| 7014 | Apr. 28 | None | V. S. silt | None | 0.00 | 5.9 | 4.6 | .0060 | .0015 | .005 | .0000 | .45 | 2.4 | .... | *v* |
| 7206 | July 21 | None | None | None | 0.00 | 5.7 | 3.2 | .0030 | .0015 | .005 | .0000 | .47 | 1.2 | .00 | *v* |
| 7420 | Oct. 7 | None | Mod. ferrug. | None | 0.30 | 7.5 | 5.5 | .0045 | .0100 | .005 | .0000 | .45 | 1.9 | .25 | *w* |
| 7421 | Oct. 7 | None | Mod. ferrug. | None | 0.30 | 11.9 | 8.6 | .0130 | .0060 | .005 | .0000 | .40 | 3.9 | .35 | *x* |
| 7422 | Oct. 7 | None | None | None | 0.00 | 6.7 | 4.0 | .0001 | .0030 | .005 | .0000 | .50 | 2.6 | .01 | *v* |
| | 1910 | | | | | | | | | | | | | | |
| 7721 | Mar. 15 | Consid. | Consid. ferrug. | None | opa-que | 19.8 | 11.1 | .0310 | .0088 | .003 | .0000 | .91 | 9.3 | 1.60 | *w* |
| 7939 | June 2 | V. slight | S. silt | None | 0.05 | 18.9 | 12.7 | .0010 | .0025 | .0025 | .0000 | .47 | 4.6 | .05 | *i* |

*t* Rain water from pond and spring; *u* filter No. 2; *v* receiving basin; *w* inlet pipe aërating tank; *x* brook from Page field (upper well); *i* catch basin No. 4 on long line.

*Examination of Water from Cocheco River, Proposed Public Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1910 | | | | | | | | | | | | | | |
| 7766 | Apr. 1 | Slight | Sl. floc. | Swam-py | 0.50 | 7.3 | 1.0 | .0036 | .0110 | .0040 | .0000 | 0.29 | .60 | .... | * |
| 7767 | Apr. 1 | Slight | Sl. floc. | Swam-py | 0.50 | 5.4 | 1.7 | .0016 | .0104 | .0040 | .0000 | 0.29 | .90 | .... | * |
| 7768 | Apr. 1 | Slight | Sl. floc. | Swam-py | 0.50 | 9.8 | .90 | .0012 | .0110 | .0040 | .0000 | 0.26 | .70 | .... | * |

*Examination of Water from Artesian Wells, Proposed Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1910 | | | | | | | | | | | | | | |
| 7613 | Jan. 21 | None | V. slight | None | 0.00 | 6.0 | 4.5 | .0010 | .0060 | .0100 | .0000 | .25 | 2.6 | .01 | .. |
| 8046 | July 6 | None | Med. silt | None | 0.05 | 18.3 | 12.3 | .0015 | .0010 | .0025 | .0000 | .75 | 4.6 | .05 | .. |

*Examination of Water from Kelley Springs.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1906 | | | | | | | | | | | | | | |
| 3754 | July 16 | None | None | None | 0.10 | 3.5 | 1.8 | .0008 | .0048 | .0050 | .0000 | .20 | .1 | .... | .. |
| 3836 | Aug. 13 | None | None | None | 0.05 | 2.8 | 2.3 | .0010 | .0060 | .0100 | .0000 | .22 | .4 | .... | .. |
| | 1908 | | | | | | | | | | | | | | |
| 5326 | May 28 | Mod'ate | Con. fer. | None | Clo-udy | 7.7 | 3.5 | .0006 | .0150 | .0060 | .0000 | .46 | .4 | 1.25 | *a* |

* B. Coli present; *a* when sampled the main was undergoing repairs.

**Dublin.**—No public supply. There are but very few wells in use at the present time in the town. The supply is very largely from springs and from the lake, which is fed by springs. There are five hydraulic rams and as many windmills, and several engines in use to pump water to the hilltops, where the summer residences are.

*Examination of Water from Dublin Pond.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7942 | 1910 June 6 | None | None | None | 0.10 | 1.0 | .50 | .0010 | .0055 | .0025 | .0000 | .10 | .4 | .000 | .. |

**Dunbarton.**—A private supply, inaugurated in 1904, furnishes water to three families and one public watering place from a spring excavated five feet deep in gravel. There is a standpipe of 100 barrels' capacity, from which the water is distributed through 1,300 feet of galvanized iron pipe, service and mains.

**Durham.**—Water is furnished to the college and to the village from five systems, all under separate management. The principal supply, known as the Durham Spring Water Company (Pettee supply) was inaugurated in 1893 and now consists of five dug and driven wells, the water of which is pumped to a standpipe of 7,000 gallons' capacity. One mile of distributing mains; about one half of the village is supplied from this source.

In 1892 the New Hampshire College of Agriculture and Mechanic Arts established a system for supplying the various college buildings, the source being a pond of nine acres. This supply has recently been augmented by a driven well 265 feet deep, capacity 40 gallons per minute. Water from both sources is pumped to a standpipe of 10,000 gallons' capacity. There is one-half mile of distributing mains.

The Durham Water Works, the only incorporated water company in town, was instituted in 1898 by J. W. Burnham. The source is a dug well twelve feet deep, the water being pumped to a standpipe of 4,000 gallons' capacity. About one tenth of the village is supplied from this source. Distributing mains, 1,000 feet.

The George Hoitt system consists of a dug well 10 feet deep, with standpipe of 6,500 gallons. This supplies one fourth of the village. There are about 1,500 feet of distributing mains.

A system established by Charles Hoitt in 1906 supplies water to a few families, the source being a well. Distributing mains, 2,000 feet.

*Examination of Water from Faucet of Supply of C. H. Pettee.*

| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 784 | 1902 Sept. 8 | None | None | None | 0.0 | 15.20 | 9.50 | .0012 | .0028 | .3500 | .0003 | .58 | 5.5 | .... | .. |
| 1360 | 1903 July 21 | Marked | Fine floc. | V. slight | 0.15 | 12.80 | 6.70 | .0000 | .0000 | .0500 | .0001 | .65 | 4.5 | .... | .. |
| 1981 | 1904 May 24 | Slight | None | None | 0.0 | 15.20 | 6.90 | .0000 | .0016 | .2200 | .0000 | .60 | 4.7 | .... | .. |
| 2693 | 1905 Feb. 10 | None | V. slight | None | 0.10 | 10.60 | 7.9 | .0110 | .0010 | .0500 | .0000 | .65 | 4.2 | .... | .. |
| 3099 | Aug. 20 | Mod. op. | Mod. | None | 0.00 | 9.3 | 7.3 | .0020 | .0034 | .0500 | .0004 | .33 | .... | .... | * |
| 3100 | Aug. 20 | S. op. | Slight | S. veg. | 0.00 | 13.4 | 11.0 | .0024 | .0022 | .0750 | .0030 | .56 | .... | .... | * |
| 3395 | 1906 Jan. 15 | None | None | M. veg. | 0.00 | 9.2 | 5.5 | .0006 | .0044 | .0250 | .0010 | .52 | 2.3 | .... | .. |
| 4124 | Nov. 3 | None | None | None | 0.05 | 11.8 | 9.3 | .0006 | .0040 | .0400 | .0000 | .52 | 5.0 | .... | .. |
| 4215 | Dec. 10 | None | None | None | 0.00 | 12.0 | 9.0 | .0005 | .0022 | .1700 | .0000 | .65 | 6.5 | .... | .. |
| 4118 | Dec. 10 | Opal | Consid. earthy | Veg. | Opal | 17.2 | 14.7 | .0005 | .0064 | .0450 | .0000 | .53 | 6.5 | .... | .. |
| 4223 | Dec. 10 | V. slight | V. slight | Argil. | 0.00 | 16.5 | 12.9 | .0008 | .0026 | .0150 | .0004 | .55 | .... | .... | .. |
| 4224 | Dec. 10 | V. slight | V. slight | Argil. | 0.00 | 10.0 | 8.4 | .0050 | .0018 | .0250 | .0000 | .45 | .... | .... | .. |
| 5004 | Nov. 5 | V. slight | Sl. opal | None | 0.00 | 10.4 | 8.6 | .0006 | .0010 | .0450 | .0000 | .40 | 5.0 | .... | .. |
| 7682 | 1910 Mar. 2 | Mark. opal. | Consid. earthy | Earthy | opaque | 11.1 | 8.0 | .0008 | .0006 | .0050 | .0000 | .83 | 5.4 | .... | .. |

* B. Coli present.

*Examination of Water from Tap at College Creamery.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4212 | 1906 Dec. 10 | None | Slight | Argil. | 0.00 | 13.0 | 10.0 | .0008 | .0020 | .0150 | .0000 | .59 | 6.5 | .... | .. |

*Examination of Water from the Charles Hoitt Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4219 | 1906 Dec. 10 | None | None | Slight | 0.00 | 8.5 | 6.5 | .0010 | .0024 | .0200 | .0000 | .45 | 6.0 | .... | .. |
| 4220 | Dec. 10 | None | V. slight | None | 0.00 | 10.0 | 8.0 | .0006 | .0024 | .0180 | .0000 | .45 | 6.0 | .... | .. |

### *Examination of Water from the Zeta House.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4214 | 1906 Dec. 10 | V. slight | V. slight | Argil. | 0.00 | 12.5 | 7.5 | .0005 | .0030 | .4500 | .0000 | 1.90 | .... | .... | * |
| 7870 | 1910 May 4 | Mod. opal. | Sl. ferrug. | Sl. foul | 0.10 | 9.3 | 8.8 | .0070 | .0020 | .2500 | .0000 | 2.30 | 7.4 | .010 | .. |

### *Examination of Water from Conant Spring, near Conant Hall.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4213 | 1906 Dec. 10 | None | V. slight | Argil. | 0.00 | 10.0 | 7.2 | .0030 | .0024 | .1200 | .0000 | .75 | 6.5 | .... | * |
| 7867 | 1910 May 4 | None | None | Musty | 0.00 | 10.7 | 8.4 | .0007 | .0040 | .050 | .0000 | .70 | 5.1 | .... | .. |

### *Examination of Water from the New Artesian Well at New Hampshire College.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7868 | 1910 May 4 | Slight | Consid. ferrug. | Earthy | 0.65 | 4.0 | 1.9 | .0030 | .0090 | .0025 | .0000 | .35 | .9 | .10 | .. |

### *Examination of Water from the Well near Gymnasium.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7683 | Mar. 2 | V. faint | Slight | Earthy | 0.00 | 8.6 | 5.1 | .0014 | .0056 | .0050 | .0000 | .49 | 4.3 | .... | .. |

### *Examination of Water from the Well of Carrie Buzzel.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5939 | 1909 Jan. 18 | Sl. opal | Mod. earthy | Earthy | 0.05 | ..... | .... | .0010 | .0050 | .4000 | .000 | 4.7 | 7.9 | .... | .. |
| 7636 | 1910 Feb. 2 | Slight | V. slight | None | 0.00 | ..... | .... | .0070 | .0080 | .4000 | .0004 | 1.7 | 8.9 | .... | .. |

### *Examination of Water from the Well of Gorham Sawyer.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7686 | Mar. 3 | Mod. | Sl. coarse | Foul | 0.10 | 60.2 | 49.7 | .0030 | .0038 | .500 | .0030 | 12.6 | 12.4 | .... | .. |
| 7628 | Feb. 1 | V. slight | V. slight | Sl. earthy | 0.05 | ..... | .... | .0090 | .0060 | .700 | High | 10.6 | 12.4 | .... | * |

* B. Coli present.

*Examination of Water from the Well of A. L. Cummings.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7670 | 1910 Feb. 23 | None | None | None | 0.05 | ..... | .... | .0008 | .0010 | .0400 | .0005 | 1.8 | 10.3 | .... | .. |

*Examination of Water from the Well of George Hoitt.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7669 | 1910 Feb. 22 | None | None | None | 0.05 | ..... | .... | .0010 | .0004 | .0100 | .0000 | .45 | 5.6 | .... | .. |

*Examination of Water from the Well of Edward Chesley.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7630 | 1910 Feb. 2 | Sl. opal | Slight | Foreign | 0.10 | ..... | .... | .0010 | .0045 | .1000 | .0000 | .80 | 4.6 | .... | .. |

**Enfield.**—The Enfield Village Fire District Water Works, built in 1902 and 1903, by Arthur W. Stone of Hartford, Vt., is owned by the precinct. The source of the supply is a pond of 21 acres in area, and an average depth of about eight feet, fed by springs. The watershed is about 2,000 acres, principally cleared land, with only two families living near. The water flows by gravity through four miles of iron pipe. Service pipes are lead. From one fourth to one third of the population are supplied from this system, with additional connections being made each week.

There are also two private systems of water works in town: the Mascoma Aqueduct Company, whose plant was built in 1884. This supply is from a spring two feet in depth, which supplies about 1,000 gallons daily. This is a gravity system, with one mile of lead main pipe, and also lead service pipe. Ten families are supplied with this water, but some of them also have the town water.

The other private system was built by the Enfield Aqueduct Company in 1854, the source being a well 16 feet deep. This, also, is a gravity system with three fourths of a mile of cement-lined lead pipe for a main, and lead service pipes. The average daily consumption from this system is 1,320 gallons, by 40 families, but the town water is also supplied to some of these patrons.

## *Examination of Water from Village Fire District Water Works.*



| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 2075 | 1904 June 20 | V. slight | Slight | Dec. veg. | 0.45 | ..... | .... | ..... | ..... | .0000 | .0000 | .15 | 4.1 | .... | .. |
| 2411 | Oct. 6 | None | None | S. veg. | 0.50 | 6.6 | 3.0 | .0014 | .0200 | .0250 | .0000 | .05 | 1.2 | .... | .. |
| 2910 | 1905 June 19 | None | None | S. veg. | 0.40 | 5.5 | 2.7 | .0000 | .0116 | .0200 | .0000 | .12 | 1.6 | .... | .. |
| 3095 | Aug. 18 | V. slight | None | S. veg. | 0.50 | 5.7 | 2.7 | .0020 | .0152 | .0100 | .0000 | .10 | 1.8 | .... | .. |
| 3368 | 1906 Jan. 5 | V. slight | None | None | 0.40 | 4.5 | 2.2 | .0016 | .0074 | .0050 | .0000 | .07 | 2.0 | .... | .. |
| 3790 | July 30 | None | Slight | Veg. | 0.40 | 4.8 | 2.0 | .0022 | .0168 | .0000 | .0000 | .05 | 1.6 | .... | * |
| 3790 | July 30 | None | S. fine | Veg. | 0.4 | 4.8 | 2.0 | .0022 | .0168 | .0000 | .0000 | .05 | 1.6 | .... | .. |
| 4011 | Sept.28 | Slight | Mod. fine | Mark'd veg. | .50 | 6.5 | 2.0 | .0014 | .0204 | .0050 | .0000 | .07 | 1.9 | .... | * |
| 4651 | 1907 June 21 | None | V. slight | Earthy | .40 | 3.5 | 1.6 | .0008 | .0120 | .0050 | .0000 | .05 | 1.5 | .... | .. |
| 5601 | 1908 Sept.14 | Slight | V. slight | None | 0.30 | 5.5 | 1.7 | .0010 | .0086 | .0040 | .0000 | .12 | 1.5 | .... | .. |
| 5860 | Nov.26 | Slight | V. slight | Earthy | 0.50 | 4.5 | 1.6 | .0110 | .0330 | .0000 | .0002 | .06 | 1.5 | .... | * |
| 5997 | ....... | None | None | Slight | 0.30 | ..... | .... | .0160 | .0140 | .0100 | .0000 | .09 | .... | .... | .. |
| 5998 | ....... | None | None | Slight | 0.30 | ..... | .... | .0160 | .0100 | .0150 | .0000 | .08 | .... | .... | .. |
| 7210 | 1909 July 22 | H. fibre | ........ | Pecul. | 0.40 | 8.3 | 4.7 | .0090 | High | .0050 | .0002 | .05 | 1.2 | .... | * |
| 7246 | Aug. 5 | V. slight | Sl. veg. | Consid. veg. | 0.40 | 5.6 | 2.1 | High | High | .0050 | .0004 | .05 | 1.4 | .... | .. |
| 7247 | Aug. 5 | Consid. opal | Slight | Veg. | opaque | 8.0 | 2.5 | Very high | Very high | .0050 | .0000 | .05 | 1.4 | .... | * |
| 7306 | Aug. 23 | Mod. | Consid. floc. | Marked veg. | 0.70 | 7.0 | 3.2 | Very high | High | .0050 | .0000 | .05 | 2.3 | .... | .. |
| 7307 | Aug. 23 | Sl. opal. | Mod. | Veg. | 0.30 | ..... | .... | High | High | .0050 | .0000 | .05 | 1.8 | .... | .. |
| 7455 | Oct. 18 | Slight | V. slight | Slight | 0.30 | 4.2 | 1.0 | .0030 | .0050 | High | .0000 | .05 | 1.2 | .... | .. |
| 7930 | 1910 May 30 | Sl. opal | None | Earthy | 0.10 | 5.5 | 4.3 | .0010 | .0035 | .0075 | .0032 | .07 | 3.5 | .... | † |
| 8245 | Aug. 1 | Heavy | Heavy | Sweet | 0.50 | ..... | .... | High | Very high | .0040 | .0000 | .08 | 1.8 | .... | .. |

* B Coli present. † .10 Zinc.

## *Examination of Water from Tap of Mascoma Aqueduct Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3079 | 1905 Aug. 14 | Slight | Consid. earthy | Slight | 0.00 | 4.3 | 3.0 | .0000 | .0000 | .0100 | .0000 | .07 | 0.7 | .... | .. |
| 3372 | 1906 Jan. 5 | None | None | None | 0.00 | 6.2 | 3.2 | .0006 | .0016 | .0080 | .0000 | .05 | 1.1 | .... | .. |
| 4116 | Oct. 31 | None | Slight | V. Sl. | 0.15 | 4.5 | 2.7 | .0006 | .0040 | .0050 | .0000 | .07 | 1.2 | .065 | .. |

*Examination of Water from Tap of Enfield Aqueduct Company.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3669 | 1906<br>Jan. 5 | None | None | None | 0.00 | 11.0 | 8 2 | .0010 | .0038 | .0750 | .0000 | .62 | 6.3 | .015 | * |
| 4115 | Oct. 31 | None | Marked | None | 0.15 | 12.2 | 10.3 | .0010 | .0052 | .0050 | .0000 | .35 | 5.3 | .... | .. |
| 4652 | 1907<br>June 21 | Mod'ate | Mod'ate | Mod. veg. | 0.40 | 10.6 | 8.2 | .0066 | .0060 | .0050 | Ft.tr. | 1.18 | 6.0 | Present | * |

*Examination of Water from the Well of Boston & Maine Railroad.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8264 | Aug. 4 | Slight | Sl. floc. | Sl. veg. | 0.70 | ..... | .... | .0020 | .0050 | .0050 | .000 | 1.10 | 6.7 | 0 | .. |

**Epping.**—Water for this town is furnished by private wells and springs. River water is furnished by the Village District Water System for use at the box shop, and several families have it for washing purposes.

*Examination of River Water, Village District Water System.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4994 | 1907<br>Oct. 31 | Slight | V. slight | S. earthy | 0.80 | 4.7 | 1.5 | .0002 | .0110 | .006 | .0000 | .34 | 0.9 | .... | * |

*Examination of Water from Well of A. W. Mitchell (Semi-Public Supply).*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4455 | 1907<br>Apr. 22 | V.S. opal | Mod. floc. | Slight | 0.05 | 34.9 | 20.0 | .0022 | .0040 | .75 | .0007 | 6.18 | 7.4 | .... | * |

* B. Coli present.

**Exeter.**—No public supply. The Exeter Water Works, owned by a private company, were installed in 1886. The source of the supply is an artificial pond fed by springs and brook. (See special report elsewhere.)

*Examination of Water from Faucet of Supply of Exeter Water Works.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 749 | 1902 Aug. 26 | V. slight | Decided red floc. | Mark. veg. | 0.5 | 7.80 | 2.80 | .0000 | .0202 | .0000 | .0000 | .37 | 2.8 | .... | .. |
| 1358 | 1903 July 20 | None | Floc. | V. slight | 0.4 | 8.20 | 1.50 | .0000 | .0096 | .0000 | .0000 | .30 | 2.2 | .... | .. |
| 1959 | 1904 May 16 | Marked | Much fine | Sl. veg. | 0.5 | 6.70 | 3.60 | .0000 | .0144 | .0050 | .0000 | .32 | 3.2 | .... | .. |
| 2209 | July 26 | Marked | V. Much red floc. | Slightly aromat. | 0.5 | 7.50 | 4.70 | .0006 | .0108 | .0050 | .0000 | .42 | 4.7 | .... | .. |
| 2670 | 1905 Jan. 30 | Consid. | Slight | Dec. vg. | 0.50 | 8.5 | 5.0 | .0080 | .0084 | .0150 | .0000 | .45 | 2.4 | .... | .. |
| 3076 | Aug. 14 | Slight | S. ferrug. | M. veg. | 0.30 | 9.2 | 5.5 | .0000 | .0124 | .0050 | .0000 | .45 | 2.8 | .... | .. |
| 3381 | 1906 Jan. 9 | Slight | Slight | Veg. | 0.60 | 5.0 | 4.3 | .0044 | .0064 | .0100 | .0000 | .57 | 2.3 | .... | .. |
| 4108 | Oct. 29 | Mod. op. | Mod. fer. | Stale | 0.30 | 8.3 | 6.2 | .0012 | .0124 | .0050 | .0000 | .55 | 3.2 | .... | * |
| 4446 | 1907 Apr. 15 | V. slight | V. slight | S. foul | 0.10 | 5.5 | 3.5 | .0020 | .0028 | .0050 | .0000 | .50 | 2.3 | .... | .. |
| 5146 | 1908 Feb. 27 | S. opal | Marked earthy | V. slight | 0.10 | 5.0 | 4.0 | .0012 | .0044 | .0070 | .0000 | .57 | 1.9 | .... | .. |
| 5145 | Feb. 27 | Slight | Slight | Mark. earthy | 0.10 | 4.8 | 3.0 | .0004 | .0036 | .0070 | .0000 | .66 | 1.2 | .... | .. |
| 5144 | Feb. 27 | S. opal | Slight | Mark. earthy | 0.05 | 4.5 | 3.0 | .0006 | .0034 | .0030 | .0000 | .60 | 1.2 | .... | .. |
| 5143 | Feb. 27 | V. ft. op. | None | S. earthy | 0.00 | 6.0 | 3.5 | .0010 | .0058 | .0050 | .0000 | .65 | 1.2 | .... | .. |
| 5142 | Feb. 27 | Con. op. | S. earthy | Mark. earthy | Cl. | 6.3 | 4.0 | .0016 | .0120 | .0060 | .0000 | .68 | 0.4 | .... | * |
| 5359 | June 20 | None | V. slight | Veg. | 0.10 | ..... | .... | .0002 | .0040 | .0060 | .0000 | .12 | 3.2 | .... | .. |

* B. Coli present.

**Farmington.**—Water is supplied from two systems, the earliest of which, owned by J. A. Fletcher, was established in 1898. The wells are twelve feet deep, the water being stored in an excavated reservoir of 100,000 gallons' capacity, from which it is distributed through 1,800 feet of cast iron mains.



In 1903 a supply was acquired by the town, the source also consisting of wells. The water is pumped to a reservoir of 900,000 gallons and is distributed through four miles of cast iron mains. Service pipe, galvanized iron.

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 853 | 1902 Oct. 10 | None | Slight | V. slight | 0.0 | 5.9 | 3.0 | .0000 | .0020 | .0200 | .0000 | .45 | 3.0 | .... | .. |
| 3092 | 1905 Aug. 17 | None | V. slight | None | 0.0 | 17.0 | 11.3 | .0030 | .0010 | .2500 | .0010 | 3.15 | 4.4 | .... | * |
| 3477 | 1906 Feb. 20 | None | S. fibrous | None | 0.0 | 15.3 | 12.3 | .0014 | .0014 | .5000 | .0005 | 2.52 | 4.4 | .... | .. |
| 4350 | 1907 Feb. 25 | V. slight | Con. floc | Pecul. | 0.05 | ..... | .... | .0054 | .0036 | .7500 | Tr. | 2.6 | 5.6 | .... | .. |
| 4937 | Oct. 10 | None | None | None | 0.00 | 19.2 | 14.9 | .0012 | .0016 | .0400 | Tr. | 2.62 | 4.6 | .... | .. |
| 5225 | 1908 Apr. 14 | None | None | None | 0.00 | 14.5 | 8.5 | .0006 | .0018 | .0400 | V. ft. trace | 2.66 | 4.6 | .... | .. |
| 5909 | Dec. 29 | None | None | Mark. foul | 0.10 | 7.1 | 4.4 | .0080 | .0070 | .0100 | Sl.tr. | .69 | 2.2 | .... | .. |
| 7095 | ....... | None | None | None | 0.00 | 18.0 | 11.1 | .0010 | .0015 | .6000 | Sl.tr. | 2.6 | 4.6 | .... | .. |
| 7909 | 1910 May 20 | V. slight | S. earthy | V. S. earthy | 0.00 | 3.9 | 2.2 | .0010 | .0020 | .0050 | .0000 | .30 | .90 | .... | .. |

* B. Coli present.

*Examination of Water from Cold Spring.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6051 | 1909 Mar. 22 | None | None | None | 0.05 | 3.5 | 2.3 | .0010 | .0015 | .0400 | .0000 | .23 | .4 | .... | .. |
| 7218 | July 26 | V. slight | Sl. floc. | None | 0.20 | 3.5 | 2.2 | .0002 | .0050 | .0000 | .0000 | .05 | .7 | .... | .. |

*Examination of Water from the Artesian Well of Farmington Shoe Manufacturing Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5599 | 1908 Sept. 3 | Heavy | Cons. earthy | Slight | opaque | ..... | .... | .0036 | .0002 | .0060 | .0000 | 1.83 | 3.9 | .... | .. |

**Fitzwilliam.**

*Examination of Water from the Well of Baptist Church Society.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7336 | 1909 Sept. 12 | V. faint | Slight | None | 0.10 | ..... | .... | .0010 | .0070 | High | .0000 | 2.50 | 4.6 | .... | .. |

**Francestown.**—A private supply, inaugurated 25 years ago, is from a spring. The watershed is cleared, but no inhabitants. Wells are excavated 12 feet deep, and the water flows by gravity through half a mile of enameled iron pipe, both service and mains. Twenty families have this water, one tenth of the population. There are private wells within this area.

*Examination of Water from Spring Reservoir.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 783 | 1902 Sept. 6 | None | None | V. slight | 0.00 | 8.5 | 4.0 | .0000 | .0000 | .3000 | .0000 | .10 | 2.7 | .... | .. |
| 3084 | 1905 Aug. 15 | None | None | None | 0.07 | 7.0 | 4.6 | .0008 | .0008 | .0920 | .0000 | .15 | 1.8 | .... | * |
| 5360 | 1908 June 20 | None | None | None | 0.05 | ..... | .... | .0002 | .0006 | .0150 | .0000 | .09 | 2.6 | .... | .. |
| 5902 | Dec. 23 | None | None | None | 0.00 | 5.0 | 2.5 | .0008 | .0001 | .0500 | .0000 | .19 | .6 | .... | .. |
| 7769 | 1910 Apr. 4 | None | Slight | Sl. earthy | 0.00 | 5.5 | 2.9 | .0012 | .0004 | .0020 | .0000 | .16 | 2.4 | .... | .. |

* B. Coli present.

**Franconia.**—No public supply. A private company, known as the Franconia Water Supply Company, in 1888 or 1889, introduced a water supply from a spring a mile and a half distant. A later supply, introduced in 1907 by Whipple and Priest, is taken from the Gale River Spring.



*Examination of Water of the Franconia Water Supply Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 387 | 1902 Feb. 1 | None | Floc. | Earthy veg. | 0.2 | 5.90 | 1.30 | .0000 | .0086 | .0210 | .0000 | .10 | 1.3 | .... | .. |
| 1357 | 1903 July 19 | None | None | None | 1.0 | 6.70 | 2.00 | .0000 | .0000 | .0200 | .0000 | .05 | 1.8 | .... | .. |
| 2678 | 1905 Feb. 1 | None | M. fine | None | 0.05 | 6.1 | 3.9 | .0000 | .0000 | .0600 | .0000 | .25 | 1.6 | .... | .. |
| 3390 | 1906 Jan. 11 | None | S. fine | S. veg. | 0.10 | 7.3 | 4.8 | .0010 | .0026 | .0300 | .0000 | .30 | 2.2 | .... | .. |
| 4177 | Nov. 20 | None | V. slight | None | 0.20 | 4.5 | 3.0 | .0010 | .0094 | .0400 | .0000 | .22 | 2.4 | .... | .. |
| 4664 | 1907 June 24 | None | S. coarse | Mark. swam-py | 0.40 | 5.5 | 3.2 | .0004 | .0040 | .0050 | .0000 | .07 | 1.1 | .... | * |
| 4665 | June 24 | None | None | V. slight | 0.00 | ..... | .... | .0002 | .0006 | .0500 | .0000 | .88 | 1.9 | .... | * |
| 5977 | 1909 Feb. 5 | None | None | None | 0.00 | 5.8 | 4.6 | .0010 | .0002 | .0750 | .0000 | .08 | 1.4 | .... | .. |

* B. Coli present.

*Examination of Water from Gale River Spring.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4958 | 1907 Oct. 15 | None | V. slight | None | 0.00 | 4.5 | 2.6 | .0002 | .0014 | .0020 | .0000 | .11 | 1.9 | .... | .. |
| 5229 | 1908 Apr. 13 | None | None | None | 0.00 | 4.5 | 2.5 | .0002 | .0004 | .0080 | .0000 | .06 | 1.9 | .... | .. |
| 7799 | 1910 Apr. 13 | None | None | None | 0.00 | 3.6 | 2.0 | .0010 | .0054 | .0030 | .0000 | .40 | 1.5 | .... | .. |

*Examination of Water from Lafayette Brook (near Profile House).*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7347 | 1909 Sept. 9 | None | None | None | 0.00 | ..... | .... | .0010 | .0015 | .0100 | .0000 | .10 | .4 | .... | .. |
| 8032 | 1910 July 5 | None | V. slight | None | 0.00 | ..... | .... | .0004 | .0030 | .0050 | .0000 | .10 | .4 | .... | .. |

**Franklin.**—The Franklin Water Works, owned by the city, were built in 1891. The source consisted originally of springs, the water being pumped into a covered reservoir about 20 feet deep. Later, to obviate the necessity for direct pumpage from the Pemigewasset River during periods of drouth, a series of driven and tubular wells was constructed along the river bank. During 1906 the supply was further augmented by the construction of some catch basins which serve to collect the water from an extensive springy area lying at the base of a hill. In 1909 a system of filtration was established, the water being pumped from the river upon a sandbed, thence draining into a storage well. (This system will be found described elsewhere in this report.)

*Examination of Water from Franklin Town Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| | 1901 | | | | | | | | | | | | | | |
| 78 | July 24 | None | None | None | 0.0 | 3.90 | 2.70 | .0036 | .0052 | .0200 | .0000 | .14 | .... | .010 | .. |
| 337 | Dec. 20 | None | None | S. veg. | 0.05 | 3.40 | 2.10 | .0008 | .0034 | .0400 | .0000 | .18 | 0.8 | .... | .. |
| 338 | Dec. 20 | None | None | S. veg. | 0.05 | 4.00 | 2.40 | .0014 | .0050 | .0220 | .0000 | .16 | 0.8 | .... | .. |
| | 1902 | | | | | | | | | | | | | | |
| 804 | Sept. 15 | None | None | None | 0.0 | 6.50 | 3.30 | .0000 | .0016 | .0200 | .0000 | .27 | 2.0 | .... | .. |
| 849 | Oct. 8 | None | None | None | 0.0 | ..... | .... | ..... | ..... | .0200 | .0000 | .... | .... | .000 | .. |
| 870 | Oct. 15 | None | None | None | 0.0 | ..... | .... | ..... | ..... | .0300 | .0000 | .17 | .... | .087 | .. |
| | 1903 | | | | | | | | | | | | | | |
| 986 | Jan 14 | None | None | S. veg. | 0.0 | 9.10 | 3.20 | .0000 | .0010 | .0200 | .0000 | .15 | 1.2 | .000 | .. |
| 1166 | Apr. 27 | None | None | None | 0.0 | 3.60 | 1.60 | .0000 | .0000 | .0100 | .0000 | .15 | 1.6 | .056 | .. |
| 1288 | July 1 | None | None | S. veg. | 0.0 | 6.20 | 2.20 | .0000 | .0016 | .0200 | .0000 | .15 | 1.8 | Tr. | .. |
| 1351 | July 20 | None | None | None | 0.0 | 4.40 | 2.60 | .0000 | .0014 | .0000 | .0000 | .20 | 1.4 | .... | .. |
| 1599 | Oct. 15 | None | None | V. slight | 0.0 | 5.10 | 1.20 | .0000 | .0040 | .0300 | .0000 | .15 | 1.1 | .040 | .. |
| 1699 | Nov. 24 | None | None | Aromatic. | 0.0 | 3.50 | 2.00 | .0006 | .0070 | .0000 | .0000 | .20 | 1.2 | .008 | .. |
| 1702 | Nov. 24 | None | None | None | 0.05 | 4.20 | 2.70 | .0010 | .0060 | .0000 | .0000 | .20 | 1.8 | .013 | .. |
| 1724 | Dec. 15 | None | None | S. veg. | 0.0 | 4.90 | 3.00 | .0000 | .0012 | .0400 | .0001 | .30 | 1.9 | .... | .. |
| 1725 | Dec. 15 | Marked | M. floc. veg. | V. S. veg. | 0.05 | 3.40 | 1.60 | .0020 | .0070 | .0100 | .0000 | .15 | 1.5 | .... | .. |
| 1754 | Dec. 22 | V. slight | None | S. veg. | 0.1 | 3.80 | 2.50 | .0000 | .0014 | .0000 | .0000 | .25 | 1.6 | .009 | .. |
| 1844 | Feb. 18 | None | S. veg. | None | 0.0 | 3.00 | 2.00 | .0006 | .0016 | .0050 | .0000 | .15 | 1.8 | .... | .. |
| 1879 | Mar. 29 | Slight | V. slight | S. veg. | 0.1 | 4.80 | 2.10 | .0006 | .0022 | .0800 | .0000 | .15 | 1.6 | .... | .. |
| 1922 | May 5 | None | None | S. veg. | 0.05 | 5.20 | 3.00 | .0024 | .0026 | .0250 | .0000 | .20 | 1.8 | .... | .. |
| 2093 | June 27 | Slight | None | V. slight | 0.0 | 2.50 | .90 | .0010 | .0024 | .0000 | .0000 | .20 | 1.0 | .... | .. |

*Examination of Water from Franklin Town Supply—Continued.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2435 | 1903 Oct. 12 | None | None | V. slight | 0.00 | 3.8 | 2.7 | .0000 | .0010 | .0000 | .0000 | .20 | 1.8 | .... | * |
| 2460 | Oct. 20 | None | None | V. slight | 0.00 | 4.4 | 3.4 | .0000 | .0014 | .0000 | .0000 | .22 | 1.8 | .... | * |
| 2540 | Nov. 15 | None | None | V. slight | 0.05 | 4.3 | 3.5 | .0000 | .0000 | .0250 | .0000 | .22 | 1.1 | .... | e |
| 2544 | 1904 Nov. 16 | None | None | None | 0.00 | 4.5 | 2.7 | .0000 | .0000 | .0350 | .0000 | .22 | 1.1 | .... | e |
| 2550 | Nov. 18 | Slight | S. fine | M. veg. | 0.00 | 4.8 | 3.3 | .0000 | .0000 | .0800 | .0000 | .22 | 1.4 | .... | f |
| 2589 | Dec. 12 | None | None | S. earthy | 0.00 | 7.5 | 6.0 | .0000 | .0010 | .0150 | .0000 | .25 | 1.2 | .... | * |
| 2599 | Dec. 19 | None | Consid. fine | S. earthy | 0.00 | 6.0 | 3.0 | .0000 | .0000 | .0400 | .0000 | .25 | 1.6 | .... | f |
| 2622 | 1905 Jan. 2 | None | S. fine | S. earthy | 0.00 | 4.3 | 3.0 | .0000 | .0000 | .0280 | .0000 | .25 | 1.1 | .... | .. |
| 2647 | Jan. 17 | Slight | M. floc. | None | 0.25 | 4.8 | 3.5 | .0000 | .0000 | .0150 | .0000 | .20 | 0.6 | .... | h |
| 2649 | Jan. 17 | None | None | Slight | 0.15 | 4.4 | 2.9 | .0000 | .0024 | .0100 | .0000 | .15 | 0.4 | .... | *j |
| 2650 | Jan. 17 | V. slight | Consid. floc. | Veg. | 0.30 | 3.7 | 2.9 | .0020 | .0010 | .0150 | .0000 | .17 | 0.9 | .... | k |
| 2683 | Feb. 7 | None | V. slight | None | 0.05 | 9.2 | 6.9 | .0000 | .0000 | .0550 | .0008 | .25 | 2.7 | .... | l |
| 2667 | Jan. 30 | Slight | S. floc. | V. slight | 0.15 | 5.0 | 3.0 | .0000 | .0010 | .0200 | .0000 | .15 | 1.4 | .... | m |
| 2694 | Feb. 13 | None | S. floc. | V. slight | 0.00 | 4.0 | 2.8 | .0010 | .0010 | .0300 | .0000 | .30 | 2.2 | .... | n |
| 2709 | Feb. 20 | Slight | M. floc. | S. foul | 0.20 | 4.2 | 3.0 | .0094 | .0000 | .0300 | .0001 | .22 | 0.6 | .... | o |
| 2747 | Mar. 13 | None | V. slight | S. musty | 0.00 | 8.0 | 6.0 | .0000 | .0014 | .0300 | .0000 | .85 | 3.1 | .110 | p |
| 1767 | Mar. 27 | None | M. floc. | S. earthy | 0.05 | 4.0 | 3.1 | .0000 | .0000 | .0280 | .0000 | .20 | 1.6 | .... | *q |
| 2773 | Mar. 29 | Much | Consid. | S. musty | 0.20 | 4.6 | 2.0 | .0010 | .0010 | .0250 | .0000 | .20 | 1.2 | .... | .. |
| 2778 | Mar. 30 | None | S. fine | Slight | 0.10 | 4.9 | 3.4 | .0014 | .0014 | .0250 | .0000 | .20 | 1.6 | .... | .. |
| 2782 | Mar. 31 | None | Consid. | S. earthy | 0.10 | 4.5 | 3.0 | .0000 | .0000 | .0200 | .0000 | .20 | 1.6 | .... | .. |
| 2784 | Apr. 1 | None | Consid. | None | 0.10 | 4.5 | 2.6 | .0014 | .0000 | .0200 | .0000 | .20 | 1.1 | .... | .. |
| 2787 | Apr. 3 | None | Consid. | None | 0.10 | 4.5 | 2.7 | .0014 | .0010 | .0200 | .0000 | .20 | 1.1 | .... | .. |
| 2789 | Apr. 4 | None | V. slight | None | 0.05 | 4.5 | 3.0 | .0014 | .0010 | .0150 | .0000 | .20 | 1.1 | .... | .. |
| 2792 | Apr. 6 | Slight | Slight | Slight | 0.10 | 4.2 | 2.3 | .0000 | .0014 | .0150 | .0000 | .20 | 1.1 | .... | .. |
| 2810 | Apr. 24 | None | Slight | None | 0.10 | 4.0 | 2.3 | .0000 | .0014 | .0150 | .0000 | .22 | 1.2 | .... | * |
| 2837 | May 10 | None | V. slight | Veg. | 0.00 | 5.8 | 3.8 | .0000 | .0000 | .0250 | .0000 | .22 | 1.4 | .... | .. |
| 2842 | May 11 | None | Consid. | V. slight | 0.00 | 13.7 | 8.2 | .0000 | .0010 | .0250 | .0000 | .25 | 6.2 | .... | .. |
| 2847 | May 13 | Slight | S. floc. | Slight | 0.00 | 5.1 | 3.2 | .0010 | .0000 | .0300 | .0000 | .20 | 1.1 | .... | .. |
| 2849 | May 15 | None | V. slight | V. slight | 0.00 | 5.1 | 3.1 | .0000 | .0000 | .0300 | .0000 | .20 | 1.1 | .... | .. |
| 2850 | May 16 | None | None | None | 0.10 | 5.1 | 3.3 | .0000 | .0000 | .0300 | .0000 | .20 | 1.1 | .... | .. |
| 2853 | May 17 | None | V. slight | None | 0.00 | 5.7 | 3.7 | .0000 | .0000 | .0300 | .0000 | .20 | 1.2 | .... | .. |
| 2854 | May 18 | None | V. slight | Earthy | 0.00 | 5.7 | 2.8 | .0010 | .0000 | .0200 | .0000 | .20 | 1.1 | .... | .. |

*Examination of Water from Franklin Town Supply.—Concluded.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 2857 | 1905 May 19 | None | None | None | 0.00 | 5.80 | 4.0 | .0010 | .0000 | .0200 | .0000 | .20 | 1.2 | .... | .. |
| 2860 | May 22 | Slight | Slight | V. slight | 0.05 | 9.7 | 6.2 | .0000 | .0000 | .5000 | .0000 | .93 | 2.7 | .... | u |
| 2862 | May 22 | None | Slight | Slight | 0.05 | 5.1 | 3.4 | .0000 | .0000 | .1000 | .0000 | .32 | 1.4 | .... | v |
| 3047 | Aug. 4 | Slight | None | None | 0.00 | 5.7 | 3.3 | .0010 | .0016 | .0200 | .0000 | .22 | 1.2 | .... | .. |
| 3196 | Sept. 26 | V. slight | V. slight | S. earthy | 0.10 | 4.9 | 2.6 | .0006 | .0060 | .0100 | .0000 | .22 | 1.8 | .... | .. |
| 3202 | Sept. 27 | None | None | None | 0.10 | 4.7 | 2.8 | .0008 | .0054 | .0200 | .0000 | .22 | 1.8 | .... | .. |
| 3231 | Oct. 17 | None | None | S. veg. | 0.15 | 4.6 | 2.9 | .0020 | .0084 | .0100 | .0000 | .22 | 1.5 | .... | .. |
| 3345 | Dec. 23 | None | None | Veg. | 0.05 | 4.1 | 2.8 | .0022 | .0038 | .0100 | .0000 | .20 | 1.9 | .... | .. |
| 3347 | Dec. 28 | M. opal | Con. floc. | M. veg. | 0.18 | 9.1 | 7.0 | .0040 | .0034 | .0250 | .0010 | .22 | 4.2 | .... | w |
| 3348 | Dec. 28 | V. slight | V. slight | S. veg. | 0.05 | 6.0 | 4.5 | .0008 | .0030 | .0250 | .0000 | .22 | 2.0 | .... | .. |
| 3355 | 1906 Jan. 2 | None | None | None | 0.00 | 4.8 | 3.5 | .0010 | .0034 | .0250 | .0000 | .22 | 2.7 | .... | .. |
| 3366 | Jan. 5 | None | None | None | 0.05 | 4.1 | 2.4 | .0010 | .0034 | .0100 | .0000 | .22 | 1.5 | .... | .. |
| 3375 | Jan. 9 | None | None | None | 0.00 | 5.3 | 3.8 | .0010 | .0014 | .0280 | .0000 | .22 | 2.0 | .... | .. |
| 3401 | Jan. 18 | None | None | None | 0.00 | 5.1 | 3.6 | .0010 | .0054 | .0200 | .0000 | .22 | 2.2 | .... | .. |
| 3412 | Jan. 25 | None | None | None | 0.05 | 5.3 | 3.6 | .0000 | .0024 | .0200 | .0000 | .20 | 1.4 | .... | * |
| 3429 | Feb. 1 | None | None | None | 0.00 | 5.3 | 3.2 | .0008 | .0010 | .0200 | .0000 | .22 | 1.2 | .... | .. |
| 3591 | May 2 | None | None | None | 0.00 | 8.0 | 2.5 | .0014 | .0014 | .0400 | .0000 | .22 | 1.4 | .... | .. |
| 4035 | Oct. 2 | Sl. opal | V. slight | None | 0.10 | 6.5 | 3.5 | .0014 | .0030 | .0100 | .0000 | .10 | 1.9 | .... | * |
| 4411 | 1907 Apr. 8 | Sl. opal | Slight | None | 0.00 | 4.1 | 2.4 | .0012 | .0014 | .0000 | .0000 | .23 | 1.6 | .... | .. |
| 4557 | May 22 | None | Slight gelatinous | None | 0.05 | 4.5 | 3.1 | .0020 | .0022 | .0050 | .0000 | .20 | 1.6 | .... | .. |
| 4667 | June 25 | None | S. fine | None | 0.00 | 4.6 | 3.5 | .0002 | .0006 | .0050 | .0000 | .30 | 1.9 | .... | * |
| 4897 | Sept. 23 | None | None | None | 0.00 | 4.5 | 3.4 | .0002 | .0030 | .0000 | .0000 | .10 | 1.2 | .... | .. |
| 5187 | 1908 Mar. 24 | Mod. opal | Slight | None | 0.5 | 4.0 | 2.7 | .0002 | .0028 | .0030 | .0000 | .18 | 1.2 | .... | .. |
| 5647 | Sept. 18 | V. slight | V. slight | None | 0.10 | 5.3 | 0.0 | .0002 | .0004 | .0100 | .0000 | .16 | .9 | .... | .. |
| 5846 | Nov. 17 | None | Sl. ferrug. | None | 0.10 | 3.3 | 1.8 | .0005 | .0010 | .0100 | .0000 | .17 | 1.6 | .... | .. |
| 6058 | 1909 Mar. 26 | Marked | Med. earthy | Mark. earthy | Opaque | 6.4 | 4.5 | .0008 | .0025 | .0100 | .0000 | .12 | 1.1 | .... | .. |
| 7767 | 1910 Apr. 5 | Slight | Cons. floc. | Sl. earthy | 0.05 | 4.5 | 3.6 | .0010 | .0016 | .0050 | .0000 | .14 | 3.2 | .... | * |
| 7862 | May 4 | None | Mod. ferrug. | V. Sl. earthy | 0.05 | 3.7 | 2.9 | .0005 | .0015 | .0075 | .0000 | .12 | 1.5 | .... | .. |
| 7880 | May 11 | V. slight | None | None | 0.05 | .... | .... | .0005 | .0010 | .0100 | .0000 | .15 | 1.2 | .... | .. |

* B. Coli present; *e* test well No. 8; *f* driven well No. 9; *h* Ward's Brook; j Webster Lake; *k* Giles Brook; *l* well No. 4; *m* well No. 16; *n* well No. 5; *o* well No. 7; *p* spring; *q* all the wells after being pumped 24 hours; *u* brick wall; *v* wood covered reservoir; *w* large well.

In addition to the above, a number of special examinations have been made for colon bacilli.

**Goffstown.**—The present system was built in 1891 by the Goffstown Fire Precinct, Goffstown Village. The reservoir from which the water supply comes is situated between the Uncanoonuc Mountains and is surrounded by woodland. The reservoir is fed by springs in the bottom of the reservoir; by a brook, fed by springs flowing from the northeastern slope of the north mountain, and from a swamp flowing into the brook near the mouth of the reservoir. In addition to the above there has recently been built a storage reservoir of larger capacity than this one; both are at the base of Uncanoonuc Mountains. The quality of the supply has recently improved, the color being much reduced.

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 201 | 1901 Oct. 10 | None | Floc.veg. | Dec. vg. | 1.40 | 5.60 | 2.20 | .0042 | .0276 | .0000 | .0002 | .17 | .... | .... | .. |
| 795 | 1902 Sept.11 | None | None | Dec. vg. | 1.90 | 8.70 | 2.00 | .0028 | .0234 | .0000 | .0002 | .11 | 2.0 | .... | .. |
| 1388 | 1903 July 29 | Slight | Floc.veg. | Dec. vg. | 1.1 | 8.00 | 1.10 | .0014 | .0202 | .0000 | .0000 | .16 | 0.9 | .... | .. |
| 1962 | 1904 May 17 | None | None | V. slight veg. | 0.9 | 4.20 | 1.80 | .0000 | .0080 | .0000 | .0000 | .13 | 1.7 | .... | .. |
| 2666 | 1905 Jan. 30 | None | None | S. veg. | 1.30 | 6.0 | 2.6 | .0000 | .0120 | .0000 | .0000 | .15 | 0.7 | .... | .. |
| 3154 | Sept. 9 | None | None | Veg. | 2.20 | 9.3 | 2.6 | .0010 | .0314 | .0100 | .0000 | .10 | 1.5 | .... | .. |
| 3370 | 1906 Jan. 10 | None | None | Veg. | 0.80 | 4.8 | 2.0 | .0014 | .0024 | .0100 | .0000 | .10 | 0.9 | .... | .. |
| 4174 | Nov. 21 | None | None | None | 0.30 | 4.3 | 2.8 | .0014 | .0070 | .0100 | .0000 | .25 | 0.4 | .... | .. |
| 4448 | 1907 Apr. 16 | None | V. slight | None | 0.10 | 2.5 | 0.9 | .0010 | .0028 | .0050 | .0000 | .23 | 0.4 | .... | .. |
| 4965 | Oct. 18 | None | None | None | 0.20 | 3.2 | 2.3 | .0012 | .0096 | .0040 | .0000 | .15 | 0.4 | .... | .. |
| 5233 | 1908 Apr. 15 | None | None | None | 0.00 | 2.5 | 1.0 | .0004 | .0014 | .0060 | .0000 | .10 | 0.4 | .... | .. |
| 5430 | July 20 | V. ft. op. | Slight | Mk.foul | 0.10 | 3.0 | 1.7 | .0008 | .0062 | .0120 | .0000 | .11 | 1.8 | .... | .. |
| 5899 | Dec. 23 | None | None | Sl. arom. | 0.70 | 6.4 | 3.5 | .0015 | .0150 | .0000 | .0000 | .17 | .9 | .... | .. |
| 7780 | 1910 Apr. 11 | None | Sl. floc. | Sl. earthy | 0.70 | 2.3 | .80 | .0004 | .0050 | .0020 | .0000 | .12 | .1 | .... | .. |

*Examination of Water from Hillsborough County Farm.*[1]

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5983 | 1909 Feb. 10 | None | V. slight | Mod. earthy | 0.10 | 4.1 | 2.3 | .0015 | .0025 | .0400 | .0000 | .33 | .7 | .... | .. |

[1] Pumped from Piscataquog River.

**Gorham.**—No public supply. The Alpine Aqueduct Company, organized in 1873, furnishes water to 160 families, one half the population, from 19 springs, three to seven feet deep, stoned and covered.



*Examination of Water from a Faucet of the Alpine Aqueduct Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 799 | 1902 Sept.11 | None | None | None | 0.0 | 7.40 | 4.80 | .0000 | .0000 | .0000 | .0000 | .10 | 1.9 | .... | .. |
| 1352 | 1903 July 18 | None | None | None | 0.0 | 5.80 | 1.20 | .0000 | .0014 | .0000 | .0000 | .05 | 1.1 | .... | .. |
| 1957 | 1904 May 15 | None | None | V.slight | 0.0 | 4.80 | 3.70 | .0014 | .0030 | .0000 | .0000 | .07 | 2.0 | .... | .. |
| 2672 | 1905 Jan. 30 | None | None | None | 0.05 | 6.0 | 4.3 | .0000 | .0000 | .0200 | .0000 | .07 | 1.6 | .... | .. |
| 2813 | Apr. 24 | None | S. veg. | None | 0.28 | 5.5 | 2.3 | .0000 | .0014 | .0250 | .0000 | .15 | 0.7 | .... | *a* |
| 2814 | Apr. 24 | None | Slight | None | 0.28 | 4.5 | 2.4 | .0000 | .0022 | .0000 | .0000 | .07 | 0.1 | .... | *b* |
| 2815 | Apr. 24 | None | None | None | 0.00 | 5.0 | 3.3 | .0000 | .0008 | .0100 | .0000 | .15 | 0.7 | .... | .. |
| 2816 | Apr. 24 | None | V. slight | None | 0.10 | 4.8 | 3.1 | .0000 | .0010 | .0000 | .0000 | .05 | 0.4 | .... | *c* |
| 3204 | Sept.27 | None | Slight | None | 0.10 | 5.1 | 3.1 | .0007 | .0020 | .0100 | .0000 | .05 | 1.2 | .... | .. |
| 3385 | 1906 Jan. 10 | None | None | None | 0.00 | 4.4 | 2.7 | .0014 | .0010 | .0100 | .0000 | .05 | 1.5 | .... | .. |
| 4112 | Oct. 30 | None | None | Mark. veg. | 0.05 | 5.7 | 2.8 | .0008 | .0048 | .0050 | .0000 | .07 | 1.2 | .... | .. |
| 4436 | 1907 Apr. 15 | None | V. slight | Aromatic | 0.10 | 3.1 | 2.0 | .0016 | .0020 | .0200 | .0000 | .05 | 1.2 | .... | .. |
| 4939 | Oct. 9 | None | None | None | 0.35 | 1.8 | 1.2 | .0008 | .0044 | .0030 | .0000 | .15 | 0.9 | .... | .. |
| 7071 | 1909 June 1 | None | None | None | 0.20 | 3.3 | 1.8 | .0005 | .0040 | .0200 | .0000 | .11 | .4 | .... | .. |
| 7285 | Aug. 18 | None | None | None | 0.00 | 5.0 | 3.2 | .0001 | .0001 | .0050 | .0000 | .07 | 1.6 | .... | .. |
| 7791 | 1910 Apr. 11 | None | Sl.earthy | Earthy | 0.10 | 3.2 | 1.8 | .0010 | .0070 | .0500 | .0000 | .07 | .6 | .... | .. |

*a* Perkins Brook; *b* South Branch of Moose Brook; *c* Ice from Gulch Brook.

**Greenfield.**—During 1910 the town voted to appropriate $200 for establishing a watering trough and drinking fountain, and an analysis was secured of the proposed supply. At this time, however, nothing further has been done in the matter.

*Examination of Water for Proposed Drinking Fountain.*

| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 7924 | 1910 May26 | None | V. slight | None | 0.00 | 8.0 | .... | .0010 | .0010 | .0450 | .0000 | .35 | 3.6 | .... | * |

*Examination of Water from the Well of Boston & Maine Railroad.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7897 | May 17 | None | None | None | 0.00 | ..... | .... | .0050 | .0125 | .0100 | .0000 | .50 | 2.0 | .... | .. |

* B. Coli present.

**Greenville.**—The town owns and operates a small water supply in the form of an artesian well 425 feet deep, ending in solid rock, and most of the distance below 125 feet in solid rock. The water is pumped to a brick reservoir of 20,000 gallons' capacity. There is one mile of wood main pipe, while the service pipes are of galvanized iron. Sixteen families and two schools take from this supply, 25 per cent. of the population. There are many private wells within this area, but none to which the public have access.

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| | 1902 | | | | | | | | | | | | | | |
| 753 | Aug. 27 | None | None | None | 0.00 | 12.40 | 8.7 | .0000 | .0000 | .0200 | .0000 | .12 | 3.9 | .... | .. |
| | 1905 | | | | | | | | | | | | | | |
| 2699 | Feb. 14 | Much | Slight | V. slight | 0.10 | 11.5 | 10.0 | .0020 | .0000 | .0000 | .0000 | .15 | 3.9 | .... | .. |
| 2970 | July 10 | V. slight | Slight | S. foul | 0.15 | 12.3 | 9.9 | .0008 | .0016 | .0120 | .0000 | .17 | 4.5 | .... | .. |
| 3135 | Sept. 1 | V. slight | S. opal | Clayey | .... | 12.2 | 7.1 | .0022 | .0022 | .0000 | .0000 | .16 | 4.0 | .... | .. |
| | 1906 | | | | | | | | | | | | | | |
| 3400 | Jan. 18 | Heavy | Consid. ferrug. | None | 0.50 | 17.8 | 13.5 | .0014 | .0074 | .0050 | .0005 | .22 | 4.6 | .... | .. |
| 3417 | Jan. 29 | V. slight | None | None | 0.10 | 13.3 | 8.5 | .0014 | .0034 | .0050 | .0001 | .27 | 4.3 | .... | .. |
| 3649 | May 31 | M. opal | None | Veg. | 0.20 | 13.5 | 9.8 | .0010 | .0014 | .0050 | .0000 | .10 | .... | .... | .. |
| 4123 | Nov. 2 | Slight | S. fine | S. veg. | 0.10 | 14.0 | 10.1 | .0008 | .0036 | .0050 | .0000 | .10 | 4.5 | .... | .. |
| | 1909 | | | | | | | | | | | | | | |
| 5966 | Feb. 3 | Heavy | Sl. earthy | Mark. | 0.40 | 13.6 | 9.4 | .0040 | .0030 | .0200 | .0000 | .15 | 3.9 | .... | * |
| 5996 | Feb. 19 | Mod. opal | V. slight | None | 0.10 | 10.7 | 7.3 | .0360 | .0020 | .0100 | .0000 | .16 | 3.7 | .... | .. |

* B. Coli present.

**Hampton.**—In 1907 the Hampton Water Works Company constructed and put in operation at the Hampton Beach Village Precinct a system of water works, the source being 13 driven wells from 16 to 21 feet deep. Located at the so-called Gill's Spring, with a collecting basin 16 feet deep. The rate of water flow is 260 gallons. The geological formation is gravel and coarse, sharp sand.

Water is pumped to steel standpipe 15 feet by 90 feet, located on Great Boar's Head. There are four miles of cast-iron distributing mains, while the service pipes are of galvanized wrought iron.

One hundred and thirty families are using the supply, which constitute, approximately, 50 per cent. of the population of the locality.

*Examination of Water from Hampton Water Works Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 4654 | 1907 June 20 | None | Slight | Earthy | 0.00 | 10.3 | 7.8 | .0012 | .0002 | .0150 | .0000 | 1.34 | 3.6 | .... | .. |
| 4655 | June 20 | None | S. fine | Earthy | 0.00 | 9.6 | 7.5 | .0004 | .0002 | .0050 | .0000 | 1.25 | 3.2 | .... | .. |
| 4774 | July 30 | S. opal | S. fine | Aromatic | Cl. | 10.5 | 9.7 | .0016 | .0028 | .0100 | High | 1.35 | 4.6 | .... | * |
| 5238 | 1908 Apr. 24 | None | More earthy | Veg. | 0.05 | 8.8 | 6.3 | .0004 | .0002 | .0050 | .0000 | 1.21 | 3.1 | .... | .. |
| 5383 | June 26 | None | None | None | 0.10 | 10.3 | 6.7 | .0010 | .0004 | .0500 | .0000 | 1.40 | 3.9 | .... | .. |
| 5385 | June 26 | V. slight | None | S. foul | 0.05 | 8.5 | 5.0 | .0002 | .0002 | .0750 | .0000 | 1.46 | 3.2 | .... | .. |
| 5510 | Aug. 13 | None | None | None | 0.00 | 13.5 | .... | .0016 | .0002 | .2000 | .0006 | 1.40 | 3.7 | .... | .. |
| 5511 | Aug. 13 | None | None | Foul | 0.00 | 24.8 | .... | .0064 | .0020 | .0750 | .0007 | 9.60 | 4.6 | .... | .. |
| 8277 | 1910 Aug. 5 | None | None | None | 0.00 | 10.7 | 6.4 | .0010 | .0010 | .0500 | .0000 | 1.35 | 3.9 | .... | .. |
| *Examination of Water from Town Pump.* | | | | | | | | | | | | | | | |
| 7176 | 1909 July 9 | None | None | Sl. foul | 0.00 | ..... | 6.8 | .0010 | .0015 | .250 | .0000 | 1.70 | 4. | .... | * |
| *Examination of Water from the Wells Supplying Casino.* | | | | | | | | | | | | | | | |
| 5591 | 1908 Aug. 31 | Slight | V. slight | Mark. foul | 0.00 | 33.0 | 22.4 | High | .0010 | .0030 | trace | 10.79 | 5.3 | .... | *a* |
| 8155 | 1910 July 19 | None | V. slight | None | 0.05 | ..... | .... | .0004 | .0030 | .150 | .0000 | 2.7 | 3.2 | .... | *b* |

*a* Casino wells by steam pump; *b* Well back of Casino.

**Hancock.**—A new supply, instituted in 1907, is obtained from Eaton's Brook. The latter is impounded by a dam and the resulting reservoir, located about two miles from the village, consists of a deep and narrow ravine, which was completely denuded of surface debris before flowing. Its capacity is 2,000,000 gallons. The mains are of iron, with galvanized iron service pipe. Twenty-five families, equivalent to about 75 per cent. of the village population, now use this supply.

*Examination of Water from Eaton's Brook and Tributaries.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites | | | | |
| | 1905 | | | | | | | | | | | | | | |
| 3040 | Aug. 1 | None | S. veg. | Con. veg. | 0.30 | 5.0 | 3.0 | .0008 | .0072 | .0300 | .0000 | .10 | 1.1 | .... | * |
| 3055 | Aug. 6 | None | V. slight | Slight | 0.15 | 10.4 | 5.0 | .0006 | .0036 | .0150 | .0000 | .10 | 1.1 | .... | * |
| 3123 | Aug. 30 | None | None | None | 0.05 | 4.0 | 2.1 | .0030 | .0038 | .0100 | .0000 | .06 | .... | .... | * |
| | 1906 | | | | | | | | | | | | | | |
| 3391 | Jan. 15 | None | S. coarse | None | 0.10 | 3.8 | 2.2 | .0010 | .0064 | .0100 | .0000 | .10 | 0.03 | .... | .. |
| 4104 | Oct. 28 | None | V. slight | S. veg. | 0.30 | 4.5 | 3.0 | .0014 | .0124 | .0050 | .0000 | .05 | 1.2 | .... | * |
| | 1907 | | | | | | | | | | | | | | |
| 4388 | Mar. 27 | Consid. | Mod. earthy | Swampy | 0.20 | 3.1 | 1.7 | .0004 | .0004 | .0220 | .0000 | .13 | 0.4 | .... | * |
| 4394 | Apr. 3 | None | V. slight | V. slight | 0.15 | 4.2 | 2.0 | .0012 | .0034 | .0200 | .0000 | .13 | 0.4 | .... | .. |
| 4463 | Apr. 25 | None | S. fine | None | 0.12 | 5.3 | 2.4 | .0012 | .0030 | .0070 | .0000 | .14 | 1.6 | .... | .. |
| 4940 | Oct. 10 | None | None | None | 0.25 | 2.1 | 1.5 | .0010 | .0042 | .0030 | .0000 | .20 | 1.2 | .... | .. |
| | 1908 | | | | | | | | | | | | | | |
| 5265 | Apr. 29 | None | None | V. slight | 0.10 | 3.9 | 2.5 | .0004 | .0034 | .0120 | .0000 | .09 | 0.4 | .... | .. |
| | 1909 | | | | | | | | | | | | | | |
| 5962 | Feb. 3 | V. ft. opal | V. slight | None | 0.10 | 4.6 | 3.0 | .0020 | .0020 | .005 | .0000 | .09 | 1.5 | .... | .. |
| | 1910 | | | | | | | | | | | | | | |
| 7657 | Feb. 14 | V. slight | Sl. fibre | Sl. earthy | 0.08 | 2.9 | 2.4 | .0004 | .0054 | .0050 | .0000 | .11 | .6 | .... | .. |
| 7787 | Apr. 11 | None | V. slight | V. slight | 0.20 | 2.3 | 1.4 | .0006 | .0100 | .0020 | .0000 | .17 | .6 | .... | *a** |

* B. Coli present. *a.* .10 zinc.

**Hanover.**—The Hanover Water Works, installed in 1893, is an impounded water in a large artificial pond. The bed of the pond was a fertile valley, which was not cleared of vegetation before impounding the water. The water has always been colored, rich in dissolved vegetable matter, with occasionally some little taste and odor, though usually not offensive.

The Hanover Aqueduct Association, a private corporation, furnishes a water that is used largely, though not exclusively, for drinking purposes. It is a normal spring water, the wells being eight or nine in number and dug to a depth of 10 to 20 feet, and yielding 4,000 gallons per day. There are very few individual wells in this locality.

There are about 100 taps in operation on this aqueduct. The main is two-inch lead pipe, and the service pipes are generally one-half inch lead; water is served through pinhole gauges presumed to deliver 40 gallons daily.

*Examination of Water from Supply of the Hanover Water Works Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| .... | 1893 Oct. 29 | Marked | Much | ....... | Faint yel. br. | 8.10 | 4.00 | .0170 | .0240 | .0000 | .0000 | .... | 2.9 | .... | a |
| .... | Nov. 27 | Marked | ........ | ....... | | 7.20 | 2.68 | .0080 | .0170 | .0000 | .0000 | .... | 2.7 | .... | b |
| .... | Dec. 29 | Faint | ........ | ....... | | 6.08 | 3.16 | .0038 | .0178 | .0000 | .0000 | .10 | 2.7 | .... | c |
| .... | 1894 Jan. 26 | None | None | ....... | 0.7 | 8.50 | .... | .0088 | .0224 | .0000 | .0000 | .26 | .... | .... | d |
| .... | Feb. 8 | None | None | Foul | 0.7 | 8.50 | 4.60 | .0010 | .0132 | .0000 | .0000 | .20 | 4.1 | .... | e |
| .... | Mar. 8 | None | None | Slight | 0.3 | 10.00 | 5.70 | ..... | ..... | ..... | ..... | .40 | 1.9 | .... | f |
| .... | Apr. 10 | Slight | ........ | ....... | 0.3 | 4.88 | 1.80 | ..... | ..... | .0400 | .0000 | .16 | .... | .... | .. |
| .... | Dec. 27 | ........ | ........ | ....... | 0.7 | ..... | .... | .0003 | .0250 | .0200 | .0000 | .05 | 2.9 | .... | g |
| .... | 1896 Mar. 20 | ........ | ........ | ....... | 0.5 | 5.28 | 2.64 | .0066 | .0180 | .0000 | .0000 | .10 | 1.4 | .... | .. |
| 798 | 1902 Sept. 11 | V. slight | Sl. veg. | V. dec. and earthy | 0.55 | 8.80 | 3.30 | .0020 | .0230 | .0000 | .0000 | .09 | 2.2 | .... | .. |
| 1353 | 1903 July 20 | Marked | V. much floc. | V. mark veg. | 0.5 | 7.80 | 2.20 | .0010 | .0240 | .0000 | .0000 | .10 | 2.2 | .... | .. |
| 1384 | July 29 | Marked | Floc veg. | Decayed veg. | 0.2 | 7.70 | 2.50 | .0010 | .0214 | .0000 | .0000 | .07 | 2.0 | .... | .. |
| 1385 | July 29 | Marked | Floc. veg. | Decayed veg. | 0.2 | 8.10 | 2.40 | .0010 | .0216 | .0000 | .0000 | .07 | 2.1 | .... | .. |

*Examination of Water from Supply of the Hanover Water Works Company.—Concluded.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1904 | | | | | | | | | | | | | | |
| 1838 | Feb. 16 | Slight | Fine floc. | V. slight | 0.6 | 8.60 | 3.20 | .0208 | .0184 | .0000 | .0000 | .10 | 2.6 | .... | .. |
| 1839 | Feb. 16 | Marked | Con. fine | Slight veg. | 0.6 | 8.20 | 3.80 | .0218 | .0184 | .0000 | .0000 | .10 | 2.7 | .... | .. |
| 1840 | Feb. 16 | Slight | Con. floc | Veg. | 0.6 | ..... | .... | .0218 | .0184 | .0000 | .0000 | .10 | 2.7 | .... | .. |
| 1865 | Mar. 8 | Slight | Slight | Mark'd veg. | 0.4 | 10.10 | 2.00 | .0104 | .0126 | .0000 | .0000 | .10 | 2.2 | .... | h |
| 1866 | Mar. 9 | Marked | Slight | Mark'd veg. | 0.5 | 9.60 | 2.50 | .0236 | .0152 | .0000 | .0000 | .15 | 2.2 | .... | .. |
| 1886 | Apr. 4 | V. slight | None | Mark'd veg. | 0.3 | 4.90 | 2.40 | .0000 | .0036 | .0000 | .0000 | .10 | 2.3 | .... | i |
| 1887 | Apr. 4 | V. slight | None | Mark'd veg. | 0.3 | 6.20 | 2.80 | .0006 | .0052 | .0000 | .0000 | .10 | 2.4 | .... | j |
| | 1905 | | | | | | | | | | | | | | |
| 3148 | Sept. 6 | Slight | Slight | Veg. | 0.50 | 8.3 | 3.6 | .0016 | .0160 | .0200 | .0000 | .07 | 2.7 | .... | .. |
| 3267 | Sept.31 | V. slight | V. S. fine | S. veg. | 0.20 | 6.3 | 3.1 | .0018 | .0112 | .0100 | .0000 | .10 | 2.8 | .... | .. |
| 3268 | Oct. 31 | Slight | Slight | S. veg. | 0.40 | 6.3 | 3.1 | .0024 | .0182 | .0050 | .0000 | .10 | 2.8 | .... | .. |
| | 1906 | | | | | | | | | | | | | | |
| 3434 | Feb. 1 | None | V. slight | None | 0.35 | 7.0 | 3.3 | .0026 | .0094 | .0050 | .0000 | .05 | 2.4 | .... | .. |
| 4130 | Nov. 4 | None | Marked veg. | S. veg. | 0.35 | 6.7 | 3.7 | .0036 | .0150 | .0050 | .0000 | .05 | 2.6 | No | .. |
| | 1907 | | | | | | | | | | | | | | |
| 4363 | Mar.16 | V. slight | S. fibrous | S. foul | 0.00 | 3.2 | .... | .0010 | .0024 | .0050 | Ft. tr. | .06 | 0.6 | .... | .. |
| 4453 | Apr. 18 | None | S. earthy | Earthy | 0.20 | 4.5 | 3.0 | .0012 | .0106 | .0100 | .0020 | .04 | 1.9 | No | * |
| 4502 | May 4 | None | S. floc. | S. veg. | 0.05 | 4.7 | 2.7 | .0038 | .0074 | .0100 | .0000 | .10 | 1.9 | .... | .. |
| 4998 | Nov. 5 | V. slight | S. coarse | None | 0.35 | 5.5 | 3.5 | .0012 | .0120 | .0050 | .0000 | .14 | 2.6 | .... | .. |
| | 1908 | | | | | | | | | | | | | | |
| 5264 | Apr. 29 | V. slight | S. floc. | None | 0.15 | 3.6 | 2.6 | .0018 | .0068 | .0100 | .0000 | .09 | 1.6 | .... | .. |
| | 1909 | | | | | | | | | | | | | | |
| 5965 | Feb. 3 | None | None | None | 0.30 | 6.4 | 3.5 | .0040 | .0110 | .050 | .0000 | .04 | 2.7 | .... | .. |
| 5971 | Feb. 4 | V. slight | V. slight | Earthy | 0.60 | 6.6 | 3.2 | High | .0160 | .020 | Sl. trace | .04 | 2.6 | .... | .. |
| | 1910 | | | | | | | | | | | | | | |
| 7775 | Apr. 8 | Mod. | Cons. floc. | Cons. earthy | 0.40 | 6.5 | 4.4 | .0008 | .0070 | .0020 | .0000 | .09 | 1.5 | .... | .. |

*a* Reservoir filling; *b* reservoir half full; *c* heavy thaw; *d* heavy thaw; *e* offensive; *f* heavy thaw; *g* sample from pipes; *h* filtered through sand filter; *i* filtered through sand filter, No. 1; *j* filtered through sand filter, No. 2. * B. Coli present.

**Haverhill.**—No public supply. The Haverhill Aqueduct Company, a stock company, built a system of water works for the town more than fifty years ago, the source of the supply being a spring. Water flows by gravity through a lead main and service pipes. The village of Woodsville in this town has a public system. For analyses of water see Woodsville.

*Examination of Water from Faucets of Haverhill Aqueduct Company.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 771 | 1902 Sept. 3 | None | None | None | 0.0 | 6.10 | 3.90 | .0000 | .0000 | .0300 | .0000 | .065 | 3.6 | .... | .. |
| 1407 | 1903 Aug. 5 | None | None | Slight | 0.0 | 5.00 | 2.80 | .0000 | .0000 | .0000 | .0000 | .05 | 2.7 | .... | .. |
| 1960 | 1904 May 16 | None | Con. fine | S. veg. | 0.0 | 4.10 | 3.10 | .0056 | .0032 | .0150 | .0000 | .08 | 2.7 | .070 | .. |
| 1997 | May 30 | None | None | None | 0.0 | 5.10 | 3.30 | .0000 | .0032 | .0000 | .0000 | .10 | 2.6 | .... | .. |
| 2536 | Nov. 15 | None | None | V. slight | 0.05 | 5.3 | 3.6 | .0000 | .0030 | .0175 | .0000 | .12 | 3.2 | .... | .. |
| 2679 | 1905 Feb. 2 | None | Slight | S. musty | 0.05 | 6.2 | 3.8 | .0000 | .0000 | .0200 | .0000 | .10 | 2.0 | .... | .. |
| 3407 | 1906 Jan. 22 | None | S. coarse | S. veg. | 0.03 | 5.0 | 3.2 | .0020 | .0044 | .0100 | .0000 | .10 | 2.3 | Tr. | .. |
| 4109 | Oct. 28 | None | Slight | None | 0.05 | 8.3 | 6.0 | .0012 | .0030 | .0100 | .0000 | .07 | 2.6 | .04 | .. |
| 4499 | 1907 May 3 | Consid. | Much earthy | None | Op. | 3.3 | 1.7 | .0022 | .0028 | .0300 | .0000 | .08 | 1.6 | .05 | .. |
| 4990 | Oct. 30 | Marked | Heavy earthy | None | Op. | 9.1 | 7.1 | .0002 | .0134 | .0060 | .0000 | .07 | 2.6 | .045 | * |
| 5261 | 1908 Apr. 29 | None | None | None | 0.05 | 4.5 | 2.9 | .0004 | .0018 | .0020 | .0000 | .07 | 2.2 | .05 | .. |
| 7667 | 1910 Feb. 25 | ........ | ........ | ........ | .... | ..... | .... | ........ | ........ | ........ | ........ | .... | .... | .200 | .. |
| 7778 | Apr. 10 | None | Sl. Silt. | Sl. earthy | 0.00 | 3.6 | 1.6 | .0008 | .0030 | .020 | .0000 | .09 | 1.1 | .200 | .. |

*Examination of Water from Supplies of Pike Manufacturing Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7471 | 1909 Oct. 25 | V. slight | Slight | Sl. earthy | 0.00 | ..... | .... | .0012 | .0120 | .0400 | .0000 | .20 | 5.3 | .... | *a* |
| 7542 | Dec. 6 | None | V. slight | None | 0.00 | 4.5 | .... | .0002 | .0005 | .0500 | .0000 | .05 | 1.6 | .000 | *c* |
| 7546 | Dec. 9 | V. slight | V. slight | None | 0.10 | ..... | .... | .0001 | .0025 | .005 | .0000 | .20 | 1.5 | .... | *b* |
| 8040 | 1910 July 6 | Slight | V. slight | None | 0.05 | ..... | .... | .0015 | .0010 | .0025 | .0000 | .20 | 2.6 | .... | *d* |

* B. Coli present. *a* Reservoir; *b* stream; *c* spring; *d* well.

**Henniker.**—Water is from the private supplies of the Henniker Spring Water Company, installed in 1884, and the Dow system, installed in 1874. The sources are springs and wells. The wells, three in number, are from 15 to 18 feet deep, with four springs used as feeders to them. The force is gravity, with four miles of galvanized iron main and service pipes. One hundred and thirty families, 95 per cent. of the population, take this water.



*Examination of Water from a Faucet of the Henniker Spring Water Company.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 745 | 1902 Aug. 26 | None | None | None | 0.0 | 5.90 | 4.50 | .0000 | .0000 | .0100 | .0000 | .07 | 2.6 | .... | .. |
| 3127 | 1905 Aug. 31 | None | None | None | 0.00 | 6.5 | 4.8 | .0000 | .0012 | .0400 | .0000 | .15 | .... | .... | .. |
| 4117 | 1906 Oct. 31 | None | None | None | 0.10 | 6.3 | 4.3 | .0008 | .0024 | .0050 | .0000 | .07 | 1.9 | .... | .. |
| 4451 | 1907 Apr. 18 | None | None | S. musty | 0.05 | 5.0 | 3.2 | .0010 | .0010 | .0150 | .0000 | .09 | 1.2 | .... | .. |
| 4989 | Oct. 30 | V. slight | V. slight | None | 0.30 | 4.2 | 2.7 | .0004 | .0070 | .0100 | .0000 | .08 | 1.2 | .... | * |
| 5015 | Nov. 14 | None | Slight | None | 0.05 | 3.0 | 2.2 | .0006 | .0026 | .0040 | .0000 | .30 | 0.4 | .... | .. |
| 5016 | Nov. 14 | V.S. opal | V. slight | None | 0.05 | 3.7 | 2.8 | .0002 | .0010 | .0050 | .0000 | .16 | 0.4 | .... | .. |
| 5017 | Nov. 13 | None | None | None | 0.08 | 5.4 | 3.7 | .0030 | .0004 | .0100 | .0000 | .32 | 1.2 | .... | * |
| 5262 | 1908 Apr. 28 | None | None | None | 0.00 | 5.0 | 2.8 | .0006 | .0004 | .0020 | .0000 | .09 | 0.4 | .... | .. |
| 5579 | 1909 Aug 28 | V. slight | V. slight | None | 0.05 | 7.0 | 4.5 | .0004 | .0014 | .0020 | .0000 | .19 | 1.9 | .... | .. |
| 5576 | Sept. 3 | Slight | V. slight | Slight | 0.00 | 5.7 | 4.2 | .0004 | .0038 | .0070 | .0000 | .09 | .4 | .... | .. |
| 7798 | 1910 Apr. 13 | None | V. slight | None | 0.00 | 2.5 | 2.2 | .0006 | .0054 | .0500 | .0001 | .10 | .7 | .... | [1] |

* B. Coli present. [1] 0.5 zinc.

**Hill.**—The present system of Hill Water Works, owned by F. R. Woodward, consists of the original Sumner stream supply, supplemented by a spring with flow of forty gallons per minute. The major portion of the supply consists of the brook water, filtered through sandy soil and collected in a well, from which it is distributed through about two miles of cement-lined mains, with galvanized service pipes. Seventy families, or practically the whole village, is supplied from this system.

*Examination of Water from the Woodward Supply.*

| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid. | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 761 | 1902 Sept. 2 | None | None | None | 0.0 | 6.00 | 2.50 | .0000 | .0028 | .0700 | .0000 | .22 | 1.8 | .... | .. |
| 1208 | 1903 May 24 | None | None | None | 0.0 | 4.40 | 2.70 | .0008 | .0076 | .1000 | .0001 | .25 | 2.6 | .... | .. |
| 2727 | 1905 Feb. 28 | None | None | None | 0.10 | 4.4 | 3.0 | .0000 | .0000 | .0150 | .0000 | .12 | 0.4 | .... | .. |
| 3035 | Aug. 1 | None | None | Veg. | 0.60 | 5.0 | 2.0 | .0000 | .0060 | .0400 | .0000 | .05 | 0.9 | .... | * |
| 3066 | Aug. 9 | Slight | M. floc. | S. veg. | 0.15 | 6.6 | 4.2 | .0006 | .0064 | .0150 | .0000 | .07 | 1.2 | .... | * |
| 3111 | Aug. 22 | None | V. slight | Earthy | 0.05 | 3.8 | 1.8 | .0008 | .0010 | .0000 | .0000 | .10 | .... | .... | * |
| 3113 | Aug.22 | None | V. slight | Slight | 0.10 | 3.5 | 1.2 | .0008 | .0022 | .0100 | .0000 | .11 | .... | .... | * |
| 3223 | Oct. 10 | None | V. slight | S. veg. | 0.20 | 4.7 | 2.7 | .0020 | .0060 | .0100 | .0000 | .05 | 1.1 | .... | .. |
| 3370 | Dec. 22 | ........ | ....... | ....... | .... | ..... | .... | ..... | ..... | ..... | ..... | ..... | .... | .... | * |
| 3500 | 1906 Mar. 5 | None | S. fine | None | 0.15 | 1.9 | 1.4 | .0006 | .0054 | .0050 | .0000 | .15 | 0.9 | .... | .. |
| 3718 | July 2 | None | None | None | 0.20 | 4.2 | 1.6 | .0014 | .0070 | .0350 | .0000 | .07 | 0.7 | .... | * |
| 3956 | Sept.10 | V.S. opal | Slight | Much | 0.10 | 4.6 | 2.6 | .0026 | .0070 | .0050 | .0000 | .15 | 1.1 | .... | .. |
| 3958 | Sept.10 | None | S. fine | Slight | 0.00 | 4.5 | 2.6 | .0024 | .0040 | .0050 | .0000 | .15 | 1.1 | .... | .. |
| 4258 | Dec. 31 | None | S. ferrug. | Veg. | 0.05 | 3.0 | 2.6 | .0008 | .0044 | .0050 | .0000 | .11 | 1.9 | .... | .. |
| 5260 | 1908 May 1 | None | None | None | 0.20 | 2.9 | 1.7 | .0002 | .0034 | .0150 | .0000 | .10 | .9 | .... | .. |
| 5514 | Aug. 18 | None | Slight | None | 0.15 | 4.7 | 3.2 | .0002 | .0008 | .0080 | .0000 | .12 | 1.2 | .... | .. |
| 5972 | 1909 Feb. 4 | None | None | None | 0.10 | 3.7 | 2.2 | .0010 | .0025 | .0100 | .0000 | .10 | .9 | .... | .. |
| 7845 | 1910 Apr. 28 | V. slight | Slight | None | 0.40 | 3.5 | 1.7 | .0007 | .0105 | .0250 | .0000 | .15 | 1.2 | .... | .. |

* B. Coli present.

**Hillsborough.**—The Hillsborough Bridge Village Fire Precinct owns a water supply, instituted in the autumn of 1886. The source is a pond of about 500 acres; average depth about 15 feet; bottom, sand and ledge, with natural deposit. The water flows by gravity to intermediate reservoir of 500,000 gallons' capacity. The total length of mains is eight miles, cast-iron and cement-lined iron pipe; service pipes are mostly galvanized iron. Practically the entire population of the precinct are supplied with this water. There are a few private wells within the area reached by the public supply.

*Examination of Water from Faucet of the Hillsborough Bridge Village Fire Precinct.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid. | Nitrates. | Nitrites. | | | | |
| 746 | 1902 Aug. 20 | None | None | None | 0.2 | 3.70 | 1.30 | .0000 | .0060 | .0120 | .0000 | .12 | 1.2 | .... | .. |
| 1374 | 1903 Aug. 27 | Slight | Floc.veg. | V.slight | 0.2 | 5.10 | 1.10 | .0000 | .0080 | .0000 | .0000 | .08 | 0.9 | .... | .. |
| 1781 | 1904 Jan. 4 | Slight | Slight | Slight | 0.15 | 4.10 | 2.00 | .0000 | .0072 | .0000 | .0000 | .12 | 1.5 | .... | .. |
| 1967 | May 17 | V. slight | Slight | None | 0.05 | 3.60 | 1.90 | .0000 | .0080 | .0000 | .0000 | .05 | 1.6 | .... | .. |
| 2685 | 1905 Feb. 8 | None | None | Arom. | 0.1 | 4.2 | 2.0 | .0000 | .0076 | .0000 | .0000 | .12 | 0.4 | .... | .. |
| 3156 | Sept. 12 | None | None | Earthy | 0.15 | 4.5 | 2.3 | .0006 | .0116 | .0100 | .0000 | .07 | 0.9 | .... | .. |
| 3398 | 1906 Jan. 17 | None | S. fine | S. earthy | 0.30 | 3.7 | 1.3 | .0010 | .0050 | .0050 | .0000 | .07 | 0.9 | .... | .. |
| 4120 | Dec. 1 | None | None | Earthy | 0.10 | 3.5 | 1.7 | .0010 | .0088 | .0050 | .0000 | .07 | 0.9 | .... | .. |
| 4210 | Dec. 6 | None | None | Veg. | 0.10 | 3.3 | 1.3 | .0010 | .0074 | .0050 | .0000 | .05 | 0.4 | .... | .. |
| 4281 | 1907 Jan. 16 | None | None | Sl. veg. | 0.10 | .... | .... | .0030 | .0090 | .0000 | .0000 | .05 | 2.7 | .... | .. |
| 4454 | Apr. 18 | None | V. slight | Mark. earthy | 0.20 | 3.2 | 1.9 | .0016 | .0084 | .0050 | .0000 | .13 | 1.2 | .... | * |
| 4861 | Sept. 2 | V. slight | V. slight | None | 0.15 | 2.0 | 1.1 | .0004 | .0094 | .0050 | .0000 | .17 | 0.4 | .... | * |
| 5001 | Nov. 4 | V. slight | V. slight | S. earthy | 0.20 | 2.4 | 0.7 | .0022 | .0068 | .0040 | .0000 | .18 | 0.4 | .... | .. |
| 5263 | 1908 Apr. 28 | None | Slight | None | 0.30 | 3.5 | 2.2 | .0004 | .0036 | .0100 | .0000 | .08 | 0.4 | .... | .. |
| 5558 | Aug. 25 | V. faint | V. slight | S. earthy | 0.10 | 2.1 | 1.3 | .0002 | .0050 | .0060 | .0000 | .13 | 0.4 | .... | .. |
| 5963 | 1909 Feb. 2 | None | None | Hay | 0.10 | 2.6 | 1.2 | .0025 | .0090 | .0000 | .0000 | .06 | .10 | .... | .. |
| 7783 | 1910 Apr. 11 | None | None | Sl. Swampy | 0.30 | 4.8 | 1.4 | .0028 | .0100 | .0020 | .0000 | .14 | .6 | .... | .. |

* B. Coli present.

**Hinsdale.**—

*Examination of Water from the Spring of Holland & Ferrin.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7627 | 1910 Feb. 1 | None | Sl. coarse | None | 0.00 | ..... | .... | .0008 | .0010 | .6000 | .0006 | 1.00 | 4.6 | .... | .. |

*Examination of Water from the Spring of Canal Street Spring Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8180 | 1910 July 22 | None | V. slight | None | 0.00 | ..... | .... | .0010 | .0011 | .005 | .0000 | .15 | 2.6 | .000 | .. |

**Hooksett.**—A system derived from Pinnacle Pond supplies a number of families.

*Examination of Water from Pinnacle Pond.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 866 | 1902 Oct. 16 | None | None | S. veg. | 0.0 | 3.40 | 1.20 | .0000 | .0042 | .0000 | .0000 | .17 | .9 | .... | .. |
| 2569 | 1904 Dec. 5 | V. slight | M. floc. | S. veg. | 0.0 | 2.4 | 2.0 | .0000 | .0050 | .0050 | .0000 | .15 | 0.4 | .... | .. |
| 3399 | 1906 Jan. 18 | V. slight | V. slight | S. veg. | 0.0 | 3.4 | 2.1 | .0010 | .0050 | .0050 | .0000 | .15 | 0.7 | .... | .. |

*Examination of Water from the Well Owned by Boston & Maine Railroad at Martin's Station.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7276 | 1909 Aug. 12 | None | V. slight | V. slight | 0.00 | ..... | .... | .0040 | .0010 | .200 | .0000 | .70 | 3.7 | .... | [1] |

[1] .80 zinc.

**Hopkinton.**—The water works of the Hopkinton Village Aqueduct Association, incorporated, were built about 1841. The water is from wells dug from eight to fifteen feet through sandy loam, sandy gravel, and hardpan and flows continually, by gravity, to the consumers. There is about three fourths of a mile of cement-lined iron pipe main, with lead service pipes. Forty-three families, about 70 per cent. of the fire district, have this water.

Besides the above families, who have constantly running water, this company supplies a public drinking fountain, the hotel, schools, town and lyceum halls, and public library.

*Examination of Water from Supply of Hopkinton Village Aqueduct Association.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 876 | 1902 Oct. 16 | None | None | None | 0.0 | 8.90 | 4.20 | .0000 | .0000 | .0300 | .0000 | .15 | 1.6 | ..... |
| 2146 | 1904 July 10 | None | None | None | 0.0 | 3.60 | 1.40 | .0014 | .0008 | .0500 | .0000 | .15 | 1.4 | ..... |
| 3147 | 1905 Sept. 6 | None | S. floc. | V. slight | 0.15 | 8.0 | 4.2 | .0008 | .0020 | .0250 | .0000 | .25 | 1.9 | ..... |
| 8318 | 1910 Aug. 15 | None | None | None | 0.00 | ..... | .... | .0010 | .0020 | .025 | .0000 | .15 | 1.9 | .000 |

The village of Contoocook is supplied with a water of good quality from Bear Pond.

*Examination of Water from Contoocook Village Supply.*

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4183 | 1906 Nov. 22 | None | None | S. earthy | 0.10 | 3.0 | 1.5 | .0014 | .0054 | .0100 | .0000 | .07 | 0.4 | ..... |
| 4445 | 1907 Apr. 17 | None | V. slight | Veg. | 0.10 | 2.7 | 1.9 | .0010 | .0030 | .0100 | .0000 | .13 | 1.2 | ..... |
| 4987 | Oct. 28 | None | None | None | 0.00 | 2.3 | 1.5 | .0002 | .0074 | .0040 | .0000 | .19 | 0.4 | ..... |
| 5283 | 1908 May 6 | None | None | S. swampy | 0.10 | 3.4 | 1.1 | .0002 | .0028 | .0100 | .0000 | .14 | 0.4 | ..... |
| 7790 | 1910 Apr. 12 | None | V. slight | None | 0.00 | 1.7 | .9 | .0014 | .0090 | .0020 | .0000 | .14 | .4 | ..... |

**Hudson.**—No public supply. The Hudson water works, owned by a private company, were built in 1892. The source of the supply is a well 20 feet deep and 22 feet wide, dug through loam and gravel. The water is pumped to a standpipe 12 feet in diameter and 60 feet high.



*Examination of Water from Well Supplying Town of Hudson.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites | | | | |
| 69 | 1901 July 16 | None | S. floc. | None | 0.0 | 6.00 | 3.70 | .0014 | .0026 | .1000 | .0000 | .40 | .... | .... | .. |
| 2744 | 1905 Mar. 7 | None | Slight | None | 0.0 | 5.6 | 4.4 | .000 | .0000 | .0300 | .0000 | .37 | 2.0 | .... | .. |
| 2991 | July 18 | None | S. floc. | None | 0.3 | 6.0 | 3.8 | .0014 | .0060 | .0100 | .0000 | .30 | 1.6 | .... | .. |
| 3416 | 1906 Jan. 26 | None | None | S. veg. | 0.0 | 6.2 | 4.2 | .0010 | .0028 | .0300 | .0000 | .30 | 1.9 | .... | .. |
| 4185 | Nov. 22 | None | Slight | Slight | 0.05 | 5.0 | 4.3 | .0006 | .0044 | .0350 | .0000 | .35 | 1.9 | .... | .. |
| 5970 | 1909 Feb. 4 | None | V. slight | None | 0.00 | 5.8 | 4.0 | .0002 | .0001 | .030 | .0000 | .36 | 1.6 | .... | .. |
| 7565 | Dec. 20 | None | None | None | 0.05 | 5.2 | 2.3 | .0010 | .0012 | .030 | .0000 | .45 | 3.60 | .... | [1] |
| 7622 | 1910 Jan. 28 | Slight | Slight | Swampy | 0.70 | 5.7 | 2.6 | .0025 | .0110 | .005 | .0000 | .40 | 2.2 | .... | .. |
| 8271 | Aug. 4 | None | None | None | 0.00 | 7.3 | 2.9 | .0010 | .0015 | .010 | .0000 | .35 | 2.6 | .... | [1] |

[1] No zinc present.

**Jackson.**—C. W. Gray & Co. installed a private water supply in 1904. The source is a stream of about 1,000 acres watershed, all wooded, no inhabitants. The water is of excellent quality, taken from a mountain stream about two miles from the village. There is a pressure of about eighty pounds per square inch. About three miles of iron service and wrought iron service pipe is employed in this system. Fifteen families, 50 per cent. of the population, are supplied.

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7911 | 1910 May 23 | None | None | Sl. Arom. | 0.20 | 1.5 | .5 | .0010 | .0035 | .0025 | .0000 | .05 | .4 | .... | .. |

**Jaffrey.**—The town instituted a system of water works in 1902, the source being a pond in Rindge having an area of 40 acres, an average depth of 20 feet, with hardpan bottom. The water flows by gravity through nine miles of 12-inch, cast-iron distributing mains; service pipes, six-inch cast iron.

*Examination of Water from Bullet Pond, Rindge.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 186 | 1901 Oct. 1 | None | S. veg. | Dec. veg. | 0.12 | 2.80 | 1.30 | .0016 | .0166 | .0000 | .0000 | .16 | .... | .... | .. |
| 232 | Oct. 20 | None | None | Veg. | 0.12 | ..... | .... | .0016 | .0180 | .0000 | .0000 | .09 | .... | .... | .. |
| 340 | 1902 Jan. 5 | None | None | Veg. | 0.2 | 2.30 | 1.10 | .0032 | .0172 | .0000 | .0000 | .08 | 0.4 | .... | .. |
| 348 | Jan. 5 | None | None | Veg. | 0.2 | 2.50 | 1.10 | .0032 | .0162 | .0000 | .0000 | .09 | 0.4 | .... | .. |
| 1373 | 1903 July 27 | Slight | None | S. musty | 0.1 | 5.10 | 1.90 | .0016 | .0058 | .0000 | .0000 | .08 | 1.4 | .... | .. |
| 1686 | Nov.23 | Slight | V. S. fine | V. dec. veg. | 0.1 | 4.00 | 1.10 | .0000 | .0144 | .0300 | .0000 | .15 | 1.2 | .... | .. |
| 1687 | Nov.23 | Slight | V. S. fine | Dec. veg. | 0.2 | 4.20 | 2.10 | .0014 | .0128 | .0200 | .0000 | .15 | 1.1 | .... | .. |
| 1758 | Dec. 22 | Slight | V. slight | V. mark. veg. | 0.1 | 4.20 | 2.40 | .0006 | .0062 | .0000 | .0000 | .25 | 2.3 | .... | .. |
| 1759 | Dec. 22 | Slight | Slight | V. mark. veg. | 0.1 | 3.90 | 2.10 | .0000 | .0074 | .0000 | .0000 | .20 | 2.3 | .... | .. |
| 1955 | 1904 May 16 | Consid. | M. fine | V.arom. | 0.2 | 4.20 | 2.20 | .0000 | .0110 | .0000 | .0000 | .18 | 2.0 | .... | .. |
| 2687 | 1905 Feb. 9 | None | None | Slight | 0.1 | 4.3 | 2.1 | .0030 | .0120 | .0000 | .0000 | .17 | 0.7 | .... | .. |
| 3138 | Sept. 5 | None | None | Slight | 0.1 | 3.7 | 2.1 | .0010 | .0136 | .0100 | .0000 | .17 | 0.9 | .... | .. |
| 3463 | 1906 Jan. 22 | None | None | Veg. | 0.1 | 3.5 | 1.5 | .0026 | .0074 | .0100 | .0000 | .22 | 0.7 | .... | .. |
| 3978 | Sept.17 | None | V. slight | S. veg. | 0.15 | 4.0 | 1.5 | .0010 | .0074 | .0050 | .0000 | .17 | 0.7 | .... | .. |
| 3981 | Sept.17 | None | V. slight | None | 0.10 | 4.1 | 1.6 | .0030 | .0094 | .0050 | .0000 | .15 | 1.1 | .... | .. |
| 4138 | Nov.7 | None | None | Slight | 0.05 | 4.1 | 2.6 | .0014 | .0074 | .0050 | .0000 | .10 | 1.0 | .... | .. |
| 4452 | 1907 Apr. 18 | None | None | S. foul | 0.10 | ..... | .... | .0014 | .0052 | .0050 | .0000 | .22 | 0.4 | .... | .. |
| 5000 | Nov. 4 | None | None | None | 0.05 | 2.4 | 1.0 | .0012 | .0058 | .0060 | .0000 | .19 | 0.4 | .... | .. |
| 5282 | 1908 May 5 | None | None | None | 0.15 | 2.6 | 1.0 | .0004 | .0036 | .0040 | .0000 | .12 | 0.3 | .... | .. |
| 5969 | 1909 Feb. 3 | None | None | Sl. earthy | 0.00 | 3.1 | 1.7 | .0050 | .0060 | .0000 | .0000 | .10 | .3 | .... | .. |
| 7145 | June29 | None | V. slight | Musty | 0.05 | 2.5 | 1.2 | .0005 | .0060 | .0000 | .0000 | .13 | .3 | .... | *a |
| 7166 | July 6 | None | Sl. veg. | Woody | 0.10 | 3.0 | 1.3 | .0020 | .0080 | .0000 | .0000 | .10 | .3 | .... | .. |
| 7841 | 1910 Apr. 27 | V. slight | V. slight | Slight | 0.10 | 2.4 | 1.0 | .0030 | .0125 | .0030 | .0000 | .15 | .4 | .... | .. |

* B. Coli present; *a* River water pumped into system.

*Examination of Water from Well of Annett Brothers.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8258 | 1910 Aug. 2 | None | None | None | 0.05 | ..... | .... | .0012 | .0026 | .0050 | .0000 | .20 | 1.2 | ..... | .. |

*Examination of Water from Well of J. P. Pierre.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7904 | May 19 | Sl. opal | None | None | 0.10 | ..... | .... | .0030 | Very High | .075 | .0010 | 3.9 | 6.0 | .... | * |

* B. Coli present.

**Keene.**—In 1870 the City of Keene installed a public water supply from two ponds, one 50 acres and the other 110 acres in area—Sylvan Lake having an average depth of 20 feet, and Echo Lake 12 feet. There are also several auxiliary supplies.

About forty miles of cast-iron and cement-lined distributing mains and galvanized iron service pipes constitute this system. Twenty-two hundred persons, 85 per cent. of the population, take from this service. There are no private wells in the area.

*Examination of Water from Keene Supply.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 1901 June 24 | V. slight | S. floc. | Dec. veg. | 0.2 | 2.80 | 1.00 | .0000 | .0169 | .0000 | .0000 | .18 | .... | .... | *a* |
| 455 | 1902 Mar. 27 | Slight | Slight | Veg. | 0.23 | 1.60 | .70 | .0010 | .0122 | .0150 | .0000 | .07 | 0.7 | .... | *b* |
| 456 | Mar. 27 | Slight | Slight | Veg. | 0.23 | 2.00 | 1.00 | .0020 | .0076 | .0000 | .0000 | .07 | 0.7 | .... | *c* |
| 457 | Mar. 27 | V. slight | Slight | Veg. | 0.32 | 3.10 | .80 | .0000 | .0052 | .0000 | .0000 | .07 | 0.6 | .... | *d* |
| 458 | Mar. 27 | Marked | Slight | Veg. | 0.12 | 2.10 | .80 | .0010 | .0078 | .0000 | .0000 | .11 | 0.6 | .... | *e* |
| 1172 | 1903 May 3 | Slight | Floc. fine | Veg. | 0.2 | 2.80 | 1.50 | .0014 | .0198 | .0000 | .0000 | .15 | 0.9 | .... | *f* |
| 1173 | May 4 | Slight | Fine floc. | Veg. | 0.15 | 5.00 | 2.00 | .0014 | .0158 | .0000 | .0000 | .15 | 0.9 | .... | .. |
| 1174 | May 4 | Slight | Fine floc. | Veg. | 0.1 | 3.00 | 0.60 | .0020 | .0202 | .0000 | .0000 | .17 | 0.6 | .... | *g* |
| 1175 | May 4 | Slight | Much fine floc. | Veg. | 0.15 | 4.90 | 1.60 | .0000 | .0060 | .0000 | .0000 | .10 | 0.4 | .... | .. |
| 2725 | 1905 Feb. 27 | None | V. slight | Veg. | 0.1 | 4.5 | 2.6 | .0000 | .0000 | .0100 | .0000 | .15 | 0.1 | .... | .. |
| 3150 | Sept. 5 | None | V. slight | Veg. | 0.2 | 4.8 | 3.5 | .0020 | .0116 | .0200 | .0000 | .20 | 0.4 | .... | *h* |
| 3406 | 1906 Jan. 22 | None | V. slight | Veg. | 0.2 | 3.6 | 1.8 | .0050 | .0064 | .0100 | .0000 | .07 | 0.7 | .... | *i* |
| 4145 | Nov. 9 | None | V. slight | None | 0.10 | 3.7 | 1.5 | .0034 | .0134 | .0050 | .0000 | .12 | 0.4 | .... | * |
| 4186 | Nov. 23 | ........ | ........ | ....... | .... | ..... | .... | ..... | ..... | ..... | ..... | ..... | .... | .... | .. |
| 4571 | 1907 May 27 | None | S. floc. | Earthy | 0.30 | 2.8 | 1.4 | .0014 | .0036 | .0130 | .0000 | .13 | 0.1 | .... | * |
| 4600 | ....... | None | S. floc. | Earthy | 0.30 | 2.8 | 1.4 | .0014 | .0036 | .0130 | .0000 | .13 | 0.1 | .... | * |
| 4710 | July 18 | None | V. slight | S. earthy | 0.05 | 4.1 | 1.7 | .0014 | .0004 | .0050 | .0000 | .29 | 0.6 | .... | * |
| 5308 | 1908 May 21 | None | V. slight | Slight | 0.20 | 2.6 | .9 | .0014 | .0124 | .0080 | .0000 | .08 | 0.4 | .... | .. |
| 5594 | Sept. 1 | V. slight | Sl. ferrug. | None | 0.08 | 4.4 | 1.4 | .0020 | .0044 | .0100 | .0000 | .19 | .3 | .... | .. |
| 5714 | Oct. 1 | V. slight | Slight | Mar-shy | 0.10 | ..... | .... | .0005 | .0010 | .0100 | .0000 | .05 | .0 | .... | .. |
| 5750 | Oct. 13 | None | V. slight | Slight | 0.15 | 3.7 | 2.3 | .0050 | .0100 | .0000 | .0000 | .10 | .2 | .... | .. |
| 5782 | Oct. 22 | V. slight | None | Mark. earthy | 0.10 | 1.0 | .3 | .0040 | .0115 | .0000 | .0000 | .09 | .2 | .... | .. |
| 5817 | Nov. 2 | None | V. slight | Earthy | 0.20 | 2.7 | .7 | .0008 | .0050 | .0000 | .0000 | .10 | .3 | .... | .. |
| 7789 | 1910 Apr. 12 | None | V. slight | Earthy | 0.15 | 2.0 | 1.3 | .0020 | .0089 | .0020 | .0000 | .15 | .4 | .... | .. |

*a* Sample from Goose Pond; *b* sample from stream proposed as an additional supply; *c* sample from small stream flowing through an alder swamp; *d* small stream, part of proposed supply; *e* sample from Woodward Pond; *f* sample from intercepting reservoir; *g* sample from Sylvan Lake; *h* sample from Echo Lake; *i* sample from Roaring Brook. * B. Coli present.

**Kensington.**—

*Examination of Water from Well of Congregational Parsonage.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 8100 | 1910 July 11 | V. slight | V. slight | Mark. earthy | 0.10 | ..... | .... | Very High | .0080 | Too High to Read | High | 6.20 | 7.9 | .012 | * |

* B. Coli present.

**Laconia.**—The Laconia Water Company was incorporated in 1885. The supply is from Lake Paugus (Long Bay), a branch of Lake Winnepesaukee. This bay receives the sewage from The Weirs and from numerous cottages along its shores. The reservoir, 135 x 90 feet, and 18 feet deep, has a capacity of 2,700,000 gallons. There is about 28 miles of cement and cast-iron mains, while the service pipes are wrought iron, cement-lined. About 90 per cent. of the population are supplied from this source; very few wells. (See correspondence elsewhere in this report.)

*Examination of Water Supply of Laconia and Lakeport.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 532 | 1902 May 19 | None | V. slight | S. veg. | 0.1 | 2.80 | .90 | .0000 | .0014 | .0000 | .0000 | .13 | .6 | .... | .. |
| 822 | Sept.22 | None | None | V. slight | 0.1 | 4.00 | 1.10 | .0000 | .0062 | .0000 | .0000 | .11 | .6 | .... | .. |
| 2141 | 1904 July 11 | None | None | None | 0.4 | 7.70 | 4.90 | .0022 | .0098 | .0450 | .0008 | .20 | 2.2 | .... | .. |
| 2732 | 1905 Mar. 1 | None | V. slight | None | 0.00 | 3.3 | 1.3 | .0014 | .0020 | .0000 | .0000 | .15 | 0.6 | .... | * |
| 3145 | Sept. 6 | V. slight | V. slight | Veg. | 0.10 | 3.2 | 1.5 | .0010 | .0080 | .0250 | .0000 | .12 | 0.9 | .... | .. |
| 3408 | 1906 Jan. 22 | None | None | None | 0.07 | 2.0 | 1.5 | .0010 | .0048 | .0100 | .0000 | .17 | 0.7 | .... | .. |
| 3738 | July 10 | None | None | S. earthy | 0.10 | 3.1 | 1.0 | .0020 | .0084 | .0250 | .0000 | .05 | 1.0 | .... | .. |
| 4128 | Nov. 5 | None | None | Veg. | 0.10 | 4.0 | 2.3 | .0014 | .0102 | .0050 | .0000 | .05 | .... | .... | .. |
| 4460 | 1907 Apr. 24 | None | V. slight | Sl. foul | 0.05 | 2.4 | 1.9 | .0010 | .0026 | .0130 | .0000 | .17 | 1.4 | .... | .. |
| 4735 | July 19 | None | None | S. earthy | 0.00 | 2.7 | 1.8 | .0006 | .0044 | .0050 | .0000 | .18 | 1.9 | .... | .. |
| 4736 | July 19 | None | None | None | 0.00 | ..... | .... | .0010 | .0036 | .0050 | .0000 | .18 | 1.2 | .... | .. |
| 4832 | Aug. 28 | ........ | ........ | ....... | 0.10 | 2.5 | 1.5 | .0002 | .0058 | .0050 | .0000 | .16 | 1.2 | .... | .. |
| 5003 | Nov. 1 | None | None | None | 0.05 | 2.1 | 1.0 | .0004 | .0036 | .0040 | .0000 | .19 | 0.7 | .... | .. |
| 5287 | 1908 May 8 | V. slight | V. slight | None | 0.12 | 2.9 | .9 | .0006 | .0034 | .0020 | .0000 | .18 | 0.7 | .... | .. |
| 5927 | 1909 Jan. 7 | None | None | Sl. earthy | 0.05 | 3.5 | 1.8 | .0002 | .0045 | .0000 | .0000 | .08 | .6 | .... | .. |
| 5928 | Jan. 7 | None | V. slight | Sl. foul | 0.05 | 2.7 | 1.3 | .0010 | .0045 | .0000 | .0000 | .08 | .4 | .... | .. |
| 5929 | Jan. 7 | V. slight | V. slight | Sl. earthy | 0.05 | 2.8 | 1.5 | .0002 | .0055 | .0000 | .0000 | .09 | .4 | .... | .. |
| 5930 | Jan. 7 | V. slight | V. slight | None | 0.05 | 2.6 | 1.3 | .0002 | .0050 | .0000 | .0000 | .07 | .3 | .... | .. |
| 5935 | Jan. 14 | Mod. | Slight | Sl. earthy | 0.05 | 2.6 | 1.2 | .0035 | .0100 | .0000 | .0000 | .10 | .3 | .... | .. |
| 5947 | Jan. 25 | V. slight | Slight | Oily | 0.05 | 3.2 | 1.0 | .0025 | .0060 | .0000 | .0000 | .15 | .4 | .... | **a* |
| 5948 | Jan. 25 | V. slight | V. slight | Sl. oily | 0.05 | 2.4 | 1.3 | .0020 | .0060 | .0000 | .0000 | .12 | .7 | .... | *b* |
| 5949 | Jan. 25 | V. slight | Slight | Sl. oily | 0.05 | 2.5 | .8 | .0020 | .0050 | .0000 | .0000 | .11 | .3 | .... | *c* |
| 5950 | Jan. 25 | Slight | Slight | Sl. swampy | 0.20 | 4.4 | 2.2 | .0040 | .0090 | .0000 | .0000 | .17 | .4 | .... | *d* |
| 7786 | 1910 Apr. 12 | None | None | Dist. veg. | 0.05 | 2.2 | .6 | .0014 | .0089 | .0010 | .0000 | .15 | .3 | .... | .. |

* B. Coli present; *a* Near Independent Ice Houses; *b* near intake; *c* Weirs Channel; *d* mouth of Block Brook, near R. R.

*Examination of Water from Opeechee Lake, Water Supply for the State School for the Feeble-Minded.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 1221 | 1903 June 10 | None | Sl. fine | V. slight | 0.05 | 3.90 | 0.60 | .0000 | .0080 | .0000 | .0000 | .15 | 1.5 | .... | .. |
| 1222 | June 10 | None | Sl. fine | V. slight | 0.05 | 6.20 | 1.60 | .0000 | .0074 | .0000 | .0000 | .15 | 1.5 | .... | .. |
| 2000 | 1904 May 31 | Slight | Sl. fine | S. foul | 0.05 | 3.40 | 1.40 | .0000 | .0084 | .0050 | .0000 | .15 | 1.1 | .... | .. |
| 3173 | 1905 Sept. 17 | V. slight | None | None | 0.0 | 3.7 | 1.5 | .0028 | .0130 | .0050 | .0000 | .15 | 0.7 | .... | .. |
| 3474 | 1906 Feb. 21 | None | V. slight | None | 0.0 | 2.7 | 1.5 | .0030 | .0080 | .0050 | .0000 | .20 | 1.2 | .... | .. |
| 4173 | Nov. 20 | None | V. slight | None | 0.10 | 4.0 | 3.0 | .0034 | .0104 | .0050 | .0000 | .17 | 1.2 | .... | * |
| 6055 | ....... | Slight | S. earthy | None | 0.10 | 3.1 | 1.6 | .0040 | .0140 | .015 | .0000 | .07 | .4 | .... | .. |

*Examination of Water from Well Owned by School for the Feeble-Minded.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6056 | ....... | Cons. floc. | Slight | Mark. foul | 0.05 | ..... | .... | High | High | .250 | .0014 | 2.6 | 5.3 | .... | * |

* B. Coli present.

**Lancaster.**—The Lancaster Water Company's works were installed in 1891, and transferred to the precinct in 1894. The source of the supply is a mountain stream at a sufficient elevation to furnish pressure by gravity, and its reservoir has a capacity of 2,000,000 gallons. The distribution is through some 12 miles of iron mains, 12-inch to 6-inch. The service pipes also are of iron. Four hundred and sixty families, 98 per cent. of the population, are supplied.

*Examination of Water Supply of Lancaster.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 813 | 1902 Sept.19 | None | None | V.slight | 0.1 | 3.40 | 1.50 | .0000 | .0012 | .0200 | .0000 | .05 | 1.5 | ...... |
| 1408 | 1903 Aug. 4 | None | None | None | 0.1 | 4.80 | 1.60 | .0000 | .0034 | .1100 | .0000 | .10 | 1.6 | ...... |
| 1965 | 1904 May 17 | Slight | Con. fine | S. veg. | 0.25 | 3.60 | 1.90 | .0000 | .0150 | .0450 | .0000 | .05 | 1.4 | ...... |
| 2686 | 1905 Feb. 8 | None | None | None | 0.05 | 5.0 | 2.2 | .0000 | .0000 | .0300 | .0000 | .05 | 1.2 | ...... |
| 3187 | Sept.20 | None | None | Slight | 0.20 | 4.7 | 1.7 | .0020 | .0074 | .0100 | .0000 | .05 | 1.1 | ...... |
| 3409 | 1906 Jan. 23 | None | None | None | 0.10 | 3.5 | 2.5 | .0010 | .0034 | .0200 | .0000 | .04 | 0.7 | ...... |
| 4486 | 1907 Apr. 30 | V.S. opal | V. slight | None | 0.20 | 3.2 | 2.0 | .0004 | .0060 | .0100 | .0000 | .07 | 1.2 | ...... |
| 4985 | Oct. 28 | None | V. slight | None | 0.20 | 3.3 | 2.5 | .0016 | .0030 | .0200 | .0000 | .10 | 1.2 | ...... |
| 7810 | 1910 Apr. 14 | None | None | Sl. swampy | 0.30 | 5.3 | 3.5 | .0032 | .0025 | .0040 | .0001 | .07 | .6 | ...... |

**Lebanon.**—The water supply is owned by the Fire Precinct, and was installed in 1897. At first the water was taken directly from a stream flowing from Mascoma Lake, later on from wells, 63 x 30 x 15 feet, supplied by 900 feet loose-jointed pipe, fed by water infiltrated from the river.

During 1907 a mechanical filter plant was installed and the river water, after a preliminary sedimentation and treatment with coagulant, is passed through these filters before pumping to the reservoir. Analyses made thus far indicate that the filtration process is very successful.

A spring, known as the Kendrick & Davis supply, is also used to some extent.

The village of West Lebanon is furnished with water supplied by the Hartford Water Company, White River Junction, Vt.

## *Examination of Water from the Lebanon Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 33 | 1901 June 27 | None | S. floc. | S. veg. | 0.3 | 4.60 | 2.80 | .0000 | .0115 | .0000 | .0000 | .22 | .... | .... | .. |
| 34 | June 27 | None | Min. matter | V. slight | 0.0 | 7.60 | 5.30 | .0000 | .0000 | .0100 | .0000 | .31 | .... | .... | .. |
| 53 | July 6 | Marked | Much. min. | None | 0.0 | 6.70 | 4.10 | .0073 | .0098 | .0000 | .0000 | .33 | .... | .... | .. |
| 54 | July 6 | None | Min. | None | 0.0 | 6.00 | 3.40 | .0028 | .0100 | .0900 | ..... | 3.51 | .... | .... | .. |
| 614 | 1902 June 25 | Slight | V. slight | Arom. veg. | 0.27 | .00 | 2.60 | .0006 | .0082 | .0330 | .0000 | .12 | 1.8 | .... | .. |
| 1144 | 1903 Apr. 19 | None | None | Dec. veg. | 0.0 | 5.00 | 3.60 | .0000 | .0190 | .0000 | .0000 | .12 | 1.6 | .... | a |
| 1297 | July 6 | Slight | Floc. | None | 0.15 | 5.10 | 2.70 | .0000 | .0072 | .0000 | .0000 | .10 | 2.0 | .... | .. |
| 1298 | July 6 | Slight | Floc. veg. | S. veg. | 0.32 | 5.30 | 1.70 | .0000 | .0080 | .0000 | .0000 | .06 | 1.5 | .... | a |
| 1968 | 1904 May 18 | None | None | V. slight | 0.1 | 4.60 | 2.80 | .0000 | .0044 | .0000 | .0000 | .10 | 2.3 | .... | .. |
| 2251 | Aug. 8 | Slight | Much floc. red | S. veg. | 0.5 | 5.80 | 2.70 | .0014 | .0024 | .0000 | .0000 | .30 | 2.4 | .... | * |
| 2293 | Aug. 22 | None | V. slight | V. slight | 0.05 | 2.00 | 4.00 | .0000 | .0020 | .0000 | .0000 | .10 | 1.8 | .... | * |
| 2294 | Aug. 22 | None | None | V. slight | 0.05 | 3.90 | 1.90 | .0000 | .0070 | .0000 | .0000 | .10 | 1.6 | .... | * |
| 2391 | Oct. 3 | None | None | None | 0.15 | 4.0 | 1.7 | .0000 | .0022 | .0000 | .0000 | .12 | 2.3 | .... | * |
| 2397 | Oct. 3 | None | None | S. earthy | 0.00 | 5.0 | 1.8 | .0096 | .0020 | .0000 | .0001 | .10 | 2.0 | .... | *a |
| 2665 | 1905 Jan. 29 | V. slight | S. fine | S. musty | 0.00 | 19.5 | 15.6 | .0014 | .0000 | .0000 | .0001 | 2.0 | 7.4 | .... | b |
| 2684 | Feb. 6 | Slight | M. fine | Peculiar | 0.05 | 17.6 | 15.6 | .0020 | .0000 | .0000 | .0004 | 2.0 | 7.0 | .... | b |
| 2949 | July 3 | None | S. floc. | S. earthy | 0.17 | 5.4 | 2.9 | .0000 | .0014 | .0000 | .0000 | .15 | 1.6 | .... | * |
| 3140 | Sept. 5 | None | None | None | 0.10 | 6.7 | 4.8 | .0006 | .0060 | .0200 | .0000 | .27 | 2.7 | .... | .. |
| 3298 | Nov. 16 | None | None | S. earthy | 0.20 | 5.2 | 3.0 | .0010 | .0058 | .0100 | .0000 | .25 | 2.4 | .... | .. |
| 3426 | 1906 Jan. 31 | None | None | None | 0.10 | 5.9 | 3.4 | .0006 | .0024 | .0050 | .0000 | .22 | 2.2 | .... | .. |
| 3792 | July 29 | None | None | None | 0.00 | 6.3 | 4.8 | .0014 | .0044 | .0050 | .0000 | .25 | 2.2 | .... | .. |
| 3870 | Aug. 20 | None | None | S. veg. | 0.10 | 7.1 | 6.1 | .0010 | .0024 | .0000 | .0000 | .27 | 3.5 | .... | * |
| 3948 | Sept. 7 | None | S. floc. | None | 0.15 | 5.2 | 2.8 | .0036 | .0050 | .0030 | .0000 | .05 | 1.4 | .... | * |
| 3951 | Sept. 7 | S. opal | Slight | Earthy | 0.40 | 5.4 | 2.4 | .0036 | .0100 | .0030 | .0000 | .05 | 1.4 | .... | * |
| 4333 | 1907 Feb. 6 | Slight | S. floc. | None | 0.20 | ..... | .... | .0014 | .0076 | Trace | .0000 | .17 | 1.9 | .... | a |
| 4483 | Apr. 29 | None | V. slight | None | 0.30 | 4.8 | 3.7 | .0008 | .0040 | .0100 | .0000 | .21 | 2.6 | .... | .. |
| 4599 | July 11 | None | S. fine | None | 0.05 | 5.1 | 3.3 | .0010 | .0054 | .0500 | .0000 | .15 | 2.6 | .... | .. |
| 4986 | Oct. 28 | V. slight | V. slight | Mark. earthy | 0.30 | 5.0 | 3.0 | .0012 | .0094 | .0060 | .0000 | .23 | 1.9 | .... | a |

*Examination of Water from the Lebanon Supply.—Concluded.*



| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 5061 | 1907 Dec. 4 | None | None | Slight | 0.05 | 3.8 | 3.2 | .0006 | .0060 | .0050 | .0000 | .13 | 2.6 | .... | a |
| 5231 | 1908 Apr. 13 | None | None | None | 0.00 | 3.2 | 1.4 | .0006 | .0028 | .0040 | .0000 | .09 | 1.2 | .... | a |
| 5232 | Apr. 13 | None | V. slight | V. slight | 0.30 | 3.6 | 2.2 | .0042 | .0068 | .0100 | .0000 | .09 | 1.0 | .... | *a |
| 5276 | May 6 | None | V. slight | Sl. arom. | 0.05 | 5.3 | 4.2 | .0006 | .0038 | .0080 | .0000 | .15 | 1.6 | .... | .. |
| 5462 | July 23 | None | None | Slight | 0.05 | 3.3 | 2.8 | .0004 | .0008 | .0020 | .0000 | .10 | 1.2 | .... | .. |
| 5757 | Oct. 14 | None | None | None | 0.05 | 3.5 | .... | .0032 | .0045 | .010 | .0000 | .04 | 3.2 | .... | .. |
| 5964 | 1909 Feb. 2 | None | None | V. slight | 0.10 | 4.7 | 2.5 | .0020 | .0040 | .008 | .0000 | .11 | 1.6 | .... | .. |
| 6040 | Mar. 18 | S. opal | None | None | 0.30 | ..... | .... | .0008 | .0025 | .005 | .0000 | .14 | 1.8 | .... | * |
| 7144 | June 28 | None | None | None | 0.00 | 4.9 | 2.5 | .0015 | .0050 | .0000 | .0000 | .15 | 1.5 | .... | .. |
| 7797 | 1910 Apr. 13 | V. slight | V. slight | Earthy | 0.20 | 4.3 | 2.7 | .0030 | .0090 | .0020 | .0000 | .08 | 4.4 | .... | .. |
| 7931 | June 1 | V. slight | None | Earthy | 0.10 | 4.4 | 2.9 | .0010 | .0060 | .0025 | .0000 | .10 | 4.9 | .... | .. |
| 7932 | June 1 | V. ft. opal | S. earthy | None | 0.10 | 4.9 | 2.9 | .0010 | .0040 | .0050 | .0000 | .12 | 2.9 | .... | .. |

* B. Coli present; *a* from Mascoma river; *b* artesian well.

## *Examination of Water from the Kendrick & Davis Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4053 | 1906 Oct. 9 | Consid. | Consid. | S. earthy | .03 | ..... | .... | .0006 | .0044 | .0100 | .0000 | .10 | 2.6 | .... | .. |
| 4068 | Oct. 17 | None | None | None | .05 | 7.8 | 6.2 | .0010 | .0028 | .0200 | .0000 | .15 | 2.9 | .... | .. |
| 4126 | Nov. 2 | None | V. slight | None | .05 | 5.0 | 3.5 | .0006 | .0048 | .0080 | .0000 | .07 | 2.3 | .... | .. |
| 4127 | Nov. 2 | None | V. slight | None | .05 | 7.9 | 5.4 | .0006 | .0054 | .0080 | .0000 | .07 | 3.9 | .... | .. |

## *Examination of Water Supplied West Lebanon by Hartford Water Company, White River Junction, Vt.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3804 | 1906 July 31 | None | None | S. veg. | 0.1 | 7.0 | 4.0 | .0018 | .0080 | .0500 | .0000 | .15 | .... | .... | .. |
| 5493 | 1908 Aug. 11 | M. opal | V. slight | Veg. | 0.15 | 5.8 | 3.8 | .0010 | .0030 | .0050 | .0000 | .07 | 2.6 | .... | .. |
| 5498 | Aug. 11 | M. opal | V. slight | Veg. | 0.17 | 5.5 | 3.2 | .0010 | .0050 | .0070 | .0000 | .06 | 1.2 | .... | .. |
| 5887 | Dec. 14 | None | Sl. floc. | Sl. fishy | 0.00 | 8.5 | 6.2 | .0040 | .0020 | .2000 | Trace | .25 | 3.2 | .... | a |
| 5961 | 1909 Feb. 2 | None | None | None | 0.00 | 5.7 | 4.2 | .0015 | .0005 | .1200 | .0000 | .12 | 2.3 | .... | .. |

*a* Sikes Springs.

*Examination of Water from Mascoma River.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 6033 | 1909 Mar. 18 | None | None | None | 0.00 | ..... | .... | .0030 | .0035 | .0050 | .0000 | .11 | 1.1 | .... | *b* |
| 7747 | 1910 Mar. 24 | Sl. fibre | Slight | Slight | 0.30 | 5.4 | 2.8 | .0006 | .0120 | .0500 | .0000 | .41 | 2.2 | .... | *c* |

*Examination of Water from White River, Proposed Temporary Public Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5903 | 1908 Dec. 26 | None | V. Sl. floc. | None | 0.05 | 9.6 | 7.1 | .0026 | .0092 | .0200 | .0000 | .20 | 5.3 | .... | * |

*b* Tap at Everett Knitting Mill after passing small mechanical filter; *c* Taken directly from river below mills; * B. Coli present.

*Examination of Water from Spring of George R. Byrle.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7608 | 1910 Jan. 20 | None | None | Foul | 0.05 | 11.5 | 8.5 | .0025 | .0025 | .3000 | Trace | .40 | 6.0 | .... | .. |

*Examination of Water from Spring of D. N. Sargent.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7609 | 1910 Jan. 20 | None | None | None | 0.00 | ..... | 9.5 | .0008 | .0002 | .0600 | .0000 | .40 | 6. | .... | .. |

*Examination of Water from Well of John Keating, West Lebanon.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7614 | 1910 Jan. 24 | V. slight | V. slight | Sl. earthy | 0.00 | ..... | .... | .0010 | .0010 | .1500 | .0000 | .30 | 6.0 | .... | .. |

*Examination of Water from McNeilis' Spring, West Lebanon.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7596 | 1910 Jan. 11 | None | V. slight | None | 0.00 | 14.0 | 9.50 | .0010 | .0008 | .4000 | .0000 | .90 | 7.4 | .... | .. |

**Lincoln.**—The J. E. Henry & Sons Co. introduced a water supply in 1903 directly from a stream. The watershed has an area of several hundred acres, wooded land. It is a gravity system, employing about one half a mile of plain iron main, and also iron service pipes. The entire village is served from this supply. There are no private wells within the area.



*Examination of Water from Faucet of Supply of J. H. Henry & Sons.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 762 | 1902 Sept. 1 | None | V. slight | V.S. vg. | 0.1 | 4.80 | 1.90 | .0000 | .0044 | .0150 | .0000 | .05 | .3 | ...... |
| 1377 | 1903 July 25 | None | None | V. slight | 0.05 | 4.10 | 1.30 | .0000 | .0030 | .0000 | .0000 | .04 | 0.6 | ...... |
| 1956 | 1904 May 14 | None | Slight | None | 0.2 | 2.90 | 1.30 | .0000 | .0054 | .0000 | .0000 | .05 | 0.9 | ...... |
| 3171 | 1905 Sept. 14 | None | None | None | 0.15 | 3.5 | 2.0 | .0010 | .0080 | .0100 | .0000 | .10 | 0.6 | ...... |
| 3426 | 1906 Jan. 30 | None | None | None | 0.10 | 2.5 | 1.4 | .0010 | .0034 | .0050 | .0000 | .05 | 0.4 | ...... |
| 4147 | Nov. 12 | None | None | None | 0.05 | 3.6 | 1.7 | .0006 | .0036 | .0050 | .0000 | .07 | 0.4 | ...... |
| 4467 | 1907 Apr. 25 | None | None | None | 0.20 | 2.5 | 1.3 | .0012 | .0026 | .0110 | .0000 | .07 | 0.9 | ...... |
| 4488 | Oct. 28 | V. slight | None | None | 0.50 | 3.0 | 1.7 | .0002 | .0070 | .0050 | .0000 | .30 | 0.4 | ...... |
| 5338 | 1908 June 2 | V. slight | V. slight | None | 0.12 | ..... | .... | .0006 | .0014 | .0030 | .0000 | .06 | 0.4 | ...... |
| 7794 | 1910 Apr. 13 | None | V. slight | Earthy | 0.05 | 2.2 | 1.2 | .0018 | .0050 | .0030 | .0000 | .05 | .4 | ...... |

**Lisbon.**—The Lisbon Water Works, owned by a private company and installed in 1887, is supplied from a pond fed by springs. The area of the pond is 100 acres; the bottom is gravelly. This is a gravity system, the reservoir having a capacity of 1,000,000 gallons. The mains are of wrought iron, six miles, and the service pipes are the same. About three hundred families, 90 per cent. of the population, are takers; very few private wells.



*Examination of Water from the Reservoir of the Lisbon Water Works Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 796 | 1902 Sept. 9 | Slight | Consid. floc. | V. slight | 0.0 | 6.90 | 2.60 | .0000 | .0066 | .0000 | .0000 | .08 | 2.3 | .... | .. |
| 1387 | 1903 Sept. 29 | Slight | None | Dec. veg. | 0.1 | 6.70 | 2.80 | .0000 | .0120 | .0000 | .0000 | .05 | 2.7 | .... | .. |
| 1985 | 1904 May 24 | Slight | S. fine | S. musty | 0.25 | 6.10 | 2.70 | .0000 | .0090 | .0000 | .0000 | .05 | 1.9 | .... | .. |
| 2707 | 1905 Feb. 20 | None | Slight | S. veg. | 0.10 | 6.2 | 4.2 | .0000 | .0060 | .0800 | .0000 | .15 | 2.2 | .... | .. |
| 3165 | Sept. 14 | None | S. fine | Earthy | 0.30 | 5.7 | 2.6 | .0000 | .0116 | .0100 | .0000 | .07 | 2.2 | .... | * |
| 3442 | 1906 Feb. 4 | None | S. ferrug. | None | 0.20 | 5.2 | 3.5 | .0014 | .0058 | .0100 | .0000 | .10 | 2.1 | .... | .. |
| 4142 | Nov. 9 | None | None | Slight | 0.20 | 6.0 | 3.5 | .0010 | .0104 | .0200 | .0000 | .05 | 2.2 | .... | .. |
| 4256 | 1907 Jan. 1 | None | Slight | Veg. | 0.10 | 4.5 | .... | .0030 | .0100 | .0050 | Ft. tr. | .05 | 3.5 | .... | * |
| 4268 | Jan. 9 | ........ | ........ | ....... | .... | ..... | .... | ..... | ..... | ..... | ..... | ..... | .... | .... | * |
| 4290 | Jan. 21 | Slight | Marked floc. | Veg. | 0.20 | ..... | .... | .0044 | .0102 | .0050 | .0000 | .05 | 2.2 | .... | * |
| 4295 | Jan. 27 | None | V. slight | Slight | 0.10 | ..... | .... | .0044 | .0052 | .0050 | .0000 | .07 | 2.4 | .... | * |
| 4480 | Apr. 29 | Sl. opal | Slight | None | 0.30 | 4.6 | 2.5 | .0016 | .0016 | .0500 | .0000 | .12 | 1.6 | .... | .. |
| 4996 | Nov. 6 | V. slight | V. slight | None | 0.35 | ..... | .... | .0040 | .0060 | .0080 | .0000 | .16 | 2.6 | .... | .. |
| 5154 | 1908 Mar. 2 | None | None | Earthy | 0.20 | 3.5 | 2.5 | .0010 | .0036 | .0060 | .0000 | .10 | 1.9 | .... | .. |
| 5185 | Mar. 24 | Mod'ate slight | Consid. earthy | Mark. earthy | 0.20 | 4.0 | 2.5 | .0026 | .0084 | .0040 | .0000 | .12 | 1.9 | .... | .. |
| 5316 | May 22 | Mod'ate | Consid. earthy | Mark. earthy | 0.20 | 6.2 | 4.5 | .0012 | .0074 | .0030 | .0000 | .08 | 2.5 | .... | .. |
| 5901 | Dec. 23 | None | None | None | 0.00 | ..... | .... | .0015 | .0030 | .0100 | .0000 | .10 | 2.4 | .... | .. |
| 7795 | 1910 Apr. 13 | V. slight | Slight | Mark. veg. | 0.15 | 4.6 | 2.0 | .0014 | .0130 | .0050 | .0000 | .09 | 1.2 | .... | .. |

* B. Coli present.

**Littleton.**—The town of Littleton derives its supply from the north branch of Gale River, the intake of which is at the base of Mt. Garfield. The main pipe, 19 miles long, is 16 inches in diameter for a short distance from the intake; 12 inches for the next five miles; and 10 inches for the remainder of the distance. There are two reservoirs, of 1,000,000 and 500,000 gallons' capacity.

*Examination of Water from the Littleton Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 4469 | 1907 Apr. 26 | None | Slight | None | 0.30 | 5.3 | 1.6 | .0008 | .0036 | .0100 | .0000 | .12 | 0.9 | ...... |
| 4911 | Oct. 2 | Sl. opal | V. slight | Slight | 0.30 | 2.4 | 1.7 | .0020 | .0042 | .0050 | .0000 | .05 | 0.4 | ...... |
| 5415 | 1908 July 9 | None | S. fine | None | 0.10 | 2.2 | 1.3 | .0006 | .0022 | .0060 | .0000 | .06 | 0.3 | ...... |
| 7536 | 1909 Dec. 2 | None | None | None | 0.00 | 3.0 | 1.6 | .0008 | .0020 | .0100 | .0000 | .08 | .4 | ...... |
| 7800 | 1910 Apr. 12 | None | V. slight | Sl. earthy | 0.10 | 2.1 | 1.2 | .0012 | .0039 | .0020 | .0000 | .07 | .1 | ...... |

**Livermore.**—The Livermore Mills Company inaugurated a water supply some twenty years ago, the source being springs, pond and streams. The watershed is about thirty thousand acres in area, and there are 150 persons living thereon. The soil is clay and gravel. The system is a combination gravity and pump, the latter 150 H. P. Iron pipe is used for the mains.

*Examination of Water from the Livermore Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 5036 | 1907 Dec. 29 | None | Slight | None | 0.00 | ..... | .... | .0040 | .0054 | .0040 | .0000 | .36 | 1.9 | ...... |
| 5373 | 1908 June 26 | None | V. slight | None | 0.10 | 3.1 | 2.0 | .0008 | .0024 | .0080 | .0000 | .07 | .4 | ...... |

**Lyme.**—In 1838 the Lyme Aqueduct Company inaugurated a system of water works, the source being springs.



*Examination of Water from Supply of Lyme Aqueduct Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 772 | 1902 Sept. 3 | None | V. slight | None | 0.0 | 8.40 | 4.70 | .0000 | .0018 | .0250 | .0000 | .08 | 4.7 | .... | .. |
| 1723 | 1903 Dec. 10 | Slight | S. fine | None | 0.0 | 5.40 | 3.60 | .0000 | .0022 | .0150 | .0000 | .07 | 3.1 | .028 | .. |
| 1975 | 1904 May 23 | None | V. slight | S. foul | 0.0 | 5.50 | 4.60 | .0020 | .0020 | .0000 | .0000 | .12 | 4.5 | .... | .. |
| 3160 | 1905 Sept. 12 | None | None | S. foul | 0.1 | 7.5 | 5.3 | .0014 | .0024 | .0100 | .0000 | .07 | 4.1 | .025 | .. |
| 3431 | 1906 Feb. 1 | None | V. slight | None | 0.0 | 7.8 | 5.7 | .0020 | .0040 | .0100 | .0000 | .15 | 3.9 | .... | .. |
| 4150 | Nov. 13 | None | None | None | 0.00 | 7.2 | 6.2 | .0008 | .0044 | .0050 | .0000 | .10 | 4.6 | .... | .. |
| 4586 | 1907 May 30 | None | V. slight | None | 0.00 | 6.8 | 5.3 | .0004 | .0022 | .0050 | .0000 | .11 | 3.9 | .... | .. |
| 5007 | Nov. 11 | None | None | None | 0.00 | 6.8 | 6.1 | .0018 | .0024 | .0040 | .0000 | .19 | 3.9 | .... | .. |
| 5323 | 1908 May 26 | V. ft. op. | V.S. fibr. | Mark. stale | 0.00 | 6.9 | 5.1 | .0010 | .0006 | .0050 | .0000 | .10 | 3.9 | .... | * |
| 7802 | 1910 Apr. 14 | None | V.S. fibr. | Mark. veg. | 0.10 | ..... | .... | .0015 | .0030 | .004 | .0000 | .39 | 2.4 | .010 | .. |

* B. Coli present.

**Madbury.**—

*Examination of Water from Well of John DeMerrit.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7928 | 1910 May 27 | None | None | ....... | .... | ..... | .... | .0015 | .0005 | .0250 | .0000 | 1.60 | 2.6 | .... | .. |
| 7952 | June 8 | None | V. slight | None | 0.05 | ..... | .... | High | .0040 | .0500 | .0024 | 5.20 | 7.4 | .... | * |

*Examination of Water from Well of W. H. Elliott.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7929 | 1910 May 27 | None | None | None | 0.05 | ..... | .... | .0015 | .0005 | .250 | .0002 | 9.8 | 8.9 | .... | .. |

*Examination of Water from Well Supplying School.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 8344 | 1910 Aug. 23 | None | V. slight | None | 0.20 | ..... | .... | .0010 | .0015 | .0030 | .0000 | 0.20 | 1.9 | .... | * |

* B. Coli present.

**Madison.**—The John F. Chick private water supply was installed in 1905. The source is a spring, excavated two or three feet deep, and the water flows by gravity through about one mile of galvanized iron pipe, both main and service. About fifteen families take this water. There are some private wells within the area.

*Examination of Water from John F. Chick Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 5496 | 1908 Aug. 11 | None | None | None | 0.00 | 4.9 | 3.0 | .0008 | .0006 | .0150 | .0000 | .07 | 2.6 | .... | .. |
| 5497 | Aug. 11 | None | None | None | 0.05 | 3.3 | 2.0 | .0005 | .0000 | .0150 | .0000 | .07 | .9 | .... | .. |
| 7466 | 1909 Oct. 21 | None | None | None | 0.00 | 4.5 | .... | .0015 | .0015 | .030 | .0000 | .08 | 1.2 | .... | .. |

**Manchester.**—A water supply was instituted by the city in 1873, was added to in 1886, and supplemented by a high service in 1894. The source is Lake Massabesic, having an area of 2,500 acres, an average depth of 20 feet, and a bottom partly rocky and partly muddy. It has approximately 40 miles of watershed, wooded and cleared about equally. Some sawdust enters the lake. The water is pumped to a reservoir of 15,000,000 gallons' capacity, and an average depth of 20 feet; low service by gravity; high service by steam; 4,000,000-gallon reservoir. There are 110 miles of distributing mains, iron; service pipes are iron, lead lined. The average daily consumption is 3,500,000 gallons; 13,000 families, 99 per cent. of the population, are consumers of this water.

*Examination of Water from Lake Massabesic.*

| Number. | Date of collection. | Appearance. Turbidity. | Sediment. | Odor. | Color. | Residue on Evapo'n Total. | Fixed. | Ammonia Free. | Albuminoid. | Nitrogen as Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 369 | 1902<br>Jan. 21 | None | None | Dec.vg. | 0.8 | 5.70 | 1.20 | .0054 | .0204 | .0000 | .0000 | .12 | 0.7 | .... | 1 |
| 370 | Jan. 21 | None | None | Dec.vg. | 0.7 | 5.50 | .70 | .0044 | .0228 | .0000 | .0000 | .16 | 0.7 | .... | 2 |
| 371 | Jan. 21 | None | None | Dec.vg. | 0.7 | 5.70 | 1.00 | .0020 | .0188 | .0000 | .0000 | .21 | 0.7 | .... | 3 |
| 372 | Jan. 21 | None | None | Dec.vg. | 1.0 | 9.10 | 1.60 | .0012 | .0156 | .0000 | .0000 | .17 | 0.7 | .... | .. |
| 727 | Aug. 22 | None | Floc.veg. | Veg. | 0.35 | 7.40 | 1.30 | .0000 | .0106 | .0000 | .0000 | .17 | 1.2 | .... | .. |
| 1074 | 1903<br>Mar. 5 | Slight | Fine floc. veg. | Dec.vg. | 0.1 | 3.80 | 1.00 | .0010 | .0132 | .0040 | .0000 | .10 | 0.0 | .... | 3 |
| 1075 | Mar. 5 | Slight | Fine floc. veg. | Dec.vg. | 0.7 | 4.90 | 1.10 | .0000 | .0066 | .0040 | .0000 | .11 | 1.0 | .... | 4 |
| 1076 | Mar. 5 | Slight | Fine floc. veg. | V. dec. vg. | 0.75 | 6.50 | 1.30 | .0000 | .0066 | .0040 | .0000 | .15 | 1.2 | .... | 3 |
| 1077 | Mar. 5 | Slight | Fine floc. veg. | Dec.vg. | 0.65 | 4.80 | 1.60 | .0000 | .0066 | .0040 | .0000 | .17 | 1.4 | .... | 5 |
| 2491 | 1904<br>Oct. 26 | Slight | M. fine | Dec.vg. | 0.4 | 3.5 | 1.7 | .0000 | .0060 | .0050 | .0000 | .22 | 0.4 | .... | 6 |
| 2492 | Oct. 26 | Slight | M. fine | S. veg. | 0.25 | 3.7 | 2.3 | .0000 | .0072 | .0050 | .0000 | .15 | 0.4 | .... | [illegible] |
| 2493 | Oct. 28 | Slight | S. fine | Dec.vg. | 0.30 | 3.7 | 2.7 | .0000 | .0060 | .0050 | .0000 | .17 | 0.4 | .... | 3 |
| 2494 | Oct. 28 | V. slight | M. fine | S. veg. | 0.35 | 4.0 | 1.9 | .0000 | .0060 | .0050 | .0000 | .15 | 0.4 | .... | 4 |
| 2495 | Oct. 28 | Slight | M. fine | S. veg. | 0.30 | 3.1 | 2.0 | .0000 | .0060 | .0050 | .0000 | .15 | 0.4 | .... | 7 |
| 3177 | 1905<br>Sept. 19 | None | None | Arom. | 0.20 | 4.5 | 1.7 | .0006 | .0104 | .0100 | .0000 | .20 | 0.6 | .... | [illegible] |
| 3214 | Oct. 4 | None | S. fine | Veg. | 0.40 | 3.7 | 0.8 | .0008 | .0100 | .0050 | .0000 | .27 | 0.6 | .... | 8 |
| 3215 | Oct. 4 | S. fine | S. fine | S. veg. | 0.20 | 4.5 | 1.8 | .0008 | .0092 | .0050 | .0000 | .27 | 0.7 | .... | 9 |
| 3216 | Oct. 4 | S. fine | S. fine | Veg. | 0.30 | 5.4 | 2.4 | .0008 | .0100 | .0050 | .0000 | .30 | 0.6 | .... | 2 |
| 3217 | Oct. 4 | None | S. fine | S. veg. | 0.20 | 5.2 | 2.5 | .0008 | .0106 | .0050 | .0000 | .30 | 0.7 | .... | [illegible] |
| 3218 | Oct. 4 | Slight | Slight | Veg. | 0.20 | 4.0 | 1.9 | .0008 | .0084 | .0050 | .0000 | .25 | 0.7 | .... | 10 |
| 3219 | Oct. 4 | None | Slight | Veg. | 0.55 | 6.9 | 2.2 | .0030 | .0084 | .0050 | .0000 | .22 | 1.1 | .... | 4 |
| 4949 | 1907<br>Oct. 15 | None | S earthy | None | 0.35 | 4.2 | 2.0 | .0002 | .0102 | .0040 | .0000 | .20 | 0.4 | .... | 11 |
| 4950 | Oct. 15 | None | S. earthy | Argil-lac. | 0.35 | 3.7 | 1.7 | .0008 | .0084 | .0060 | .0000 | .18 | 0.4 | .... | 12 |
| 4951 | Oct. 15 | None | S. earthy | Argil-lac. | 0.35 | 4.7 | 3.0 | .0010 | .0084 | .0020 | .0000 | .20 | 1.2 | .... | 1 |
| 4952 | Oct. 15 | None | S. earthy | None | 0.35 | 4.5 | 1.7 | .0002 | .0084 | .0006 | .0000 | .23 | 0.4 | .... | 13 |
| 4953 | Oct. 15 | None | Slight | None | 0.30 | 3.0 | 1.5 | .0002 | .0078 | .0100 | .0000 | .19 | 0.4 | .... | 8 |
| 4954 | Oct. 15 | V. slight | S. earthy | None | 0.35 | 4.8 | 1.7 | .0010 | .0084 | .0100 | .0000 | .22 | 0.4 | .... | 14 |
| 4955 | Oct. 15 | None | S. earthy | None | 0.40 | 4.6 | 1.8 | .0016 | .0078 | .0080 | .0000 | .21 | 0.4 | .... | 15 |
| 4956 | Oct. 15 | V. S. op. | S. earthy | None | 0.30 | 4.3 | 1.7 | .0012 | .0104 | .0100 | .0000 | .23 | 0.4 | .... | 4 |
| 5165 | 1908<br>Mar. 11 | None | V. slight | S. earthy | 0.50 | ..... | .... | .0018 | .0100 | .0100 | .0000 | .34 | 0.4 | .... | [illegible] |

*Examination of Water from Lake Massabesic.—Concluded.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1908 | | | | | | | | | | | | | | |
| 5604 | Sept. 8 | Slight | Sl. fine | Sl. earthy | 0.20 | 6.3 | 3.2 | .0004 | .0064 | .0020 | .0000 | .15 | .6 | .... | 10 |
| 5605 | Sept. 8 | Slight | Sl. fine | None | 0.20 | 5.7 | 3.8 | .0002 | .0058 | .0050 | .0000 | .16 | .3 | .... | 8 |
| 5606 | Sept. 8 | V. slight | Slight | None | 0.20 | 5.0 | 4.5 | .0002 | .0062 | .0050 | .0000 | .28 | .3 | .... | 4 |
| 5607 | Sept. 8 | Slight | Sl. fine | None | 0.20 | 3.4 | 1.2 | .0002 | .0066 | .0050 | .0000 | .18 | .4 | .... | 16 |
| 5608 | Sept. 8 | V. slight | Slight | Earthy | 0.15 | 3.8 | 1.0 | .0002 | .0050 | .0060 | .0020 | .16 | .3 | .... | 1 |
| 5609 | Sept. 8 | None | None | None | 0.30 | 5.3 | 2.8 | .0002 | .0032 | .0040 | .0000 | .14 | .4 | .... | *11 |
| 5654 | Sept.21 | None | V. slight | None | 0.20 | 4.5 | 2.7 | .0008 | .0076 | .0030 | .0000 | .18 | .4 | .... | .. |
| 5653 | Sept.21 | None | V. slight | None | 0.20 | 3.7 | 2.0 | .0004 | .0060 | .0030 | .0000 | .20 | .4 | .... | .. |
| 5732 | Oct. 7 | None | Slight | None | 0.25 | 3.0 | 1.6 | .0026 | .0050 | .0050 | .0000 | .18 | .1 | .... | * |
| 5733 | Oct. 7 | Marked | Con. | None | 0.50 | 3.0 | 1.8 | .0010 | .0100 | .0080 | .0000 | .16 | .1 | .... | .. |
| | 1909 | | | | | | | | | | | | | | |
| 7524 | Dec. 1 | None | None | None | 0.20 | 3.7 | 1.5 | .0008 | .0085 | .005 | .0000 | .20 | .4 | .... | .. |
| 7527 | Dec. 1 | V. slight | Sl. floc. | None | 0.70 | 12.0 | 5.0 | .0010 | High | .0400 | .0000 | .80 | 3.2 | .... | .. |
| 7529 | Dec. 1 | V. slight | V. slight | Sl. swamp. | 0.60 | 6.5 | 3.2 | .0010 | .0140 | .0050 | .0000 | .25 | 1.2 | .... | .. |
| 7530 | Dec. 1 | V. slight | V. slight | Sl. swamp. | 0.70 | 7.5 | 3.5 | .0010 | High | .0050 | .0000 | .30 | 1.9 | .... | .. |

[1] High service intake; [2] Deer neck bridge; [3] Half way between Severance Beach and Battery Point; [4] Mouth of Sucker Brook; [5] Front of Judge Emery residence; [6] Between Battery and Rocky Points; [7] Island toward low service intake; [8] Battery Point; [9] Bog, north end of Back Pond; [10] Dam at outlet; [11] Under bridge; [12] Low service outlet; [13] Between Brown and Fletcher islands; [14] Mouth of Merrill Brook; [15] Front of big wharf; [16] Front Pond 400 ft. from wharf; * B. Coli present.

*Examination of Water from Spring at Stark Park.*

| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1909 | | | | | | | | | | | | | | |
| 7456 | Oct. 20 | None | Sl. floc. | Sl. earthy | 1.00 | 5.5 | .... | .0025 | .0030 | .1000 | .0004 | .60 | 1.9 | .... | .. |

*Examination of Water from Wells of W. H. McElwain Company.*

| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1908 | | | | | | | | | | | | | | |
| 5652 | Sept.21 | V. S. op. | Slight | Mark. earthy | 0.00 | 12.5 | 6.8 | .0002 | .0014 | .1000 | .0002 | 1.25 | 4.6 | .... | * |
| 5651 | Sept.21 | V. S. op. | V. slight | Gaso-line | 0.00 | 21.1 | 9.2 | .0020 | .0028 | .2200 | High | 1.66 | 6.2 | .... | .. |
| 5853 | Nov.20 | None | V. slight | None | 0.00 | ..... | .... | .0025 | .0001 | .2000 | .0000 | 1.00 | 3.7 | .... | .. |
| | 1909 | | | | | | | | | | | | | | |
| 7277 | Aug. 12 | None | Sl. earthy | Sl. earthy | 0.00 | ..... | .... | .0005 | .0010 | .1000 | Trace | 2.30 | 4.9 | .... | *a |
| | 1910 | | | | | | | | | | | | | | |
| 8348 | Aug. 12 | V. slight | V. slight | Urine | 0.05 | 13.9 | 9.8 | .0030 | .0025 | .1150 | V. High | .55 | 6.0 | .... | * |
| 8349 | Aug. 12 | None | Sl. floc. | Sl. gaso-line | 0.05 | 14.2 | 8.0 | .0020 | .0015 | .2250 | High | .75 | 6.0 | .... | .. |

* B. Coli present; *a* spring.

*Examination of Water from Well of Manchester Battalion Rifle Range Association.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | * | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 8098 | 1910 July 12 | None | None | Sl. earthy | 0.05 | ..... | .... | .0006 | .0010 | .0025 | .0000 | .20 | 2.9 | .... | .. |

*Examination of Water from Spring of New Y. M. C. A. Building.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7774 | 1910 Apr. 7 | V. slight | Sl. earthy | Con. earthy | 0.05 | ..... | .... | .0120 | .0041 | .2000 | High | 14.0 | 12.4 | .... | .. |

* B. Coli present; *a* spring.

**Marlborough.**—Water is from private springs, average about three feet deep, and flows by gravity through one-inch lead pipe to dwellings.

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 2407 | 1904 Oct. 3 | Slight | Con. floc. | Musty | 0.05 | 10.6 | 3.1 | .0000 | .0000 | .0000 | .0000 | .15 | 0.3 | .... | .. |
| 2408 | Oct. 3 | None | M. fine | Musty | 0.10 | 15.7 | 8.1 | .0000 | .0000 | .0000 | .0000 | .15 | 0.4 | .... | .. |
| 2669 | 1905 Jan. 30 | None | Much | None | 0.0 | 4.1 | 2.1 | .0000 | .0000 | .0100 | .0000 | .15 | 0.4 | .056 | .. |
| 3647 | 1906 May 29 | None | None | Slight | 0.10 | 2.0 | 1.0 | .0020 | .0024 | .0100 | .0000 | .07 | .... | .... | .. |
| 4553 | 1907 May 19 | None | None | Sl. veg. | 0.00 | 2.9 | 1.9 | .0008 | .0016 | .0100 | .0000 | .22 | 0.9 | .... | .. |
| 4999 | Nov. 4 | None | None | None | 0.5 | ..... | .... | .0002 | .0064 | .0020 | .0000 | .17 | 1.2 | .... | .. |

**Meredith.**—The Meredith Fire District owns and operates a water supply that was installed in 1894, the source being springs. The water flows by gravity from a reservoir on a hill, 175 feet above the level of the town. The iron main is 4 3-4 miles long; the service pipes are of galvanized iron. Two hundred families, 85 per cent. of the population, are supplied. There are two public drinking fountains on this system.



*Examination of Water from a Faucet of the Supply of the Meredith Fire District.*

| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 774 | 1902 Sept. 3 | None | None | Dec.vg. | 0.2 | 6.10 | 1.60 | .0020 | .0074 | .0000 | .0000 | .12 | 1.6 | .... | .. |
| 1296 | 1903 July 7 | Slight | V. slight | M. veg. | 0.1 | 5.00 | 2.30 | .0000 | .0038 | .0000 | .0000 | .10 | 1.6 | .... | .. |
| 1399 | Aug. 3 | Marked | M. fine | V. dec. veg. | 0.25 | 6.60 | 1.90 | .0040 | .0158 | .0300 | .0000 | .15 | 1.9 | .... | .. |
| 1971 | 1904 May 23 | None | None | Sl. veg. | 0.25 | 3.10 | 1.70 | .0022 | .0030 | .0000 | .0000 | .15 | 1.6 | .... | .. |
| 2688 | 1905 Feb. 9 | None | None | V. slight | 0.10 | 6.0 | 3.3 | .0010 | .0000 | .0100 | .0000 | .20 | 1.8 | .... | .. |
| 3193 | Sept. 25 | V. slight | None | Slight | 0.20 | 4.2 | 2.6 | .0010 | .0082 | .0100 | .0000 | .10 | 1.5 | .... | .. |
| 3427 | 1906 Jan. 30 | None | None | Slight | 0.10 | 4.9 | 2.6 | .0008 | .0024 | .0050 | .0000 | .22 | 1.2 | trace | .. |
| 4175 | Nov. 21 | None | None | V. sl. foul | 0.05 | 4.8 | 2.3 | .0014 | .0076 | .0100 | .0000 | .22 | 1.9 | .... | .. |
| 4513 | 1907 May 8 | None | V. slight | None | 0.10 | 2.6 | 1.8 | .0012 | .0030 | .0050 | .0000 | .17 | 0.4 | .03 | .. |
| 5013 | Nov. 12 | V. slight | V. slight | None | 0.25 | 2.9 | 1.8 | .0002 | .0054 | .0050 | .0000 | .32 | 1.2 | .... | .. |
| 7553 | 1909 Dec. 13 | V. slight | V. slight | None | 0.10 | 3.2 | 1.6 | .0008 | .0070 | .005 | .0000 | .20 | 1.9 | .... | .. |

**Merrimack.**—No public supply.

*Examination of Water Forwarded by W. H. McElwain Company.*

| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 7414 | 1909 Oct. 6 | V. slight | V. slight | None | 0.40 | ..... | .... | .0015 | .0100 | .0050 | .0000 | .30 | 1.9 | .... | *a* |
| 8177 | 1910 July 23 | Con. op. | V. slight | Clay | 0.15 | ..... | .... | .0006 | .0066 | .0025 | .0000 | 1.50 | 1.2 | .... | *b* |

*a*. Baboosic Brook; *b*. Driven well.

**Milford.**—The public water works of Milford were built in 1890 by John T. Langford and purchased by the town in 1891. There are three collecting wells, two of them about 35 feet in diameter and one 20 feet deep; one somewhat smaller is fed by driven pipes. Soil, gravel with clay bottom. The water is pumped to a standpipe of 250,000 gallons' capacity.



*Examination of Water from Faucet of Milford Water Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 152 | 1901 Sept. 9 | None | None | None | 0.2 | 5.10 | 3.20 | .0012 | .0074 | .0120 | .0000 | .23 | .... | .... | .. |
| 826 | 1902 Sept.22 | None | None | None | 0.1 | 6.40 | 3.60 | .0000 | .0030 | .0000 | .0000 | .13 | 3.40 | .... | .. |
| 827 | Sept.22 | V. slight | Slight | Slight | 0.3 | 8.00 | 2.60 | .0022 | .0066 | .0000 | .0003 | .18 | 2.60 | .... | .. |
| 1014 | 1903 Jan. 28 | Slight | None | Veg. | 0.1 | 13.60 | 4.00 | .0000 | .0008 | .0000 | .0000 | .17 | 3.30 | .... | .. |
| 1400 | Aug. 3 | V. slight | None | None | 0.1 | 5.60 | 2.80 | .0000 | .0040 | .0000 | .0000 | .15 | 2.40 | .... | .. |
| 1980 | 1904 May 23 | None | None | Sl. earthy | 0.15 | 5.90 | 1.40 | .0000 | .0018 | .0000 | .0000 | .10 | 1.20 | .... | * |
| 2080 | June21 | Slight | V. mark. floc. red | V. slight | 0.3 | 6.60 | 4.60 | .0006 | .0010 | .0000 | .0000 | .22 | 4.70 | .... | .. |
| 2147 | July 12 | None | V. slight | V. slight | 0.3 | 4.40 | 1.10 | .0026 | .0044 | .0000 | .0000 | .20 | 0.90 | .... | *a* |
| 2148 | July 12 | Marked | V. slight | None | 0.1 | 6.60 | 2.20 | .0014 | .0034 | .0000 | .0000 | .17 | 2.30 | .... | *b* |
| 2206 | July 26 | V. slight | V. slight | V. slight | 0.3 | 3.70 | 2.40 | .0000 | .0060 | .0000 | .0000 | .12 | 1.80 | .... | *c* |
| 2208 | July 26 | None | None | None | 0.0 | 4.90 | 3.50 | .0006 | .0000 | .0200 | .0000 | .17 | 1.10 | .... | *a* |
| 2368 | Sept.14 | Slight | Slight | V. slight | 0.15 | 4.90 | 2.90 | .0000 | .0064 | .0000 | .0000 | .20 | 1.90 | .... | *d* |
| 2369 | Sept.14 | Slight | Slight | None | 0.3 | 6.10 | 2.50 | .0000 | .0070 | .0000 | .0000 | .15 | 2.70 | .... | *c* |
| 2370 | Sept.15 | None | Con.floc. | Dec. earthy | 0.05 | 5.20 | 2.40 | .0010 | .0024 | .0000 | .0000 | .20 | 2.60 | .... | *b* |
| 3163 | 1905 Sept.13 | V.slight | Slight | None | 0.30 | 7.3 | 4.4 | .0000 | .0104 | .0100 | .0000 | .17 | 2.9 | .... | *c* |
| 3164 | Sept.13 | V. slight | None | None | 0.20 | 5.5 | 2.8 | .0006 | .0054 | .0050 | .0000 | .20 | 2.3 | .... | .. |
| 3419 | 1906 Jan. 30 | None | Slight | None | 0.10 | 4.4 | 3.5 | .0008 | .0020 | .0050 | .0000 | .20 | 2.2 | .... | *e* |
| 3759 | July 17 | None | None | None | 0.15 | 5.8 | 3.3 | .0006 | .0020 | .0100 | .0000 | .20 | 1.6 | .... | .. |
| 4088 | Oct. 22 | V. slight | V. slight | V.sl.veg. | 0.10 | 4.8 | 2.8 | .0010 | .0024 | .0050 | .0000 | .07 | 1.2 | .... | .. |
| 4315 | 1907 Jan. 30 | None | V. slight | None | 0.00 | ..... | .... | .0010 | .0022 | .0050 | .0000 | .21 | 1.9 | .... | * |
| 4356 | Mar. 6 | None | None | Foreign | 0.15 | ..... | .... | ..... | ..... | .0050 | .0000 | .20 | 0.9 | .... | .. |
| 5009 | Nov.11 | None | None | None | 0.10 | 4.6 | 3.0 | .0002 | .0040 | .0030 | .0000 | .31 | 1.9 | .... | .. |
| 5307 | 1908 May 20 | None | None | None | 0.10 | 5.8 | 2.3 | .0002 | .0024 | .0050 | .0000 | .12 | 0.9 | .... | .. |

*Examination of Water from Faucet of Milford Water Supply.—Concluded.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 5659 | 1908 Sept.21 | Mod. op. | Slight | Gas | 1.3 | 7.7 | 5.6 | .0004 | .0036 | .0040 | .0000 | .25 | 2.8 | .... | .. |
| 5660 | Sept.21 | Mod. op. | Slight | M'ked gas | 0.80 | ..... | .... | .0002 | .0030 | .0030 | .0000 | .20 | 3.9 | .... | .. |
| 5661 | Sept.21 | Sl. op. | V. slight | None | 0.40 | 6.0 | 4.3 | .0014 | .0006 | .0050 | .0000 | .20 | 1.8 | .... | .. |
| 5785 | Oct. 21 | None | None | None | 0.20 | 3.5 | 2.1 | .0010 | .0020 | .0000 | .0000 | .17 | .9 | .... | .. |
| 7549 | 1909 Dec. 8 | V. Slight | Slight | None | 0.05 | 3.9 | 1.7 | .0001 | .0012 | .0100 | .0000 | .18 | 1.2 | .... | .. |
| 7821 | 1910 Apr. 21 | None | None | None | 0.10 | 3.9 | 2.3 | .0005 | .0070 | .0100 | .0000 | .35 | .9 | .... | * |
| 7893 | May 17 | Cons. | V. heavy ferrug | Veg. | 0.10 | 5.1 | 3.1 | .0010 | .0010 | .0025 | .0000 | .30 | 1.4 | .... | *f |
| 7894 | May 17 | None | Sl. earthy | Earthy | 0.20 | 4.0 | 2.4 | .0010 | .0070 | .0050 | .0000 | .30 | 1.6 | .... | e |
| 7895 | May 17 | Slight | Sl. fibre | Earthy | 0.10 | 3.6 | 2.8 | .0010 | .0040 | .0100 | .0000 | .30 | 1.2 | .... | b |
| 7896 | May 17 | V. slight | Sl. floc. | Earthy | 0.50 | 4.0 | 2.2 | .0030 | .0095 | .0050 | .0000 | .30 | 1.9 | .... | .. |
| 7936 | June 3 | None | None | None | 0.00 | 3.0 | 2.0 | .0010 | .0010 | .0100 | .0000 | .30 | 1.2 | .... | .. |

* B. Coli present; *a* well No. 1; *b* well No. 2; *c* well No. 3; *d* standpipe; *e* tap at pumping station; *f* end of line.

*Examination of Water from Wells of Lovejoy Granite Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7203 | 1909 July 19 | V. ft. op. | V. slight | None | 0.00 | ..... | .... | .0001 | .0010 | .0500 | .0000 | .20 | 1.1 | .... | .. |
| 7201 | July 19 | V. slight | V. slight | Sl. earthy | 0.10 | 8.5 | 5.7 | .0002 | .0002 | .0300 | trace | .25 | 3.2 | .... | * |
| 7294 | Sept.20 | None | None | None | 0.00 | ..... | .... | .0001 | .0002 | .0400 | .0000 | .25 | .... | .... | .. |

* B. Coli present.

*Examination of Water from Well Owned by Hillsborough Mills.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5840 | 1908 Nov.16 | None | V. slight | Sl.foul | 0.05 | ..... | .... | .0001 | .0025 | .0400 | .0006 | .20 | 1.2 | .037 | .. |

**Milton.**—

*Examination of Water from Spring in Woods, Used by Public.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid. | Nitrates. | Nitrites. | | | | |
| 5721 | 1908 Oct. 4 | None | V. slight | None | 0.00 | 5.3 | .... | .0010 | .0005 | .0050 | .0000 | .... | .3 | .... | .. |

*Examination of Water from Well Owned by Spaulding's Sons Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7943 | 1910 June 6 | None | V. slight | None | 0.00 | ..... | .... | .0010 | .0015 | .0250 | .0000 | 1.85 | 2.9 | .15 | .. |

**Nashua.**—A private supply, the Pennichuck Water Works, installed by Nashua Aqueduct Company, in 1853, has for a source springs and wells. The wells, from 16 to 52 feet in depth, are driven through alternate layers of marl, sand, fine gravel and coarse gravel, and flow from 20 gallons to 275 gallons per minute. The reservoir, of 4,000,000 gallons' capacity, is 13 feet in depth. There are about 75 miles of cast iron distributing mains; wrought iron, galvanized, is used for service pipes. The average daily consumption is 3,500,000 gallons, by 4,000 families, about 95 per cent. of the population.

*Examination of Water from Pennichuck Water Works Company, Nashua.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 750 | 1902 Aug. 26 | None | None | Sl. veg. | 0.0 | 6.00 | 1.50 | .0000 | .0000 | .0000 | .0000 | .15 | 1.5 | .... | .. |
| 1136 | Apr. 12 | None | Floc.veg. | Sl. veg. | 0.0 | 4.00 | 2.70 | .0000 | .0010 | .0150 | .0000 | .17 | 2.0 | .... | .. |
| 1137 | Apr. 12 | None | None | None | 0.0 | 3.80 | 2.20 | .0000 | .0000 | .0000 | .0000 | .15 | 2.4 | .... | .. |
| 1395 | July 3 | Slight | Floc.veg. | V. dec. veg. | 0.08 | 4.30 | 2.30 | .0000 | .0048 | .0000 | .0000 | .20 | 2.2 | .... | .. |
| 1396 | July 3 | Slight | Floc.veg. | V. dec. veg. | 0.08 | 5.20 | 2.50 | .0000 | .0024 | .0000 | .0000 | .20 | 2.2 | .... | .. |
| 1978 | 1904 May 23 | V.mark. | Sl. fine | S.musty | 0.6 | 4.10 | 1.10 | .0000 | .0024 | .0350 | .0000 | .22 | 0.9 | .... | .. |
| 2384 | Sept.19 | Slight | Con.fine | V. dec. veg. | 0.2 | 4.40 | 2.70 | .0000 | .0024 | .0000 | .0000 | .20 | 1.4 | .... | .. |
| 2500 | Oct. 31 | None | S. fine | V. slight | 0.0 | 5.7 | 4.0 | .0000 | .0020 | .0000 | .0000 | .20 | 2.6 | .... | .. |
| 2682 | 1905 Feb. 6 | None | None | Earthy | 0.1 | 4.2 | 1.9 | .0000 | .0000 | .0100 | .0000 | .17 | 1.8 | .... | .. |
| 3180 | Sept.19 | Slight | None | Veg. | 0.15 | 6.3 | 2.8 | .0034 | .0082 | .0050 | .0000 | .17 | 1.9 | .... | .. |
| 3445 | 1906 Feb. 6 | None | None | Veg. | 0.10 | 3.7 | 2.7 | .0008 | .0030 | .0050 | .0000 | .22 | 2.0 | .... | .. |
| 3820 | Aug. 7 | V. slight | V. slight | Veg. | 0.03 | 6.0 | 5.0 | .0010 | .0064 | .0050 | .0000 | .20 | 1.4 | .... | .. |
| 4178 | Nov.23 | None | None | Earthy | 0.05 | 5.0 | 4.0 | .0010 | .0054 | .0050 | .0000 | .25 | 0.19 | .... | .. |
| 4294 | 1907 Jan. 24 | None | None | None | 0.00 | ..... | .... | .0010 | .0006 | .0000 | .0000 | .07 | 2.7 | .... | .. |
| 5025 | Nov.15 | None | None | Earthy | 0.10 | 3.9 | 3.3 | .0008 | .0024 | .0020 | .0000 | 2.3 | 1.9 | .... | .. |
| 5117 | 1908 Jan. 21 | None | None | None | 0.00 | 3.3 | 2.7 | .0008 | .0008 | .0060 | .0000 | .21 | 2.5 | .... | .. |
| 5915 | Dec. 30 | Ft. op. | None | None | 0.00 | ..... | .... | .0005 | .0015 | .0000 | .0000 | .18 | 1.2 | .... | .. |
| 6008 | 1909 Mar.13 | None | None | Sl. earthy | 0.10 | 3.1 | 2.0 | .0010 | .0035 | .0100 | .0000 | .18 | 1.4 | .... | .. |
| 7857 | 1910 May 2 | V. slight | Mod.veg. | Sl. swamp | 0.70 | 4.0 | 2.0 | .0035 | .0100 | .0020 | .0000 | .30 | 2.0 | .025 | .. |

*Examination of Water from Ponds Owned by Nashua Coal and Ice Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7487 | 1909 Oct. 28 | None | Sl. veg. | Con. earthy | 0.30 | ..... | .... | .0015 | .0130 | .0050 | .0000 | .25 | 1.9 | .... | * |
| 7488 | Oct. 28 | None | None | Sl. earthy | 0.40 | ..... | .... | .0045 | .0170 | .0050 | .0000 | .20 | 1.5 | .... | .. |

* B. Coli present.

*Examination of Water from Pond Owned by George E. Balcom.*



| Number. | Date of collection. | Appearance. | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 489 | 1909 Oct. 28 | Sl. opal. | Mod.floc. | Arom. | 0.30 | ..... | .... | High | High | .0050 | .0000 | .40 | .4 | .... | .. |

*Examination of Water from Danforth Spring—Supply of Highland Sanitarium.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4374 | 1907 Mar.18 | None | V. slight | Sl. foul | 0.00 | 9.8 | 7.8 | .0046 | .0020 | .3700 | trace | .68 | 3.6 | .... | * |
| 5118 | 1908 Jan. 21 | None | None | None | 0.00 | 6.8 | 4.0 | .0012 | .0016 | .0200 | .0000 | .65 | 3.2 | .... | .. |
| 5119 | Jan. 21 | None | None | None | 0.05 | 6.8 | 4.4 | .0006 | .0012 | .0150 | .0000 | .64 | 3.2 | .... | .. |

* B. Coli present.

*Examination of Water from Harris Pond.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5116 | 1908 Jan. 21 | None | None | Hay-like | 0.50 | 2.0 | 1.7 | .0004 | .0054 | .0100 | .0000 | .19 | 1.2 | .... | * |

* Colon B. present.

*Examination of Water from Nashua River.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4293 | 1907 Jan. 24 | Mod. op. | Mod. | Musty | 0.30 | ..... | .... | .0240 | .0120 | .0000 | .0000 | .60 | 2.6 | .... | * |

* Colon B. present.

**New Boston.**—The New Boston Creamery furnishes water from Grist Mill Pond; the latter is of small area and hard bottom. The water flows by gravity through eight-inch pipe from pond forced through pump, eight-foot head. This water is furnished for fire hydrants, and to eight families, but is not used for drinking or in food. Drinking water is from wells and springs.

*Examination of Water from Grist Mill Pond.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 4506 | 1907 May 6 | None | V. slight | None | 1.60 | 5.4 | 2.4 | .0014 | .0090 | .0150 | .0000 | .28 | 0.9 | present | .. |
| 5020 | Nov. 19 | None | None | None | 0.80 | 3.9 | 2.7 | .0004 | .0104 | .0050 | .0000 | .26 | 0.4 | high | .. |

*Examination of Water from Well Supplying Presbyterian Church.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7441 | 1909 Oct. 15 | None | None | Earthy | 0.00 | ..... | .... | .0002 | .0008 | .0050 | .0000 | 1.0 | 3.2 | high | .. |

*Examination of Water from Stream Owned by G. C. Warren.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7962 | 1910 June 15 | V. slight | V. slight | Swampy | 1.4 | 5.0 | 1.9 | .0050 | .0060 | .0050 | .0000 | 1.35 | 1.5 | high | .. |

*Examination of Water from Supplies of J. Reed Whipple.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7650 | 1910 Feb. 10 | V. slight | V. slight | Con. swampy | 0.70 | ..... | .... | .0008 | .0130 | .0000 | .0000 | .06 | 1.9 | high | *a* |
| 7961 | June 21 | None | None | V. slight | 0.00 | 8.0 | 5.3 | .0010 | .0010 | .1000 | .0000 | .95 | 5.0 | high | *b* |

*a* Spring receives surface drainage; *b* well.

**Newbury.**—Private parties supply running water from springs to the summer cottages at Blodgett's Landing. Another party supplies his own and two or three other cottages from a well.

*Examination of Water from Blodgett Spring, Blodgett's Landing.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 4520 | 1907 May 10 | None | None | None | 0.00 | 5.3 | 4.3 | .0018 | .0018 | .0200 | .0000 | .49 | 2.3 | .... | .. |
| 5610 | 1908 Sept. 18 | None | None | None | 0.00 | ..... | .... | .0006 | .0002 | .0200 | .0000 | .20 | 1.2 | .... | .. |

**Newfields.**—

*Examination of Water from a Well Opposite Railroad Station.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7660 | 1910 Feb. 3 | None | Sl. earthy | Ft. swamp. | 0.00 | ..... | .... | .0006 | .0024 | .150 | .0000 | .70 | 3.1 | .... | .. |

*Examination of Water from Well of Methodist Parsonage (Used by School Children).*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7659 | 1910 Feb. 31 | None | Sl. floc. | Sl. earthy | 0.00 | ..... | .... | .0008 | .0014 | .3000 | .0000 | 1.75 | 2.6 | .... | .. |

*Examination of Water from Well of George S. Littlefield.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7662 | 1910 Feb. 13 | None | Slight | None | 0.05 | ..... | .... | .0002 | .0034 | .450 | .0000 | 2.44 | 5. | .... | .. |

*Examination of Water from Well of Old Newfields Tavern.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7661 | 1910 Feb. 13 | None | None | None | 0.00 | ..... | .... | .0008 | .0042 | .7000 | .0000 | 2.12 | 6.0 | .75 | .. |

**New Hampton.**—During 1910 the precinct inaugurated a supply, the source being Mountain Pond. The latter is a sheet of water of about 30 acres area, 10 to 40 feet deep, situated at a considerable altitude about one mile from any habitation, and with no pasturage near pond, brook or reservoir. The pond is fed by springs, and has a hard, clean bottom. The shores of this as well as the bed of the brook, (one mile long) leading to the distributing reservoir, have been recently cleaned. The reservoir has a capacity of 5,000,000 gallons, with an average depth of five feet. About two miles of cast iron mains have been laid, with services of galvanized iron. It is expected that the system will be placed in operation about September 1.

*Examination of Water from Mountain Pond.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 5277 | 1908<br>May 4 | Slight | S. floc. | S. stale | 0.15 | 3.5 | 1.9 | .0016 | .0044 | .0030 | .0000 | .09 | 0.4 | .... | .. |
| 5278 | May 4 | Mod'ate | S. floc. | Slight | 0.10 | 2.4 | 1.2 | .0018 | .0066 | .0050 | .0000 | .09 | 0.4 | .... | .. |
| 5297 | May 18 | V. slight | S. floc. | None | 0.15 | 2.5 | 1.3 | .0006 | .0024 | .0050 | .0000 | .08 | 0.3 | .... | .. |
| 5495 | Aug. 12 | V. slight | V. slight | None | 0.20 | ..... | .... | .0005 | .0113 | .0050 | .0000 | .... | ... | .... | .. |
| 5796 | Oct. 23 | None | V. slight | Slight | 0.15 | 2.4 | .30 | .0020 | .0090 | .0000 | .0000 | .08 | .30 | .... | .. |
| 5884 | Dec. 10 | V. slight | V. slight | Sl. musty | 0.10 | 2.9 | 1.5 | .0040 | .0100 | .0000 | .0000 | .09 | .30 | .... | .. |
| 6012 | 1909<br>Mar. 1 | V. faint | V. slight | Slight | 0.10 | 2.7 | 1.4 | .0060 | .0070 | .0050 | .0000 | .08 | .10 | .... | .. |

**New Ipswich.**—

*Examination of Water from Well of Congregational Church, Smithville.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7228 | | V. S. op. | V. slight | None | 0.05 | ..... | .... | .0010 | .0020 | .1500 | .0006 | .4 | 4.6 | .05 | * |

* B. Coli present.

**New London.**—This town has no public supply as yet, the matter of the Morgan Pond system contemplated being still in abeyance. The supply is from a private system owned by C. E. Shepard, consisting of two bored wells, 305 and 219 feet deep, respectively, the water being pumped to a reservoir of 30,000 gallons. One mile is of galvanized iron mains with services of the same material. About 20 per cent. of the population is thus supplied, including Colby Academy, two stores, a hotel and ten families. Two or three families are supplied by C. W. Converse with water pumped from Sunapee Lake.

## *Examination of Water from Morgan Pond.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 3931 | 1906 Aug. 28 | None | S. veg. | S. veg. | 0.50 | 5.0 | 2.2 | .0026 | .0134 | .0000 | .0000 | .05 | 0.7 | .... | .. |
| 3932 | Aug. 28 | None | S. veg. | S. veg. | 0.60 | 6.0 | 2.8 | .0390 | .0170 | .0000 | .0000 | .10 | 0.9 | .... | *a |

*B. Coli present; *a* Brook flowing from Morgan Pond.

## *Examination of Water from Stream on Land of H. W. Kidder—Twin Lake Village Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4839 | 1907 Aug. 26 | None | None | None | 0.3 | ..... | .... | .0002 | .0052 | .0050 | .0000 | .10 | 1.9 | .... | .. |

## *Examination of Water from Wells of Soo-Nipi Park Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5047 | 1907 Dec. 2 | None | None | None | 0.00 | ..... | .... | .0014 | .0026 | .0080 | .0000 | 1.93 | 6.7 | h'gh | .. |
| 5056 | Dec. 2 | Sl. op. | V. slight | None | 0.20 | ..... | .... | .0040 | .0038 | .0100 | V. high | 2.29 | 4.6 | .... | .. |

## *Examination of Water from Reservoir Owned by C. E. Shepard.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5922 | 1909 Jan. 4 | None | V. slight | None | 0.05 | 8.5 | 6.4 | .0005 | .0005 | .0050 | .0000 | .09 | 2.9 | .... | *a* |
| 7796 | 1910 Apr. 13 | V. slight | V. slight | None | 0.00 | 7.3 | 4.6 | .0015 | .0040 | .0050 | .0000 | .35 | 2.9 | .... | *b* |
| 7838 | Apr. 25 | V. slight | V. slight | Sl. earthy | 0.05 | 7.3 | 6.7 | .0015 | .0010 | .0050 | .0000 | .05 | 3.3 | .... | *a* |

*a* Tap from reservoir; *b* well.

## *Examination of Water from Well Owned by Colby Academy.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5940 | 1909 Jan. 18 | Mod. | Con. earthy | Con. earthy | 0.20 | ..... | .... | .0090 | high | .0400 | .0040 | 12.2 | 2.6 | .... | * |

* B. Coli present.

## *Examination of Water from Lake Sunapee.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7172 | 1909 July 8 | None | None | None | 0.10 | 3.3 | 1.8 | .0002 | .0050 | .0000 | .0000 | .09 | .3 | .... | .. |

**Newmarket.**—The public water supply, owned by the town, was built in 1894. The water, from a stream, is pumped to a standpipe of 22,000 gallons' capacity. There are seven miles of cast iron distributing mains, and the service pipes are of galvanized iron. The average daily consumption is 150,000 gallons. About 90 per cent. of the population are supplied from this system, but some private wells are still in use. (See special report elsewhere.)

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 2952 | 1905 July 3 | None | Clayey | Earthy | 0.35 | 7.1 | 5.8 | .0000 | .0042 | .0000 | .0000 | .30 | 2.8 | .... | * |
| 3444 | 1906 Feb. 6 | S. op. | None | None | 0.10 | 7.7 | 5.2 | .0006 | .0028 | .0100 | .0000 | .35 | 1.9 | .... | .. |
| 4678 | 1907 July 3 | S. op. | V. slight | None | 0.35 | 6.3 | 4.3 | .0010 | .0074 | .0150 | .0000 | .28 | 2.9 | .... | * |
| 4916 | Oct. 2 | Mod. op. | V. slight | S. earthy | 0.60 | 6.4 | 3.6 | .0002 | .0100 | .0050 | .0000 | .37 | 1.9 | .... | .. |
| 7351 | 1909 Sept.14 | Mod. op. | Sl. fib'y | Mkd. earthy | 0.30 | 10.0 | 6.5 | .0010 | .0060 | .0050 | .0000 | .40 | 3.2 | .... | * |
| 7356 | Sept.14 | None | V. slight | Sl. earthy | 0.10 | 6.1 | 2.6 | .0025 | .0100 | .0050 | .0000 | .40 | 1.5 | .... | .. |
| 7360 | Sept.14 | Mod. op. | Mod. earthy | Mkd. earthy | 0.40 | ..... | .... | .0015 | .0065 | .0050 | .0000 | .30 | 2.8 | .... | .. |
| 7817 | 1910 Apr. 20 | Slight | None | Clayey | 0.30 | 4.9 | 4.3 | .0022 | .0085 | .0075 | .0000 | .40 | 1.4 | .... | * |

* B. Coli present.

**Newport.**—The town owns and operates a system of water works, installed in 1894, supplied by a pond, or lake, of 66 acres; average depth about thirty feet; bottom largely sand and rock. The watershed is about four or five square miles, about two thirds wooded; three families reside thereon. There are also one or two individuals who sell spring water.

The public supply is a gravity system, with eight miles of cast iron mains, and wrought iron, cement-lined service pipes. Perhaps five hundred families take this water. There are not many private wells.

*Examination of Water from Tap of Town Supply.*



| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 844 | 1902 Oct. 9 | None | None | Veg. | 0.1 | 6.90 | 1.20 | .0000 | .0048 | .0000 | .0004 | .10 | .9 | .... | .. |
| 2013 | 1904 June 2 | None | None | S. musty | 0.1 | 4.10 | 2.50 | .0000 | .0036 | .0000 | .0000 | .15 | 1.6 | .... | .. |
| 3448 | 1906 Feb. 6 | V. slight | V. slight | S. veg. | 0.1 | 2.8 | 1.4 | .0026 | .0070 | .0050 | .0000 | .12 | 0.4 | .... | .. |
| 4225 | Dec. 10 | Mod. op. | Slight | Slight | 0.1 | 5.0 | 2.5 | .0008 | .0092 | .0050 | .0000 | .08 | .... | .... | .. |
| 4516 | 1907 May 8 | None | V. slight | None | 0.10 | 3.4 | 2.5 | .0024 | .0046 | .0050 | .0000 | .13 | 0.9 | .... | .. |
| 5065 | Dec. 6 | None | None | None | 0.20 | 4.2 | 2.7 | .0012 | .0074 | .0120 | .0000 | .05 | .04 | .... | .. |
| 5989 | 1909 Feb. 6 | None | None | Sl. earthy | 0.05 | 3.0 | 1.5 | .0010 | .0060 | .0050 | .0000 | .09 | .7 | .... | .. |

*Examination of Water Supplying Draper & Company, North Newport.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7273 | 1909 Aug. 11 | Mod. | Slight | V.slight earthy | 0.05 | ..... | .... | .0060 | .0025 | .0200 | High | .10 | 6.1 | 0.5 | *a* |
| 7428 | Oct. 6 | None | V. slight | None | 0.00 | ..... | .... | .0050 | .0001 | .5000 | .0006 | .60 | 4.2 | .... | .. |
| 7559 | Dec. 16 | V. slight | V. slight | None | 0.05 | ..... | .... | .0010 | .0008 | .0500 | .0000 | .08 | 4.7 | trace | *b* |
| 7558 | Dec. 16 | V. slight | V. slight | None | 0.05 | ..... | .... | .0001 | .0008 | .0500 | .0000 | .08 | 4.6 | .... | *c* |

*a* Well; *b* well trough lead pipe; *c* well without pipe.

**Northfield.**—(See Tilton for analysis of supply).

**Northumberland.**—Groveton Village Precinct incorporated a system of public water works in 1894, from streams. There are two watersheds, of wooded land mainly, with no inhabitants. The source of the supply is in the mountain-side, and the water flows by gravity through about four miles of cast iron mains; service pipes are of galvanized iron. The entire precinct is supplied from this system. There are two or three private wells within the radius of this supply.

Northumberland Falls is supplied by a private water company.

*Examination of Water from Groveton Village Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 4204 | 1906 Nov. 30 | None | V. slight | Sl. earthy | 0.10 | 4.0 | 2.5 | .0008 | .0054 | .0050 | .0000 | .15 | 1.2 | .... | * |
| 4532 | 1907 May 13 | None | None | None | 0.10 | 2.3 | 1.5 | .0004 | .0046 | .0100 | .0000 | .14 | 0.7 | ..... | .. |
| 5068 | Dec. 9 | None | None | None | 0.00 | 2.7 | 1.4 | .0008 | .0032 | .0200 | .0000 | .09 | 0.4 | ..... | .. |
| 6080 | 1909 Mar. 5 | None | None | None | 0.00 | 2.3 | 1.4 | .0010 | .0015 | .0300 | .0000 | .08 | .10 | ..... | .. |
| 7537 | Dec. 2 | None | None | Sl. earthy | 0.00 | 3.0 | 1.8 | .0005 | .0020 | .0100 | .0000 | .05 | .60 | ..... | .. |

* B. Coli present.

*Examination of Water Supplying Odell Manufacturing Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5708 | 1908 Sept. 29 | None | None | None | 0.00 | ..... | .... | .0010 | .0020 | .0050 | High | .08 | .... | .... | *a* |
| 5709 | Sept. 29 | None | None | None | 0.60 | ..... | .... | .0008 | .0076 | .0020 | .0000 | .10 | .... | .... | *b* |

*a* Spring; *b* brook.

**Northwood.**—No public supply.

**Nottingham.**—All get water from wells and springs.

*Examination of Water from Well Used by General Public at Nottingham.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 3020 | 1905 July 26 | None | V. slight | None | 0.0 | 5.7 | 3.5 | .0008 | .0022 | .0200 | .0000 | .27 | 1.4 | ..... | .. |

**Orange.**—The supply is wholly from private wells and springs.

**Orford.**—No public supply. There are private supplies from springs, which furnish water to some 30 families. These springs are dug from six to eight feet deep, through sandy loam, subsoil rock. The water flows by gravity through iron and lead mains, with lead for service pipes. There are no individual wells in the vicinity. There are several other private springs.



*Examination of Water Supplying Schools.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid. | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7064 | 1909 May 27 | Sl. op. | V. slight | None | 0.15 | ..... | .... | .0008 | .0045 | .0050 | .0000 | .05 | 3.1 | .... | *a* |
| 7914 | 1910 May 24 | Sl. op. | V. slight | Mkd. veg. | 0.10 | 5.0 | 3.4 | .0140 | .0040 | .0370 | .0000 | .10 | 3.1 | .062 | *b* |

*a* Well in pasture; *b* spring.

**Ossipee.**—This town has no public supply. During 1909 Mr. C. A. Wiggin forwarded a sample of water for examination, taken from "reservoir" at Duncan Lake, it being the intention to install a supply for the use of the cottagers.

*Examination of Water from Reservoir of C. A. Wiggin.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid. | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7032 | 1909 May 13 | None | Slight | Slight | 0.00 | 3.3 | 2.0 | .0005 | .0015 | .0050 | .0000 | .13 | .3 | .... | .. |

**Pembroke.**—There are two private supplies. The Suncook Water Works, built in 1896, is supplied from a pond having an area of 25 acres, and located eight miles from the village; no inhabitants within two or three miles. The water, which flows by gravity, is taken from a collecting reservoir, located five miles from town and formed by the damming of a brook flowing from the pond. The area flowed has become swamp-like in character, none of the surface growth having been removed, and as a result, this supply is the most highly colored in the state. There are nine miles of distributing mains, cast iron; service pipe of galvanized iron. About 50 per cent. of the population is supplied from this source. The Baker & Dearborn Water Works were built in 1895, the source being a spring and Suncook River. The latter receives all the sewage of Pittsfield, 16 miles above. The river water is pumped to three reservoirs, 150 x 20, 50 x 20, and 50 x 20, and nine feet deep, respectively. The distributing main is one mile in length and is of wrought iron; service pipes of galvanized iron. About 10 per cent. of the population take from this supply.

*Examination of Water from Suncook Water Works.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 1331 | 1903 July 14 | None | Floc. veg. | S. veg. | 1.5 | 6.10 | 0.90 | .0028 | .0248 | .0000 | .0000 | .15 | 0.6 | ...... |
| 1583 | Oct. 12 | None | None | S. veg. | 0.7 | 5.90 | 1.00 | .0000 | .0126 | .0000 | .0000 | .17 | 0.6 | ...... |
| 1932 | 1904 May 8 | None | None | Mkd. veg. | 0.85 | 2.00 | 0.40 | .0020 | .0102 | .0000 | .0000 | .12 | 0.4 | ...... |
| 2658 | 1905 Jan. 23 | None | None | Veg. | 1.2 | 8.0 | 2.1 | .0000 | .0134 | .0200 | .0000 | .20 | 1.9 | ...... |
| 2729 | Feb. 27 | None | None | Slight | 0.7 | 5.8 | 2.6 | .0104 | .0046 | .0000 | .0000 | .27 | 1.5 | ...... |
| 2961 | July 6 | None | Con. floc. | S. veg. | 1.6 | 5.5 | 1.7 | .0000 | .0104 | .0000 | .0000 | .12 | 1.2 | ...... |
| 3278 | Oct. 31 | None | None | Arom. | 1.2 | 6.7 | 2.7 | .0028 | .0136 | .0050 | .0000 | .22 | 1.5 | ...... |
| 3840 | 1906 Aug. 14 | V. slight | Mod'ate | None | 1.2 | 4.5 | 2.0 | .0044 | .0190 | .0100 | .0000 | .07 | .... | .... * |
| 4164 | Nov. 16 | V. slight | V. slight | S. veg. | 0.60 | 5.0 | 3.5 | .0024 | .0064 | .0050 | .0000 | .10 | 1.2 | ...... |
| 4399 | Apr. 4 | None | None | S. veg. | 0.80 | 2.8 | 1.1 | .0016 | .0076 | .0800 | .0000 | .14 | 1.0 | ...... |
| 4895 | Oct. 25 | None | None | S. veg. | 1.40 | 7.2 | 2.6 | .0002 | .0300 | .0000 | .0000 | .06 | 0.4 | ...... |
| 5166 | 1908 Mar. 13 | V. faint | V. slight | None | 0.60 | 3.3 | 1.7 | .0006 | .0090 | .0120 | .0000 | .20 | 1.2 | ...... |
| 5523 | Aug. 18 | None | None | Swam-py | 1.60 | 8.3 | 1.8 | .0012 | High | .0080 | .0000 | .16 | 1.1 | .... * |
| 5683 | Sept. 24 | None | V. slight | None | 0.30 | 3.2 | 1.4 | .0002 | .0090 | .0020 | .0000 | .11 | .4 | ...... |
| 7696 | 1910 Mar. 9 | V. slight | V. slight | Sl. swampy | 0.10 | 4.4 | 1.5 | .0002 | .0086 | .0050 | .0000 | .22 | .4 | ...... |

* B. Coli present.

*Examination of Water from Baker & Dearborn Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 1584 | 1903 Oct. 12 | Slight | V. slight | S. foul | 0.2 | 3.60 | 1.90 | .0020 | .0026 | .0000 | .0000 | .20 | 2.4 | .... | .. |
| 3269 | 1905 Oct. 30 | None | Slight | None | 0.3 | 4.6 | 2.6 | .0010 | .0050 | .0100 | .0000 | .56 | 0.6 | .... | * |
| 3319 | Nov.28 | ........ | ........ | ....... | .... | ..... | .... | ..... | ..... | ..... | ..... | .50 | .... | .... | * |
| 3846 | 1906 Aug. 14 | None | V. slight | None | 0.1 | 4.4 | 3.4 | .0014 | .0062 | .0100 | .0000 | .25 | .22 | .... | .. |
| 4146 | Nov.13 | None | None | None | 0.15 | 4.3 | 3.1 | .0010 | .0080 | .0200 | .0000 | .22 | .9 | .... | .. |
| 4400 | 1907 Apr. 4 | None | None | None | 0.00 | 3.4 | 1.7 | .0034 | .0076 | .0270 | .0000 | .20 | 1.2 | .... | .. |
| 4894 | Oct. 26 | Sl. op. | V. slight | Clayey | 0.05 | 4.4 | 2.9 | .0002 | .0024 | .0000 | .0000 | .17 | .7 | .... | .. |
| 5170 | 1908 Mar.16 | None | V. slight | None | 0.05 | 3.0 | 2.0 | .0004 | .0002 | .0100 | .0000 | .17 | 1.2 | .... | .. |
| 7707 | 1910 Mar.10 | Sl. op. | V. slight | Earthy | 0.00 | 6.0 | 2.9 | .0006 | .0020 | .0050 | .0000 | .09 | 2.0 | .... | .. |

* B. Coli present.

*Examination of Water from Wells Supplying Pembroke Academy.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7337 | 1909 Sept. 3 | None | None | None | 0.00 | ..... | .... | .0001 | .0005 | .1500 | .0000 | .70 | 1.6 | .030 | .. |
| 6003 | Feb. 23 | None | None | None | 0.00 | ..... | .... | .0020 | .0010 | .2000 | .0000 | 6.3 | 11.5 | trace | .. |
| 7504 | Oct. 3 | V. slight | V. slight | Slight | 0.00 | 2.5 | .... | .0010 | .0020 | .0100 | .0000 | .70 | 1.9 | .... | * |
| 7760 | 1910 Apr. 6 | None | None | None | 0.00 | ..... | .... | .0004 | .0008 | Very high | .0000 | 6.62 | 12.4 | .0 | .. |
| 7852 | Apr. 30 | V. slight | Sl. floc. | Sl. clay. | 0.05 | 5.4 | 3.5 | .0015 | .0030 | .0650 | .0000 | .65 | .6 | .... | .. |

* B. Coli present.

*Examination of Water from Well Owned by Suncook Mills.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7803 | 1910 Apr. 14 | None | V. slight | None | 0.10 | ..... | .... | .0002 | .0051 | High | .0005 | 1.15 | 3.4 | V ry h'gh | .. |

**Peterborough.**—In 1896 the town installed a water supply from a brook fed by springs. The watershed is three miles by one mile in extent, consisting of pasturage and woodland. It is a gravity system of approximately ten miles of distributing mains, iron; service pipes of iron, cement lined. There are quite a number of wells still in use, but they are gradually being given up.

*Examination of Water from Tap of Town Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 851 | 1902 Oct. 10 | None | None | Dec. veg. | 0.4 | 6.30 | 1.80 | .0000 | .0062 | .0000 | .0000 | .12 | 1.8 | ...... |
| 1427 | 1903 Aug. 10 | None | V. slight | S. veg. | 0.4 | 7.70 | 1.70 | .0000 | .0098 | .0000 | .0000 | .10 | 1.6 | ...... |
| 1452 | Aug. 17 | None | V. slight | V. s. vg. | 0.32 | 5.00 | 2.00 | .0000 | .0072 | .0000 | .0000 | .10 | 1.9 | ...... |
| 1979 | 1904 May 23 | None | None | None | 0.3 | 3.50 | 0.50 | .0000 | .0046 | .0000 | .0000 | .10 | 0.7 | ...... |
| 2467 | Oct. 20 | None | M. fine | S. musty | 0.30 | 3.6 | 1.0 | .0000 | .0080 | .0000 | .0000 | .10 | 0.7 | ...... |
| 2468 | Oct. 20 | None | None | V. slight | 0.40 | 4.9 | 3.0 | .0000 | .0046 | .0000 | .0000 | .25 | 2.0 | ...... |
| 2697 | Feb. 14 | None | None | V. slight | 0.25 | 3.7 | 2.0 | .0010 | .0034 | .0200 | .0000 | .12 | 0.6 | ...... |
| 3197 | Sept. 25 | None | None | None | 0.40 | 5.3 | 3.0 | .0006 | .0096 | .0050 | .0000 | .15 | 1.9 | ...... |
| 3447 | 1906 Feb. 5 | None | None | None | 0.10 | 3.0 | 1.2 | .0010 | .0032 | .0050 | .0000 | .17 | 0.3 | ...... |
| 4199 | Nov. 28 | None | V. slight | None | 0.10 | 2.5 | 1.0 | .0030 | .0084 | .0050 | .0000 | .12 | 0.4 | ...... |
| 4200 | Nov. 28 | None | None | None | 0.30 | 3.3 | 1.2 | .0014 | .0084 | .0050 | .0000 | .20 | 1.2 | ...... |
| 4531 | 1907 May 13 | None | None | Veg. | 0.40 | 3.0 | 1.8 | .0004 | .0060 | .0050 | .0000 | .05 | 0.9 | ...... |
| 4973 | Oct. 21 | None | None | None | 0.40 | 5.0 | 2.9 | .0004 | .0058 | .0070 | .0000 | .20 | 0.4 | ...... |
| 7260 | 1909 Aug. 9 | Slight | Mod. floc. | V. Sl. veg. | .30 | 4.2 | 2.5 | .0001 | .0095 | .0050 | .0000 | .10 | .7 | ...... |
| 7528 | Dec. 1 | None | None | None | 0.40 | 4.3 | 1.8 | .0002 | .0060 | .0050 | .0000 | .10 | .6 | ...... |
| 7575 | Dec. 24 | V. slight | Sl. floc. | Sl. earthy | 0.05 | 3.0 | 1.0 | .0005 | .0080 | .0000 | .0000 | .05 | .3 | ...... |
| 7576 | Dec. 24 | V. slight | V. slight | None | 0.30 | 3.0 | 2.5 | .0001 | .0070 | .0000 | .0000 | .05 | .9 | ...... |
| 7822 | 1910 Apr. 21 | None | None | None | 0.40 | 3.6 | 1.8 | .0025 | .0082 | .0075 | .0000 | .20 | .6 | ...... |

**Pittsfield.**—The Pittsfield Aqueduct Company installed a system of water works in 1884. The source is a pond one-half mile long and an average of one-eighth mile wide; average depth some ten feet, bottom largely stone and gravel. A little more than half the watershed, one mile by three fourths of a mile, is wooded; not over six permanent inhabitants. This pond has no visible inlet, but is fed from its own bottom.



The force is gravity, through an open brook, for a mile descending constantly, over a gravelly and rocky bottom; capacity of reservoir, 1,500,000 gallons. There are four miles of distributing mains, largely cement lined; service pipes, cement lined, plain iron, and galvanized iron. Four hundred families, substantially the whole village, are takers. Very few wells within the area.

*Examination of Water from the Pittsfield Aqueduct Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 1112 | 1903 Mar.30 | Distinct | Much fine | Veg. | 0.2 | 3.90 | 1.70 | .0024 | .0046 | .0100 | .0001 | .15 | 0.7 | .... | .. |
| 1117 | Apr. 1 | Distinct | Much fine | Veg. | 0.22 | 5.30 | 2.30 | .0000 | .0042 | .0150 | .0000 | .15 | 1.4 | .... | .. |
| 1456 | Aug. 19 | V. slight | V. slight | Decided veg. | 0.22 | 2.70 | 1.10 | .0000 | .0068 | .0000 | .0000 | .15 | 1.1 | .... | .. |
| 1984 | 1904 May 24 | Slight | Sl. fine | Slight musty | 0.15 | 8.00 | 3.20 | .0020 | .0046 | .0000 | .0000 | .13 | 1.9 | .... | .. |
| 2750 | 1905 Mar.13 | None | None | None | 0.1 | 6.0 | 4.0 | .0096 | .0050 | .0150 | .0005 | .15 | 0.3 | .... | .. |
| 3194 | Sept.25 | None | Slight | Foul | 0.15 | 2.9 | 1.6 | .0008 | .0084 | .0050 | .0000 | .17 | 1.2 | .... | .. |
| 3456 | 1906 Feb. 12 | None | V. slight | Veg. | 0.10 | 2.80 | 2.0 | .0014 | .0074 | .0050 | .0000 | .42 | 0.7 | .... | .. |
| 3878 | Aug. 22 | None | Con. | Earthy | 0.20 | 5.7 | 1.4 | .0016 | .0192 | .0000 | .0000 | .12 | 0.1 | .... | *a* |
| 3879 | Aug. 22 | Cons. | Con. | S. earthy | 0.20 | 6.0 | 1.9 | .0028 | .0184 | .0000 | .0000 | .12 | 0.1 | .... | *b* |
| 4526 | 1907 May 13 | None | V. slight | Musty | 0.15 | 5.2 | 2.6 | .0014 | .0320 | .0050 | .0000 | .24 | 0.7 | .... | .. |
| 5064 | Dec. 11 | None | None | Sl. foul | 0.40 | 2.8 | 2.3 | .0006 | .0084 | .0100 | .0100 | .15 | 0.4 | .... | * |
| 5984 | 1909 Feb. 10 | Slight | Sl. veg. | Sl. earthy | 0.10 | 3.4 | 1.9 | .0020 | .0060 | .0100 | .0000 | .17 | .2 | .... | .. |
| 7131 | June 23 | V. slight | None | Earthy | 0.05 | ..... | .... | .0005 | .0035 | .0300 | .0000 | .11 | .4 | .... | .. |
| 7534 | Dec. 2 | None | None | None | 0.05 | 3.0 | 1.3 | .0010 | .0065 | .0050 | .0000 | .20 | .7 | .... | .. |

* B. Coli present; *a* from pond; *b* from reservoir.

**Plainfield.**—A private supply was introduced in 1890-91 by the Meriden Water Company. The source of the supply is springs dug from 7 to 10 feet deep, and flowing from 10 to 30 gallons per minute.

The watershed has an area of about 100 acres, all cleared. The water flows by gravity to two reservoirs, one 20 x 25 x 8 feet, and having a capacity of 1,000 barrels; the other 13 feet in diameter by 12 feet deep; plain wrought iron pipe. Twenty families, besides the hotel and boarding house, are supplied from this source. There are many individual wells in the locality.



*Examination of Water of Meriden Water Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 860 | 1902 Oct. 13 | Marked | Much min. | Slight | 0.1 | 10.00 | 5.0 | .0000 | .0000 | .0000 | .0000 | .06 | 4.5 | .... | .. |
| 1974 | 1904 May 23 | None | None | S. earthy | 0.0 | 5.60 | 4.7 | .0024 | .0038 | .0300 | .0000 | .10 | 4.5 | .... | .. |
| 2595 | Dec. 14 | None | None | None | 0.00 | 7.0 | 5.1 | .0000 | .0014 | .0300 | .0000 | .30 | 3.7 | .... | .. |
| 2691 | 1905 Feb. 9 | None | S. fine | None | 0.05 | 9.2 | 6.0 | .0000 | .0000 | .0150 | .0000 | .12 | 3.5 | .... | .. |
| 3179 | Sept.19 | Slight | None | None | 0.10 | 6.4 | 4.4 | .0010 | .0082 | .0050 | .0000 | .05 | 3.1 | .... | .. |
| 3201 | Sept.27 | None | Slight | S. earthy | 0.10 | 14.6 | 11.4 | .0008 | .0064 | .2000 | .0000 | .57 | 8.2 | .... | a |
| 3432 | 1906 Feb. 1 | None | None | None | 0.0 | 6.7 | 4.3 | .0008 | .0014 | .0080 | .0000 | .05 | 2.6 | .... | .. |
| 4041 | Oct. 2 | None | Slight | Sl. veg. | 0.10 | 13.2 | 11.2 | .0010 | .0030 | .0050 | .0000 | .05 | 7.4 | .... | .. |
| 4042 | Oct. 2 | None | Sl. fine | Veg. | 0.10 | 15.5 | 13.5 | .0028 | .0041 | .0100 | .0000 | .05 | 8.3 | .... | .. |
| 4176 | Nov.21 | V. sl. op. | V. slight | Sl. foul | 0.20 | 9.0 | 6.0 | .0010 | .0056 | .0100 | .0000 | .42 | 5.3 | .... | * |
| 4493 | 1907 Apr. 30 | None | None | None | 0.00 | 5.5 | 4.0 | .0004 | .0018 | .0120 | .0000 | .09 | 2.9 | .... | .. |
| 5054 | Nov.27 | None | None | Sl. veg. | 0.00 | 5.8 | 4.8 | .0014 | .0028 | .0150 | .0000 | .18 | 3.2 | .... | .. |
| 5055 | Dec. 3 | None | None | None | 0.20 | ..... | .... | .0002 | .0048 | .0060 | .0000 | .20 | 3.9 | .... | .. |
| 5685 | 1908 Sept.24 | Con. | Con. earthy | Mark. foul | Cloudy | ..... | .... | .0070 | .0062 | .0040 | .0000 | .25 | .... | .... | b |
| 5687 | Sept.24 | V. slight | Sl. earthy | Sl. marshy | 0.05 | ..... | .... | .0046 | .0036 | .0040 | .0001 | .10 | .... | .... | .. |
| 5774 | Oct. 20 | Mark. op. | Med. clay | None | Cloudy | 15.0 | 11.8 | .0010 | .0080 | .0000 | .0000 | .05 | 7.1 | .... | c |
| 5842 | Nov.17 | None | Sl. earthy | Sl. earthy | 0.00 | 10.0 | 7.2 | .0010 | .0020 | .0000 | .0000 | .05 | 5.6 | .... | c |
| 7497 | 1909 Oct. 28 | Slight | Sl. earthy | None | 0.05 | 12.2 | 7.7 | .0010 | .0045 | .0050 | .0000 | .12 | 6.7 | .... | .. |
| 7820 | 1910 Apr. 20 | None | Sl. earthy | Earthy | 0.00 | 4.1 | 2.7 | .0012 | .0030 | .0100 | .0000 | .15 | 2.0 | .... | .. |

*a* Pond supplying ice; * B. Coli present; *b* well in Freeman's pasture, supplies K. U. A; *c* hole in O. A. Stearn's field.

**Plaistow.**—

*Examination of Water from Stream, Proposed Public Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 340 | 1910 Aug. 23 | V. slight | V. slight | Musty | 0.30 | ..... | .... | .0030 | High | .0050 | .0000 | .30 | 1.9 | ..... | .. |

**Plymouth.**—The town installed a system of water works in 1880 and 1881, the supply being from springs and wells. The average depth of the wells is six feet. A foot of top soil is loam; below the loam is marl and gravel. The wells are dug. The water flows by gravity to two reservoirs having a capacity of 4,000,000 gallons; area, one acre; average depth, 12 feet. There are six miles of cement lines, and two miles of cast iron mains, with galvanized iron service pipes. Fifteen per cent. of the population take this water.

*Examination of Water from Town Supply.*



| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 627 | 1902 June 30 | V. slight | None | Veg. | 0.25 | 8.00 | 3.10 | .0000 | .0054 | .0000 | .0000 | .10 | 2.3 | .... | * |
| 629 | June 30 | Slight | Slight | Veg. | 0.26 | 7.80 | 3.10 | .0006 | .0084 | .0000 | .0000 | .12 | 2.3 | .... | † |
| 630 | June 30 | Slight | Slight | Dec. vg. | 0.26 | 8.10 | 2.00 | .0006 | .0120 | .0000 | .0000 | .07 | 1.9 | .... | ‡ |
| 631 | June 30 | Slight | None | Dec. vg. | 0.26 | 6.40 | 2.50 | .0000 | .0072 | .0000 | .0000 | .07 | 1.9 | .... | *h* |
| 1406 | 1903 Aug. 5 | V. slight | Slight | V. slight | 0.2 | 5.00 | 2.70 | .0000 | .0066 | .0000 | .0000 | .07 | 2.4 | .... | .. |
| 1585 | Oct. 12 | None | V. slight | None | 0.25 | 7.40 | 4.70 | .0016 | .0052 | .0150 | .0000 | .20 | 3.1 | .... | *k* |
| 1586 | Oct. 12 | None | Slight | None | 0.2 | 7.10 | 3.80 | .0000 | .0036 | .0200 | .0000 | .20 | 3.6 | .... | *hh* |
| 1992 | 1904 May 27 | Slight | Slight | Dec. vg. | 0.25 | 5.20 | 2.60 | .0008 | .0042 | .0000 | .0000 | .10 | 1.8 | .... | .. |
| 2702 | 1905 Feb. 14 | None | V. slight | None | 0.10 | 5.7 | 4.7 | .0000 | .0000 | .0200 | .0000 | .08 | 1.9 | .... | .. |
| 3205 | Sept. 28 | V. slight | S. fine | M. veg. | 0.30 | 6.0 | 3.7 | .0014 | .0144 | .0100 | .0000 | .05 | 2.0 | .... | .. |
| 3301 | Nov. 20 | V. slight | Slight | M. veg. | 0.30 | 6.6 | 4.0 | .0044 | .0164 | .0100 | .0000 | .20 | 2.4 | .... | ‡ |
| 3302 | Nov. 20 | None | V. slight | S. earthy | 0.20 | 5.5 | 3.5 | .0010 | .0048 | .0150 | .0000 | .07 | 2.0 | .... | † |
| 3443 | 1906 Feb. 6 | None | V. slight | None | 0.10 | 5.5 | 2.5 | .0006 | .0034 | .0100 | .0000 | .07 | 2.3 | .... | .. |
| 3974 | Sept. 12 | None | V. slight | S. veg. | 0.05 | 9.0 | 4.5 | .0010 | .0028 | .0100 | .0000 | .05 | 1.9 | .... | .. |
| 4490 | 1907 Apr. 30 | V. sl. op. | V. slight | Sealing wax | 0.00 | 3.1 | 2.2 | .0006 | .0004 | .0050 | .0000 | .13 | 2.7 | .... | .. |
| 5509 | 1908 Aug. 13 | None | None | None | 0.00 | 4.1 | 2.3 | .0004 | .0000 | .0050 | .0000 | .08 | 0.4 | .... | .. |
| 5954 | 1909 Jan. 27 | None | None | None | 0.00 | 4.0 | 2.5 | .0001 | .0001 | .0700 | .0000 | .12 | 1.2 | .... | .. |
| 7540 | Dec. 6 | None | None | Con. earthy | 0.10 | 4.3 | 3.0 | .0008 | .0020 | .0100 | .0000 | .08 | 1.5 | .... | .. |

* Sample taken from faucet in mill; † sample taken from Reservoir No. 1; ‡ sample taken from Reservoir No. 2; *h* sample taken from faucet in drug store; *k* stream to Reservoir No. 2; *hh* stream to Reservoir No. 1.

**Portsmouth.**—The city constructed a system of water works in 1891, the source being wells and springs. The watershed is about four square miles in area, partly wooded; no inhabitants very near. The wells are driven from 70 to 100 feet, in gravel. The water is pumped to a standpipe having a capacity of 500,000 gallons. There are very few private wells.

*Examination of Water from Portsmouth Water Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 621 | 1902 June 27 | None | Sl. floc. | S. arom. | 0.0 | 10.40 | 8.8 | .0000 | .0018 | .0150 | .0000 | .27 | 4.5 | .... | .. |
| 1405 | 1903 Aug. 4 | None | Slight | None | 0.0 | 16.50 | 11.1 | .0000 | .0010 | .0500 | .0003 | .57 | 8.7 | .... | .. |
| 2774 | 1905 Feb. 24 | Slight | Slight | Peculiar | 0.10 | 39.7 | 33.5 | .0094 | .0044 | .2000 | .0066 | 6.12 | 12.5 | .... | *a |
| 2781 | Mar.29 | V. mark. | M. floc. | Dec.veg | 0.60 | 5.7 | 2.6 | .0000 | .0082 | .0150 | .0000 | .32 | 0.9 | .... | b |
| 2881 | 1906 June 2 | None | None | None | 0.10 | 18.0 | 13.7 | .0014 | .0014 | .2000 | .0010 | .70 | 10.3 | .... | c |
| 2992 | July 18 | None | None | None | 0.10 | 24.2 | 20.2 | .0000 | .0020 | .0200 | .0000 | 5.70 | 8.2 | .... | d |
| 3019 | July 26 | S. op. | Slight | ....... | .... | ..... | .... | .0032 | .0032 | .1200 | .0020 | 6.40 | .... | .... | d |
| 3045 | Aug. 3 | None | S. veg. | Veg. | 0.55 | 12.5 | 9.0 | .0010 | .0112 | .0500 | .0000 | .54 | 5.4 | .... | e |
| 4527 | 1907 May 13 | None | V. slight | None | 0.05 | 15.0 | 12.5 | .0010 | .0006 | .0200 | .0000 | .58 | 7.1 | .... | .. |
| 5058 | Dec. 4 | None | None | None | 0.05 | 13.9 | 11.5 | .0004 | .0010 | .0040 | .0000 | .50 | 6.7 | .... | .. |
| 6002 | 1909 Feb. 23 | None | None | None | 0.00 | 15.3 | 9.4 | .0004 | .0004 | .1500 | .0000 | .54 | 6.9 | .... | .. |
| 7690 | 1910 Mar. 8 | None | None | None | 0.00 | 16.9 | 10.8 | .0002 | .0022 | .0100 | .0000 | .66 | 8.0 | .... | .. |

* B. Coli present; *a* Madison Street reservoir; *b* reservoir Peverly Springs; *c* fountain head newly driven well; *d* Hanover Street reservoir; *e* Perverly Spring Brook.

*Examination of Water from Well of John Yarwood, Used by Public.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8254 | 1910 Aug. 2 | V. slight | Sl. earthy | Foreign | 0.00 | ..... | .... | .0002 | .0004 | .0050 | .0000 | 1.11 | 7.0 | .... | .. |

*Examination of Water from Well of H. P. Paine, Used by Public.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7983 | 1910 June 21 | Mod. op. | Con. ferrug | Mark. earthy | 0.30 | ..... | .... | .0010 | High | .0250 | .0000 | .85 | 4.9 | .... | .. |

**Raymond.**—In 1893 the town installed a public water supply from a system of wells driven from 40 to 60 feet deep, through loam, sand and gravel. The water is pumped to a standpipe having a capacity of 118,037 gallons. The watershed is about one square mile in area, is about equally wooded and cleared, and on it are about 600 inhabitants. There are a few wells in the locality.



*Examination of Water from Faucet of Raymond Water Works.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 376 | 1902 Jan. 24 | None | None | V. slight | 0.0 | 11.90 | 8.50 | .0010 | .0064 | .1900 | .0000 | 1.62 | 4.2 | .... | .. |
| 1404 | 1903 Aug. 4 | Slight | V.S.fine | Slight | 0.0 | 18.10 | 11.9 | .0030 | .0020 | .2900 | .0002 | 2.15 | 6.0 | .... | .. |
| 2018 | 1904 June 6 | None | None | None | 0.05 | 19.10 | 14.2 | .0010 | .0020 | .4000 | .0000 | 2.65 | 7.7 | .... | .. |
| 2695 | 1905 Feb. 14 | None | None | Slight | 0.0 | 14.2 | 10.8 | .0000 | .0000 | .3000 | .0000 | 2.50 | 4.1 | .... | .. |
| 3195 | Sept.25 | Slight | S.ferrug. | Slight | 0.08 | 15.9 | 10.1 | .0006 | .0030 | .2000 | .0000 | 1.95 | 4.6 | .... | .. |
| 3441 | 1906 Feb. 5 | None | None | Slight | 0.05 | 14.5 | 11.8 | .0006 | .0034 | .0500 | .0000 | 2.21 | 4.6 | .... | .. |
| 4521 | 1907 May 10 | None | V. slight | None | 0.00 | 15.7 | 10.7 | .0014 | .0006 | .0300 | Tr. | 2.30 | 4.8 | .... | .. |
| 5058 | Dec. 4 | None | S. ferrug. | None | 0.00 | 16.7 | 12.8 | .0004 | .0014 | .4000 | .0000 | 2.18 | 6.0 | .... | .. |
| 6015 | 1909 Mar. 4 | None | None | None | 0.05 | 15.8 | 9.7 | .0001 | .0005 | .3500 | .0000 | 2.5 | 4.9 | .... | .. |
| 7694 | 1910 Mar. 8 | None | None | None | 0.00 | 11.7 | 9.8 | .0030 | .0002 | .0400 | .0030 | 2.31 | 6.0 | .... | .. |

**Rochester.**—The Rochester Water Works, owned by the city, installed in 1885, has for a source a pond and reservoir, the pond being about one hundred acres, and the reservoir two hundred acres in area. The watershed, several square miles in extent, is both wooded and cleared, with; perhaps, 75 inhabitants.



*Examination of Water from Tap of City Supply, Rochester.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 878 | 1902 Oct. 17 | None | None | S. veg. | 0.15 | 5.70 | 1.00 | .0000 | .0086 | .0000 | .0000 | .15 | 0.9 | .... | .. |
| 1436 | 1903 Aug. 13 | V. mark. | Much fine veg. | Peculiar veg. | 0.35 | 7.00 | 2.10 | .0036 | .0560 | .0000 | .0000 | .20 | 0.4 | .... | .. |
| 2020 | 1904 June 6 | Slight | Con. fine | Dec. misty veg. | 0.2 | 3.10 | 2.20 | .0020 | .0198 | .0000 | .0000 | .15 | .... | .... | .. |
| 2700 | 1905 Feb. 15 | None | None | V. slight | 0.3 | 3.5 | 2.0 | .0140 | .0088 | .0300 | .0000 | .22 | 0.4 | .... | .. |
| 3446 | 1906 Feb. 6 | None | None | V. slight | 0.10 | 2.7 | 1.1 | .0006 | .0064 | .0050 | .0000 | .17 | 0.3 | .... | .. |
| 4558 | 1907 May 22 | V. slight | S. floc. | Slight | 0.50 | ..... | .... | .0012 | .0120 | .0100 | .0000 | .25 | 0.4 | .... | .. |
| 4974 | Oct. 22 | None | S. mod. coarse | None | 0.05 | 2.1 | .9 | .0014 | .0088 | .0030 | .0000 | .19 | 0.4 | .... | .. |
| 5062 | Dec. 4 | None | None | S. veg. | 0.10 | ..... | .... | .0006 | .0078 | .0060 | .0000 | .26 | 1.2 | .... | .. |
| 5346 | Aug. 26 | Slight | V. S. coarse | Foreign | 0.10 | 3.3 | 1.2 | .0010 | .0066 | .0030 | .0000 | .15 | 0.4 | .... | .. |
| 5547 | Aug. 26 | Slight | Slight | None | 0.10 | 2.5 | 1.2 | .0012 | .0060 | .0020 | .0000 | .20 | 0.4 | .... | .. |
| 5898 | 1908 Dec. 22 | V. slight | V. slight | Musty | 0.60 | 4.3 | 2.6 | .0020 | .0180 | .0000 | .0000 | .22 | 1.1 | .... | .. |
| 7227 | 1909 July 29 | None | None | Pec. | 0.20 | 1.9 | 1.0 | .0015 | .0065 | .0000 | .0000 | .05 | .3 | .... | .. |
| 7699 | 1910 Mar. 9 | Slight | Slight | Foreign | 0.40 | 4.0 | 1.4 | .0002 | .0044 | .0050 | .0000 | .29 | .7 | .... | .. |
| 8288 | Aug. 8 | None | V. slight | None | 0.15 | 2.5 | 1.0 | .0020 | .0080 | .0025 | .0000 | .18 | .4 | .... | .. |
| 7814 | Apr. 20 | Slight | Mod. | Swampy | .50 | 5.4 | 2.8 | .0040 | .0065 | .0035 | .0000 | .27 | .4 | .... | * |

* B. Coli present.

**Salem.**—A private water supply was installed in 1903 by the Salem Water Works Company. The source of supply, Canobie Lake, is of about 1,000 acres in area, 40 feet in depth on an average, and gravelly bottom. The watershed is approximately 500 acres, mostly wooded. The shore of the pond, upon which is Canobie Lake Park, is frequented by summer cottagers and excursionists. The water flows by gravity through about three miles and a half of iron main pipe, and the service pipes are of galvanized iron. It is estimated that 15 per cent. of the population use this water.

*Examination of Water Taken from Canobie Lake.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 228 | 1901 Oct. 27 | None | Slight | Dec.veg | 0.1 | 2.80 | 1.50 | .0000 | .0176 | .0000 | .0000 | .21 | 1.2 | ...... |
| 229 | Oct. 27 | None | Slight | Dec.veg | 0.1 | 3.00 | 1.20 | .0000 | .0192 | .0000 | .0000 | .23 | 1.2 | ...... |
| 2045 | 1904 June 13 | Slight | Slight | Marked veg. | 0.05 | 6.20 | 2.80 | .0014 | .0136 | .0000 | .0000 | .30 | 2.6 | ...... |
| 2706 | 1905 Feb. 20 | None | S. floc. | Dec.veg | 0.00 | 3.7 | 1.1 | .0010 | .0060 | .0800 | .0000 | .30 | 0.6 | ...... |
| 3203 | Sept.28 | None | None | S. foul | 0.10 | 3.7 | 1.7 | .0008 | .0080 | .0050 | .0000 | .37 | 1.1 | ...... |
| 3832 | 1906 Aug. 8 | None | None | None | 0.10 | 4.2 | 2.7 | .0014 | .0082 | .0050 | .0000 | .35 | 0.6 | ...... |
| 4818 | 1907 Aug. 21 | None | None | None | 0.05 | ..... | .... | .0012 | .0074 | .0050 | .0000 | .38 | 1.2 | ...... |
| 6077 | 1909 Apr. 8 | None | None | Mr'shy | 0.05 | 2.8 | 1.5 | .0030 | .0070 | .0050 | .0000 | .30 | .3 | ...... |

*Examination of Water from Well Supplying Schoolhouse.*

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7882 | 1910 May 12 | None | None | None | 0.05 | ..... | .... | .0010 | .0017 | .0025 | .0000 | .40 | 1.5 | ...... |

**Salisbury.**—

**Sanbornton.**—No public supply.

*Examination of Water from Well of Second Baptist Church.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 5768 | 1908 Oct. 17 | V. slight | Sl. veg. | Foreign | 0.00 | ..... | .... | .0020 | .0025 | .0300 | .0000 | .80 | 1.8 | .... | .. |
| 7315 | 1909 Aug. 26 | ........ | ........ | Sl. foul | 0.00 | ..... | .... | Very high | .0045 | .0400 | .0000 | 1.45 | 2.60 | .... | * |

* B. Coli present.

**Sandown.**—

*Examination of Water from Well Owned by Boston & Maine Railroad.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7090 | 1909 June 9 | V. slight | V. slight | Con. earthy | 0.05 | ..... | .... | .0020 | .0035 | .0200 | .0000 | .30 | 1.2 | trace | .. |

**Somersworth.**—A system of water works was constructed in 1905-06. The water is taken from Salmon Falls River directly to a filter-bed of modern construction (Lawrence type) and capable of filtering about 1,500,000 gallons in 24 hours. The water is pumped from the storage channels of the filter-bed to a standpipe of ample capacity, from which it is distributed about the city.

*Examination of Water Supplying Somersworth.*

| | | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number. | Date of collection. | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| | 1906 | | | | | | | | | | | | | | |
| 3463 | Feb. 13 | None | V. slight | Slight | 0.40 | 5.0 | 3.0 | .0006 | .0014 | .0050 | .0000 | .20 | 1.6 | .... | .. |
| 4239 | Dec. 20 | None | V. slight | Sl. veg. | 0.25 | 6.0 | 3.8 | .0010 | .0080 | .0000 | .0000 | .35 | 2.5 | .... | * |
| | 1907 | | | | | | | | | | | | | | |
| 4263 | Jan. 2 | V. slight | V. slight | Earthy | 0.20 | ..... | .... | .0014 | .0050 | .0000 | .0000 | .23 | 2.6 | .... | * |
| 4283 | Jan. 15 | None | None | Earthy | 0.50 | ..... | .... | .0014 | .0080 | .0000 | .0000 | .20 | 3.9 | .... | * |
| 4340 | Feb. 11 | None | None | Mark'd | 0.35 | ..... | .... | .0016 | .0046 | .0030 | .0000 | .25 | 2.2 | .... | * |
| 4402 | Apr. 4 | None | None | woody Veg. | 0.50 | 4.9 | 2.5 | .0010 | .0082 | .0000 | .0000 | .22 | 1.2 | .... | * |
| 4817 | Aug. 19 | None | Son. floc. | None | 0.25 | 6.0 | 4.0 | .0050 | .0044 | .0050 | .0000 | .38 | 2.5 | .... | |
| 4962 | Oct. 18 | Mod. op. | Con. floc fibr. | Earthy | 0.70 | 6.2 | 4.6 | .0024 | .0136 | .0020 | .0000 | .28 | 1.2 | .... | *[1] |
| 4963 | Oct. 18 | Sl. op. | Sl. mod. | Sl.grass | 0.70 | 5.0 | 3.0 | .0050 | .0124 | .0020 | .0000 | .26 | 1.9 | .... | *[2] |
| 5060 | Dec. 4 | None | coarse V. slight | Sl. veg. | 0.60 | 4.7 | 2.2 | .0040 | .0084 | .0050 | .0000 | .11 | 1.6 | .... | .. |
| | 1908 | | | | | | | | | | | | | | |
| 5256 | Apr. 27 | Slight | Mod.floc | Earthy | 0.40 | 4.5 | 1.2 | .0026 | .0130 | .0080 | .0000 | .22 | 1.5 | .... | * |
| 5257 | Apr. 27 | None | Slight | Sl.stale | 0.30 | 3.4 | 1.2 | .0010 | .0066 | .0100 | .0000 | .18 | 0.7 | .... | [3] |
| 5830 | Nov. 9 | None | V. slight | Earthy | 0.20 | 4.8 | 2.2 | .0015 | .0040 | .0100 | .0000 | .22 | 1.4 | .... | * |
| 5864 | Nov.25 | None | None | None | 0.20 | 4.3 | 2.2 | .0002 | .0075 | .0000 | .0000 | .25 | 1.3 | .... | .. |
| | 1909 | | | | | | | | | | | | | | |
| 6000 | Feb. 24 | None | None | M'shy | 0.30 | 4.5 | 1.9 | .0020 | .0040 | .0200 | .0000 | .18 | 1.6 | .... | * |
| 7518 | Nov.18 | None | None | None | 0.30 | 4.0 | 1.7 | .0002 | .0070 | .0050 | .0000 | .20 | 1.6 | .... | * |
| | 1910 | | | | | | | | | | | | | | |
| 7708 | Mar. 9 | V. slight | None | Earthy | 0.40 | 3.8 | 2.0 | .0004 | .0034 | .0100 | .0000 | .27 | 1.1 | .... | .. |
| 8000 | June 29 | V. slight | Slight | None | 0.60 | 4.0 | 2.5 | .0010 | .0070 | .0050 | .0000 | .25 | 1.9 | .... | .. |

* B. Coli present; [1] Salmon Falls River at North Rochester; [2] Salmon Falls River at inlet of filter; [3] Salmon Falls River at Milton.

*Examination of Water from Well of Great Falls Manufacturing Company.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7902 | 1910 May 19 | None | None | Sl. earthy | 0.00 | 22.3 | 19.8 | .0010 | .0015 | .250 | .0016 | 5.2 | 11.0 | .... | * |

* B. Coli present.

*Examination of Water from Well of Benjamin Ward.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7621 | 1910 Jan. 27 | Slight | Slight | Earthy | 0.05 | ..... | .... | .0085 | .0045 | High | .0008 | 9.20 | 7.0 | .... | .. |

**Stark.**—

*Examination of Water from Pond Supplying Percy Summer Club.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7286 | 1909 Aug. 17 | None | Mod.veg. | None | 0.10 | ..... | .... | .0001 | .0025 | .0050 | .0000 | .05 | 0.9 | .... | * |

* B. Coli present.

**Stratford.**—The village of North Stratford has two private water supplies. In 1882 Mr. Clark Stevens installed a supply from a system of springs, the watershed being about sixty acres, mostly cleared land; no inhabitants. The springs are seven in number, stoned from five to seven feet deep. In 1888 Mr. J. C. Hutchins introduced a second supply, also from springs stoned about six feet deep, with same kind of soil as first supply. The watershed is about five square miles in area, mostly cleared land, no inhabitants. The water is distributed, by gravity, through three miles of galvanized iron pipe, both service and mains. Sixty families, 95 per cent. of the population, take this water.

*Examination of Water from Hutchins Supply.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites | | | | |
| 800 | 1902 Sept.11 | None | None | None | 0.0 | 5.60 | 2.20 | .0010 | .0030 | .0150 | .0000 | .05 | 1.9 | .... | .. |
| 3262 | 1905 Oct. 27 | None | V. slight | V.slight | 0.30 | 7.5 | 3.9 | .0014 | .0048 | .0100 | .0000 | .05 | 1.9 | .... | .. |
| 3513 | 1906 Mar. 9 | None | None | None | 0.05 | 4.0 | 2.3 | .0008 | .0016 | .0100 | .0000 | .12 | 1.8 | .... | .. |
| 4240 | Dec.20 | None | V. slight | None | 0.15 | 7.0 | 4.0 | .0006 | .0040 | .0050 | .0000 | .05 | 1.8 | .... | .. |
| 5085 | 1907 Dec. 18 | None | V. slight | None | 0.00 | 3.1 | 2.5 | .0006 | .0002 | .0060 | .0000 | .12 | 1.9 | .... | .. |
| 5739 | 1908 Oct. 8 | None | Slight | None | 0.15 | 2.6 | 1.9 | .0014 | .0036 | .0030 | .0000 | .05 | 1.9 | .... | * |
| 6007 | 1909 Mar. 1 | None | V. slight | None | 0.05 | 3.7 | 2.5 | .0002 | .0008 | .0300 | .0000 | .05 | 1.6 | .... | .. |
| 7714 | 1910 Mar.10 | None | V. slight | None | 0.00 | 3.7 | 3.0 | .0002 | .0004 | .0100 | .0000 | .10 | 2.7 | .... | .. |

* B. Coli present.

*Examination of Water from Stevens Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 801 | 1902 Sept.13 | None | None | None | 0.0 | 6.10 | 2.10 | .0000 | .0000 | .0200 | .0000 | .05 | 2.0 | .... | .. |
| 3261 | 1905 Oct. 27 | None | None | None | 0.10 | 7.3 | 3.8 | .0010 | .0042 | .0300 | .0000 | .05 | 2.4 | .... | .. |
| 3514 | 1906 Mar. 9 | None | None | S. fishy | 0.05 | 7.2 | 3.6 | .0008 | .0016 | .0100 | .0000 | .05 | 2.7 | .... | .. |
| 4241 | Dec. 20 | None | None | None | 0.00 | 8.7 | 7.0 | .0008 | .0014 | .0050 | .0000 | .05 | 3.2 | .... | * |
| 4332 | 1907 Feb. 5 | None | None | None | 0.00 | ..... | .... | .0010 | .0000 | .0200 | .0000 | .06 | 2.4 | .... | .. |
| 4602 | May 30 | None | None | None | 0.00 | 5.7 | 3.0 | .0008 | .0004 | .0050 | .0000 | .14 | 1.9 | .... | * |

* B. Coli present.

**Sunapee.**—The Sunapee Water Works, owned by the town, were built in 1900, Sunapee Lake being the source from which water is taken to supply the Sunapee Village and Ledge Pond for George's Mills. Water from the pond flows by gravity, while that from the lake is pumped to a reservoir of 300,000 gallons' capacity. There are about five miles of distributing mains of cast iron and galvanized iron pipes. About one hundred and twenty-five families, some 80 per cent. of the population, are using this supply. The Lake Sunapee Water Supply

Company, a private company of 23 stock owners and takers, installed its works in October, 1886. The water is taken from Sunapee Lake, and flows by gravity. The plant is nearly worthless at this time, as the pipes are of small size and filled with rust.



*Examination of Water from Lake Sunapee and from Ledge Pond.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 823 | 1902 Sept. 22 | None | Slight | S. musty | 0.1 | 3.50 | .60 | .0000 | .0112 | .0000 | .0000 | .07 | 0.6 | .... | a |
| 824 | Sept. 22 | None | V. slight | Dec. veg. | 0.15 | 3.40 | .70 | .0000 | .0090 | .0000 | .0000 | .10 | 0.6 | .... | .. |
| 1418 | 1903 Aug. 10 | V. slight | V. slight | V. dec. veg. | 0.1 | 3.60 | 2.80 | .0000 | .0080 | .0400 | .0000 | .07 | 2.8 | .... | .. |
| 1419 | Aug. 10 | None | V. slight | Dec. veg | 0.05 | 3.50 | 0.90 | .0000 | .0122 | .0000 | .0000 | .05 | 0.9 | .... | .. |
| 2019 | 1904 June 6 | None | V. slight | S. foul | 0.2 | 3.50 | 2.10 | .0012 | .0052 | .0000 | .0000 | .10 | 2.0 | .... | .. |
| 2713 | 1905 Feb. 21 | V. slight | Slight | Slight | 0.10 | 3.6 | 1.9 | .0000 | .0014 | .0900 | .0000 | .10 | 0.6 | .... | .. |
| 3237 | Oct. 17 | None | None | S. veg. | 0.10 | 4.0 | 1.4 | .0010 | .0058 | .0050 | .0000 | .05 | 0.9 | .... | .. |
| 3468 | 1906 Feb. 19 | None | None | None | 0.00 | 3.5 | 2.0 | .0010 | .0038 | .0050 | .0000 | .10 | 0.7 | .... | .. |
| 3471 | Feb. 21 | None | None | S. veg. | 0.10 | 3.0 | 2.0 | .0010 | .0038 | .0100 | .0000 | .10 | 0.9 | .... | a |
| 3862 | Aug. 20 | None | None | None | 0.20 | 3.7 | 2.2 | .0026 | .0094 | .0100 | .0000 | .10 | 0.4 | .... | .. |
| 3894 | Aug. 23 | V. slight | V. slight | Mrk'd earthy | 0.10 | 3.9 | 2.4 | .0014 | .0094 | .0050 | .0000 | .10 | 0.4 | .... | a |
| 4405 | 1907 Apr. 5 | S. op. | V. slight | S. earthy | 0.10 | 2.4 | 1.0 | .0034 | .0090 | .0000 | .0000 | .05 | 1.2 | .... | .. |
| 4534 | May 15 | None | S. coarse | S. veg. | 0.15 | 3.0 | 1.2 | .0030 | .0082 | .0120 | .0000 | .12 | 1.2 | .... | .. |
| 5074 | Dec. 12 | None | None | None | 0.10 | 2.3 | 1.2 | .0008 | .0078 | .0040 | .0000 | .08 | 0.4 | .... | .. |
| 5077 | Dec. 13 | None | None | None | 0.20 | 4.0 | 2.0 | .0014 | .0096 | .0100 | .0000 | .12 | 0.4 | .... | a |
| 5396 | 1908 July 2 | V. slight | S. floc. | Mrk'd earthy | 0.20 | ..... | .... | .0002 | .0036 | .0070 | .0000 | .10 | 0.4 | .... | .. |
| 7693 | 1910 Mar. 8 | None | None | None | 0.05 | 3.2 | 1.2 | .0006 | .0032 | .0050 | .0000 | .13 | .7 | .... | .. |
| 7704 | Mar. 9 | None | None | Sl. swampy | 0.20 | 3.6 | 1.8 | .0006 | .0105 | .0050 | .0000 | .11 | 1.1 | .... | .. |

*a* Ledge Pond, George's Mills Supply.

*Examination of Water from Well of Emerson Paper Company.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8005 | 1910 June 30 | V. slight | V. slight | Veg. | 0.05 | ..... | .... | .0025 | .0010 | .0250 | .0016 | .15 | 5.3 | .... | .. |

**Sutton.**—One well, owned by the town, furnishes water through a lead pipe, some 500 or 600 feet, to a trough, one end for horses, and from the other several families get their drinking-water.



*Examination of Water from Well of M. B. Wadleigh.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7654 | 1910 Feb. 8 | None | None | None | 0.00 | ..... | .... | .0010 | .0012 | .4000 | .0000 | .80 | 2.60 | .01 | * |

*B. Coli present.

**Swanzey.**—

*Examination of Water from Wells Supplying Y. M. C. A. Camp.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 8331 | 1910 Aug. 17 | Sl. op. | V. s. coarse | Earthy | 0.05 | ..... | .... | .0010 | .0010 | .0050 | .0000 | .15 | 2.6 | .... | a |
| 8332 | Aug. 17 | None | S. floc. | None | 0.05 | ..... | .... | .0010 | .0010 | .0050 | .0000 | .10 | 1.2 | .... | b |

*a* East well; *b* west well.

**Tamworth.**—

*Examination of Water from Well of Congregational Society.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 5713 | 1908 Oct. 1 | None | None | None | 0.05 | ..... | .... | .0010 | .0020 | .3500 | .0010 | 1.90 | .... | .... | .. |

*Examination of Water from the Well Supplying Chocorua House Syndicate.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 7921 | 1910 May 24 | None | None | S. earthy | 0.00 | 2.1 | 1.3 | .0015 | .0020 | .0050 | .0000 | .25 | .4 | ...... |

**Temple.**—

*Examination of Water from Spring of William H. Davidson.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | |
| 8242 | 1910 July 31 | None | None | V. S. earthy | 0.00 | ...... | .... | .0004 | .0004 | .0040 | .0000 | .25 | 1.9 | V. h'gh |

**Tilton.**—The Tilton & Northfield Aqueduct Company's works were built in 1887-88. The source is Chestnut Pond, of 60 acres area, 10 to 76 feet deep, sandy or gravelly bottom. Several hundred acres of the watershed are pasture and woodland; five farms. This is a gravity system, with 12 miles of cement-lined and cast iron mains, with galvanized iron service pipes. Probably 500 families take this water, 80 or 90 per cent. of the population.

*Examination of Water from a Faucet of the Tilton & Northfield Aqueduct Company.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 1901 May 28 | V. slight | Slight | Distinct eg. | 0.2 | 3.40 | 1.30 | .0019 | .0150 | .0000 | .0000 | .09 | .... | .... | .. |
| 345 | Dec. 31 | None | None | None | 0.2 | 2.90 | 1.20 | .0044 | .0136 | .0050 | .0000 | .09 | 0.9 | .... | .. |
| 1219 | 1903 June 1 | Marked | Much floc. red | V. slight | 0.2 | 4.60 | 2.00 | .0000 | .0100 | .0000 | .0000 | .10 | 1.1 | .... | .. |
| 1431 | Aug. 11 | Slight | None | V. slight | 0.15 | 3.00 | 1.00 | .0000 | .0074 | .0000 | .0000 | .09 | 0.4 | .... | .. |
| 1636 | Nov. 2 | None | None | None | 0.0 | 2.80 | 1.30 | .0000 | .0050 | .0000 | .0000 | .20 | 1.2 | .... | .. |
| 2022 | 1904 June 7 | Slight | Much fine | V. slight | 0.3 | 4.40 | 2.20 | .0000 | .0098 | .0000 | .0000 | .10 | 1.9 | .... | .. |
| 2712 | 1905 Feb. 21 | Slight | V. slight | Slight | 0.10 | 3.9 | 2.5 | .0000 | .0010 | .0150 | .0000 | .15 | 0.6 | .... | .. |
| 2785 | Apr. 3 | None | None | Dec.veg | 0.30 | 8.5 | 6.5 | .0000 | .0044 | .0100 | .0000 | .15 | 0.6 | .... | .. |
| 3482 | 1906 Feb. 22 | V. slight | None | Sl. earthy | 0.20 | 2.0 | 1.0 | .0010 | .0084 | .0050 | .0000 | .17 | 0.9 | .... | .. |
| 4533 | 1907 May 14 | V. slight | S. veg. | S. veg. | 0.30 | 3.5 | 2.0 | .0054 | .0166 | .0050 | .0000 | .25 | 1.2 | .... | .. |
| 5082 | Dec. 16 | Slight | V. slight | None | 0.20 | 3.2 | 1.7 | .0012 | .0042 | .0100 | .0000 | .23 | 0.4 | .... | .. |
| 5873 | 1908 Dec. 1 | None | V. slight | Earthy | 0.10 | 1.9 | .... | .0001 | .0120 | .0500 | .0000 | .12 | .10 | .... | .. |
| 5861 | Nov.25 | V. slight | V. slight | Sl. earthy | 0.10 | 1.5 | 0.4 | .0010 | .0080 | .0000 | .0001 | .13 | .10 | .... | .. |
| 7688 | 1910 Mar. 8 | None | None | Earthy | 0.05 | 1.9 | 0.6 | .0024 | .0050 | .0050 | .0000 | .11 | .40 | .... | .. |

*Examination of Melted Ice from Ice Supply of Frank Sanborn.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7922 | 1910 May 26 | Mod.fibr. | Con. fibr. | Arom. | 0.05 | ..... | .... | .0010 | .0110 | .0025 | .0000 | .05 | .0 | .... | .. |

*Examination of Melted Ice from Ice Supply of A. A. Cunningham.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7923 | 1910 May 26 | S op. | Mod. gel. | Arom. | 0.05 | ..... | .... | .0070 | .0105 | .0025 | .0000 | .05 | .0 | .... | * |

* B. Coli present.

**Walpole.**—The Walpole Water & Sewer Company inaugurated a system of water works in 1904. It consists of a reservoir having an area of about two acres and an average depth of about 10 feet, constructed on a small stream. The site was stripped to a gravel and hard dirt bottom. The watershed is about six tenths of a square mile, wooded and cleared. Two families at a considerable distance from brook.



The force is gravity, four miles of coated cast iron mains, with galvanized iron service pipes, being used. Eighty families, 50 per cent. of the population of Walpole Village, have this supply. There are many private wells within the area.

The water from the reservoir above referred to flows through a filter plant; thence into a distributing reservoir of concrete construction, covered on top, of about 50 feet diameter, 18 feet deep; capacity about 250,000 gallons.

The village of North Walpole also has a supply derived from springs.

*Examination of Water from the Company's Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites | | | | |
| 2082 | 1904 June 20 | None | S. floc. | S. musty | 0.1 | 7.30 | 4.60 | .0048 | .0032 | .0200 | .0000 | .15 | 4.1 | .... | .. |
| 2119 | July 3 | Slight | Slight | S. veg. | 0.1 | 5.50 | 3.90 | .0052 | .0038 | .0000 | .0000 | .15 | 3.2 | .... | * |
| 2591 | Dec. 13 | None | Slight | M. foul | 1.5 | 6.3 | 4.0 | .0000 | .0034 | .0000 | .0001 | .20 | 3.2 | .... | .. |
| 2779 | 1905 Mar. 26 | None | Slight | Dec. veg | 0.2 | 5.3 | 3.5 | .0000 | .0030 | .0150 | .0000 | .10 | 1.9 | .... | .. |
| 2994 | July 18 | V. slight | Much | Dec. veg | 0.8 | 7.7 | 4.4 | .0024 | .0142 | .0050 | .0000 | .07 | 3.1 | .... | .. |
| 3476 | 1906 Feb. 19 | None | None | None | 0.0 | 5.8 | 3.8 | .0014 | .0014 | .0050 | .0000 | .12 | 2.4 | .... | * |
| 3640 | May 30 | None | Slight | None | 0.05 | 2.0 | 1.0 | .0010 | .0040 | .0100 | .0000 | .15 | .... | .... | .. |
| 3641 | May 30 | None | None | Slight | 0.10 | 4.5 | 3.0 | .0010 | .0014 | .0050 | .0000 | .25 | 1.6 | .... | .. |
| 4342 | 1907 May 17 | None | V. slight | Veg. | 0.15 | 5.8 | 3.1 | .0002 | .0020 | .0050 | .0000 | .15 | 2.5 | .... | .. |
| 5080 | Dec. 16 | None | None | None | 0.10 | 4.6 | 3.8 | .0014 | .0010 | .0050 | .0000 | .30 | 2.6 | .... | * |
| 5552 | 1908 Aug. 24 | V. slight | V. slight | None | 0.05 | ..... | .... | .0034 | .0024 | .0150 | .0000 | .18 | 2.4 | .... | .. |
| 7702 | 1910 Mar. 9 | None | None | None | 0.05 | 4.1 | 2.8 | .0004 | .0014 | .0050 | .0000 | .14 | 2.6 | .... | .. |

* B. Coli present.

*Examination of Water from Supply of North Walpole.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5618 | 1908 Sept. 12 | None | V. slight | Foreign | 0.00 | 4.6 | 3.7 | .0016 | .0016 | .0100 | .0000 | .24 | 1.8 | .... | * |
| 5619 | Sept. 12 | None | V. slight | Foreign | 0.00 | 4.9 | 3.8 | .0024 | .0040 | .0060 | .0000 | .25 | 2.4 | .... | * |
| 5663 | Sept. 21 | None | None | None | 0.00 | 7.5 | 3.2 | .0002 | .0032 | .0080 | .0000 | .33 | 2.6 | .... | .. |
| 5664 | Sept. 21 | V. faint | V. slight | None | 0.00 | 9.4 | 5.2 | .0008 | .0002 | .0020 | .0000 | .31 | 2.6 | .... | .. |
| 5665 | Sept. 21 | None | None | None | 0.00 | ..... | .... | .0002 | .0002 | .0020 | .0000 | .27 | 2.2 | .... | .. |

* B. Coli present.

*Examination of Water from Town Well.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5551 | 1908 Aug. 21 | None | V. slight | None | 0.00 | 17.3 | 13.7 | .0004 | .0018 | .2200 | .0000 | 2.11 | 5.0 | .... | .. |
| 7975 | 1910 June 18 | None | V. slight | S. foul | 0.00 | 8.0 | 3.8 | .0020 | .0010 | .1000 | .0000 | 1.10 | 3.5 | .... | .. |

*Examination of Water from Supply Owned by C. H. Holden.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5756 | 1908 Oct. 14 | None | None | None | 0.00 | 15.8 | .... | .0030 | .0024 | 1.000 | .0004 | 1.70 | 5.9 | .... | * |

* B. Coli present.

**Warner.**—In 1895 a supply was introduced by private parties, which was later purchased by the Warner Village Fire District. This consists of a reservoir supplied by springs and a brook. The bottom is clayey hardpan in part, and part gravel; average depth, eight feet. Cast iron and galvanized iron pipe is used. The watershed is estimated at 400 acres, wooded; not more than 12 inhabitants. The volume of water varies greatly. The water flows by gravity. There are quite a number of private wells in the locality. There are many private supplies which are piped from springs long distances through lead pipe.

*Examination of Water from a Faucet of the Village District Supply.*



| Number. | Date of collection. | Appearance: Turbidity. | Sediment. | Odor. | Color. | Residue on Evapo'n: Total. | Fixed. | Ammonia: Free. | Albuminoid | Nitrogen as: Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 754 | 1902 Aug. 29 | None | None | V. slight | 0.3 | 5.30 | 2.00 | .0000 | .0110 | .0000 | .0000 | .10 | 1.5 | .... | .. |
| 1417 | 1903 Aug. 10 | Slight | Fine | Foul veg. | 0.1 | 4.20 | 1.60 | 0000 | .0106 | .0000 | .0000 | .08 | 1.6 | .... | .. |
| 2122 | 1904 July 6 | Slight | S. fine | S. veg. | 0.25 | 5.60 | 2.10 | .0000 | .0050 | .0000 | .0000 | .10 | 1.2 | .... | .. |
| 2715 | 1905 Feb. 22 | None | None | V. slight | 0.10 | 5.3 | 3.2 | .0000 | .0010 | .0000 | .0000 | .12 | 1.2 | .... | .. |
| 3470 | 1906 Feb. 19 | None | None | None | 0.05 | 2.5 | 1.8 | .0010 | .0020 | .0100 | .0000 | .15 | 1.1 | .... | .. |
| 4133 | Nov. 7 | None | None | Slight | 0.35 | 5.2 | 3.0 | .0014 | .0100 | .0100 | .0000 | .10 | 1.8 | .... | .. |
| 4555 | 1907 May 22 | None | S. floc. | Veg. | 0.10 | 2.3 | 1.8 | .0004 | .0046 | .0100 | .0000 | .10 | 0.7 | .... | .. |
| 5079 | Dec. 17 | None | None | None | 0.20 | 2.2 | 1.6 | .0012 | .0024 | .0070 | .0000 | .15 | 0.4 | .... | .. |
| 5625 | 1908 Sept. 12 | V. slight | V. slight | Stale | 0.10 | ..... | .... | .0002 | .0070 | .0020 | .0000 | .06 | 1.2 | .... | *a |
| 5641 | Sept. 16 | Mod. floc | Earthy | None | ? | 6.8 | 3.3 | .0002 | .0010 | .0150 | .0000 | .35 | 2.9 | .... | *b |
| 7705 | 1910 Mar. 10 | None | None | None | 0.10 | 5.4 | 1.8 | .0030 | .0026 | .0050 | .0000 | .18 | .40 | .... | .. |

* B. Coli present; *a* auxiliary supply from Warner River; *b* new well 50 feet from the river.

*Examination of Water from Well Owned by Boston & Maine Railroad.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7515 | 1909 Nov. 23 | Heavy | V. S. earthy | V. mk'd earthy | Hgh | ..... | .... | .0002 | .0170 | .0050 | .0000 | .10 | 1.9 | .... | .. |

**Warren.**—There are two private systems of water works in town: one, the Warren Water Works, was built in 1873, the source being a spring about a mile distant. The water flows by gravity through galvanized iron pipe. Nineteen families are supplied from this source. The other supply, the H. N. Merrill Water Works, was installed about the year 1895. This supply is from a spring and driven well 474 feet deep. The water flows partly by gravity and partly by being pumped into a reservoir. Ten per cent. of the population, 24 families, take this water, which is delivered through one mile of iron main and galvanized iron service pipes. Several families have private supplies, pipes from springs on elevated ground. There are not many private wells within the radius of these supplies.



*Examination of Water from Various Sources.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 875 | 1902 Oct. 17 | Slight | Fine | V. slight | 0.1 | 7.20 | 2.60 | .0000 | .0116 | .0000 | .0500 | .09 | 1.95 | .... | *a* |
| 877 | Oct. 17 | None | None | S. veg. | 0.1 | 6.50 | 2.70 | .0000 | .0038 | .0000 | .0000 | .10 | 2.7 | .... | *b* |
| 3227 | 1905 Oct. 10 | None | None | None | 0.05 | 5.4 | 2.1 | .0020 | .0020 | .0100 | .0000 | .12 | 1.1 | .... | *b* |
| 3472 | 1906 Feb. 22 | None | None | None | 0.0 | 8.5 | 7.5 | .0040 | .0010 | .0100 | .0000 | .10 | 4.6 | .... | *ac* |
| 3473 | Feb. 22 | V. slight | V. slight | None | 0.0 | 2.9 | 2.3 | .0030 | .0024 | .0100 | .0000 | .10 | 1.4 | .... | *ad* |
| 4543 | 1907 May 18 | None | None | Sl. veg. | 0.00 | 4.6 | 3.4 | .0004 | .0006 | .0700 | .0000 | .05 | 2.5 | .... | *a* |
| 5075 | Dec. 13 | None | None | None | 0.5 | ..... | .... | .0008 | .0024 | .0040 | .0000 | .15 | 1.2 | .... | *a* |
| 7730 | 1910 Mar. 17 | None | V. slight | None | 0.00 | 4.0 | 2.6 | .0016 | .0012 | .0060 | .0000 | .03 | 2.4 | h'gh | *a* |
| 8280 | Aug. 8 | None | None | None | 0.00 | 4.4 | 3.5 | .0010 | .0005 | .0450 | .0000 | .05 | 2.6 | .0 | *a* |

*a* From H. N. Merrill Water Works; *b* from Warren Water Works; *c* from well; *d* from spring.

*Chemical Examination of Water from Stream, Supply of State Sanitarium for Consumptives.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4780 | 1907 Aug. 3 | None | S. floc. | None | 0.10 | 3.1 | 0.8 | .0010 | .0030 | .0050 | .0000 | .13 | 0.4 | .... | .. |
| 7355 | 1909 Sept. 11 | None | None | None | 0.00 | 4.0 | 2.2 | .0002 | .0002 | .0050 | .0000 | .05 | 0.7 | .... | .. |

*Examination of Melted Ice Taken from Pond.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8339 | 1910 Aug. 14 | Slight | Mod. grey floc. | Earthy | 0.00 | ..... | .... | High | High | .1250 | .0000 | .01 | .0 | .... | * |

* B. Coli present.

**Weare.**—No public supply.

*Examination of Water from Wells Owned by B. & C. D. Fessenden Company, East Weare.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1910 | | | | | | | | | | | | | | |
| 8315 | Aug. 15 | None | None | None | 0.00 | ..... | .... | .0010 | .0010 | .0025 | .0000 | .10 | 1.2 | .... | .. |
| 8316 | Aug. 15 | None | V. slight | None | 0.00 | ..... | .... | .0020 | .0020 | .2500 | ft. tr. | .50 | 3.9 | .... | .. |
| 8317 | Aug. 15 | None | None | Foul | 0.00 | ..... | .... | .0010 | .0020 | .0750 | .0000 | .30 | 4.6 | .0 | .. |

**Westmoreland.**—

*Examination of Water from Well of John P. Kuhlke.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1910 | | | | | | | | | | | | | | |
| 7677 | May 9 | None | Slight | S. earthy | 0.05 | ..... | .... | .0025 | .0035 | .0100 | .0000 | .20 | 1.2 | .... | .. |

**Whitefield.**—The public water works, owned by the town, were built by private parties in 1892. There are two watersheds of about 30 acres each. The water flows by gravity to a reservoir having a capacity of about 1,000,000 gallons, and is delivered through five miles of cast iron mains, galvanized iron service pipes, to about 300 families, seven eighths of the entire population. (See special report elsewhere).

*Examination of Water from Town Supply.*



| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 861 | 1902 Oct. 14 | None | Sl. floc. | Veg. | 0.0 | 5.00 | 1.50 | .0000 | .0026 | .0000 | .0000 | .04 | 1.5 | .... | .. |
| 2143 | 1903 July 11 | None | None | S. veg. | 0.1 | 6.60 | 2.60 | .0050 | .0034 | .0000 | .0000 | .05 | 1.4 | .... | .. |
| 2429 | Aug. 11 | None | None | V. slight | 0.0 | 4.40 | 2.40 | .0022 | .0058 | .0000 | .0000 | .07 | 1.6 | .... | .. |
| 2718 | 1905 Feb. 23 | None | None | None | 0.0 | 4.4 | 3.0 | .0000 | .0014 | .0300 | .0000 | .10 | 1.5 | .... | .. |
| 3183 | Oct. 17 | None | None | None | 0.15 | 3.9 | 2.9 | .0008 | .0048 | .0100 | .0000 | .05 | 0.6 | .... | .. |
| 3484 | 1906 Feb. 17 | None | None | None | 0.10 | 4.8 | 3.0 | .0010 | .0052 | .0200 | .0000 | .05 | 0.9 | .... | .. |
| 7700 | 1910 Mar. 9 | Sl. op. | S. earthy | None | 0.10 | 6.4 | 2.5 | .0002 | .0020 | .0050 | .0000 | .10 | 0.3 | .... | .. |
| 8255 | Aug. 2 | None | V. slight | Foreign | 0.05 | 4.0 | 3.4 | .0006 | .0042 | .0100 | .0000 | .03 | 0.9 | .... | * |

* B. Coli present.

**Wilmot.—**

*Examination of Water from Well of Kearsarge School of Practice.*

| Number. | Date of collection. | Appearance: Turbidity. | Appearance: Sediment. | Appearance: Odor. | Appearance: Color. | Residue on Evapo'n: Total. | Residue on Evapo'n: Fixed. | Ammonia: Free. | Ammonia: Albuminoid | Nitrogen as: Nitrates. | Nitrogen as: Nitrites. | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7018 | 1909 Apr. 30 | None | None | None | 0.00 | ..... | .... | .0015 | .0030 | .0050 | .0000 | .05 | 0.4 | .075 | .. |
| 7563 | Feb. 22 | None | None | Sl. earthy | 0.00 | 5.0 | .... | .0002 | .0002 | .0200 | .0000 | .05 | 1.9 | .04 | .. |

*Examination of Water from Well of the Congregational Society.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7729 | 1910 Mar. 17 | None | V. slight | None | 0.00 | 6.4 | 2.2 | .0014 | .0034 | .1300 | .0000 | 1.70 | 2.6 | h'gh | .. |
| 7916 | May 24 | None | None | None | 0.05 | ..... | .... | .0015 | .0020 | .0100 | .0000 | .70 | 1.3 | .012 | .. |

**Wilton.**—The source of the supply is Mill Brook, with the intake at Gaerwen Falls, 250 feet above the bridge at East Wilton, about 1 2-3 miles from the village. Mill Brook, or Gaerwen Falls Brook, rises on the eastern slope of the Pack Monadnock range of mountains, and has a watershed of nearly four square miles. It is also the outlet of Burton Pond, a sheet of water some 60 acres in extent which is dammed and will serve as an admirable storage reservoir. There are seven miles of 12-inch iron mains, with galvanized iron service pipes, through which the water is delivered by gravity to about 100 families.



*Examination of Water from Wilton Supply.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 1869 | 1904 Mar. 13 | None | Sl. floc. veg. | Mrk'd veg. | 0.2 | 4.30 | 2.10 | .0010 | .0048 | .0000 | .0000 | .15 | 1.25 | .... | .. |
| 1915 | May 1 | None | Floc. veg | S. veg. | 0.3 | 2.80 | 1.20 | .0014 | .0082 | .0000 | .0000 | .12 | 0.7 | .... | .. |
| 1982 | May 23 | Slight | Much veg. | Much veg. | 0.35 | 4.80 | 1.20 | .0000 | .0076 | .0000 | .0000 | .10 | 1.1 | .... | .. |
| 2124 | July 5 | V. slight | Slight | Sl. veg. | 0.25 | 4.80 | 1.50 | .0000 | .0074 | .0000 | .0000 | .15 | 0.7 | .... | .. |
| 2274 | Aug. 14 | None | V. slight | Musty veg. | 0.25 | 4.20 | 1.90 | .0000 | .0034 | .0000 | .0000 | .15 | 0.4 | .... | * |
| 2363 | Sept. 13 | V. slight | V. slight | Dec. veg | 0.20 | 3.70 | 1.70 | .0014 | .0028 | .0000 | .0000 | .20 | 0.9 | .... | * |
| 2471 | Oct. 4 | Slight | Con. floc | Dec. veg | 0.4 | 5.6 | 2.2 | .0044 | .0120 | .0000 | .0000 | .35 | 1.4 | .... | *a |
| 3342 | 1905 Oct. 18 | None | V. slight | Sl. earthy | 0.8 | 5.0 | 2.7 | .0040 | .0100 | .0050 | .0000 | .25 | 1.4 | .... | *a |
| 3271 | Oct. 30 | None | None | S. veg. | 0.28 | 3.8 | 1.3 | .0010 | .0040 | .0050 | .0000 | .27 | 0.4 | .... | a |
| 3483 | 1906 Feb. 26 | S. op. | Slight | Slight | 0.20 | 6.9 | 3.7 | .0020 | .0090 | .0200 | .0000 | .22 | 1.2 | .... | a |
| 4827 | 1907 Aug. 21 | None | None | None | 0.05 | 3.9 | 1.6 | .0016 | .0044 | .0050 | .0000 | .22 | 1.2 | .... | .. |
| 5771 | 1908 Oct. 20 | Sl. op. | None | None | 0.25 | 3.1 | 2.1 | .0010 | .0020 | .0000 | .0000 | .17 | 1.2 | .... | .. |
| 7891 | 1910 May 16 | V. slight | None | Musk | 0.40 | 2.9 | 1.5 | .0010 | .0085 | .0025 | .0000 | .30 | 0.6 | .... | .. |

* B. Coli present; *a* reservoir.

**Winchester.**—

*Examination of Water from Spring of Water Company.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 7800 | 1910 May 18 | Slight | Sl. earthy | V. S. earthy | 0.10 | 4.2 | 3.6 | .0010 | .0020 | .0050 | .0016 | .12 | 1.2 | .025 | * |

* B. Coli present.

*Examination of Water from Well of Fred Felch.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7759 | 1910 Apr. 8 | None | None | None | 0.00 | ..... | ....: | .0004 | .0006 | .0050 | .0000 | .26 | 1.5 | h'gh | .. |

**Wolfeboro.**—The public water works, owned and operated by the town, were installed in 1889. The source of the supply is a pond of about 300 acres; depth in places from 60 to 70 feet; average for the pond about 32 feet; bottom mostly sand, with small rocks. The watershed is from three to four square miles in extent; five sevenths woodland, two sevenths pasture; only one family inhabits the watershed. This is a gravity system, with between five and six miles of cast iron mains and galvanized and wrought iron service pipes. Practically the entire population is supplied from this system.

*Examination of Water from Public Fountain.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 842 | 1902 Oct. 9 | None | None | S. musty | 0.0 | 3.90 | 1.40 | .0000 | .0068 | .0000 | .0000 | .07 | 1.3 | .... | .. |
| 1659 | 1903 Nov. 9 | Slight | Fine | S. veg. | 0.0 | 2.90 | 1.40 | .0010 | .0056 | .0000 | .0000 | .08 | 1.4 | .... | .. |
| 2136 | 1904 July 5 | None | S. fine | V. slight | 0.1 | 2.30 | .80 | .0000 | .0062 | .0000 | .0000 | .15 | 0.9 | .... | .. |
| 2711 | 1905 Feb. 21 | Slight | Slight | Slight | 0.00 | 3.6 | 1.8 | .0000 | .0014 | .0500 | .0000 | .00 | 0.6 | .... | .. |
| 3234 | Oct. 17 | None | Slight | Veg. | 0.10 | 2.5 | 2.5 | .0008 | .0090 | .0100 | .0000 | .07 | 0.4 | .... | .. |
| 3506 | 1906 Mar. 6 | None | None | S. veg. | 0.10 | 3.5 | 1.8 | .0014 | .0074 | .0050 | .0000 | .15 | 0.7 | .... | .. |
| 3868 | Aug. 20 | None | None | None | 0.10 | 2.9 | 1.2 | .0022 | .0000 | .0050 | .0000 | .07 | 0.4 | .... | .. |
| 4578 | 1907 May 29 | None | V. slight | None | 0.05 | 4.1 | 1.8 | .0006 | .0064 | .0100 | .0000 | .14 | 0.4 | .... | .. |
| 5230 | Apr. 13 | None | V. slight | V. mk'd veg. | 0.25 | 2.0 | .6 | .0002 | .0074 | .0040 | .0000 | .08 | 0.4 | .... | .. |
| 7706 | 1910 Mar. 9 | None | V. slight | None | 0.00 | 2.9 | 1.5 | .0010 | .0042 | .0050 | .0000 | .13 | .10 | .... | .. |

**Woodstock.**—In 1897 the North Woodstock Water Company installed a system of water works which was sold to the town of Woodstock. This is in the precinct of North Woodstock. The source is a stream dammed to form a reservoir of about one acre. Seventy families, 99 per cent. in the precinct, are takers. There are no wells in the precinct. The town of Woodstock is about evenly divided into the northern and southern portion. The latter is supplied with water from private wells and springs, and since the removal of all lead pipe, etc., it seems to be of good quality.

*Examination of Water from Supply of the North Woodstock Water Company.*



| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | Chlorine. | Hardness. | Lead. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | | | | |
| 2215 | 1904 July 29 | V. slight | V. slight | None | 0.7 | 5.90 | 1.40 | .0010 | .0080 | .0000 | .0000 | .05 | 0.7 | .... | .. |
| 3889 | 1906 Aug. 22 | Gel. | None | Veg. | 0.50 | ..... | .... | .0010 | .0080 | .0050 | .0000 | .05 | 0.4 | .... | .. |
| 4438 | 1907 Apr. 16 | None | None | Sl. veg. | 0.18 | 4.1 | 1.7 | .0016 | .0024 | .0050 | .0000 | .05 | 0.9 | .... | .. |
| 4748 | July 22 | None | None | None | 0.70 | 3.8 | 1.5 | .0002 | .0046 | .0050 | .0000 | .15 | 0.4 | .... | .. |
| 5081 | Dec. 16 | None | None | None | 0.20 | 2.8 | 2.1 | .0006 | .0026 | .0150 | .0000 | .10 | 1.2 | .... | .. |
| 8104 | 1910 July 13 | V. slight | None | None | 0.55 | 2.6 | 0.8 | .0006 | .0020 | .0025 | .0000 | .07 | 0.4 | .... | .. |

*Examination of Water from Elbow Pond, Proposed Source of Public Supply.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6080 | 1909 Apr. 9 | Sl. veg. | Sl. veg. | Arom. | 0.3 | 2.8 | 1.4 | .0025 | .0090 | .0100 | .0000 | .06 | 0.1 | .... | .. |
| 6081 | Apr. 7 | None | Sl. veg. | Arom. | 0.3 | 3.0 | 1.6 | .0065 | .0100 | .0100 | .0000 | .05 | 0.1 | .... | .. |

**Woodsville** (village in town of Haverhill).—Woodsville Fire District is supplied with water by the Woodsville Aqueduct Company, whose plant was installed in 1885 by James Gordon, who introduced water from Gordon Spring in 1892 or 1893. The first-named supply is from Ammonoosuc River, which receives all the sewage from the towns of Bath, Lisbon and Littleton, farther up the river. The water is pumped directly from the river, and flows through about three miles of iron distributing mains.

This company also supplies water from a spring, dug about four feet deep, which yields about 50,000 gallons daily, delivered through two miles of lead pipe. Soil is mucky loam with sandy bottom. About nine tenths of the population are supplied from these sources.

Gordon spring is about two feet deep, while the volume of water is about 48,000 gallons daily; soil, mucky loam with sandy bottom. One-half mile of galvanized iron pipe is used to convey this water. Thirty-three families take from this supply.

*Examination of Water from Supply of Woodsville Aqueduct Company.*

| Number. | Date of collection. | Appearance | | | | Residue on Evapo'n | | Ammonia | | Nitrogen as | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Total. | Fixed. | Free. | Albuminoid | Nitrates. | Nitrites. | Chlorine. | Hardness. | Lead. | |
| 17 | 1901 June 3 | None | Con.floc. | S. veg. | 0.1 | 3.60 | 1.20 | .0014 | .0057 | .0066 | .0000 | .13 | .... | .... | .. |
| 81 | June 3 | None | Much floc. | S. veg. | 0.1 | 4.10 | 1.70 | .0046 | .0093 | .0066 | .0000 | .13 | .... | .... | .. |
| 19 | June 3 | None | Slight | S. veg. | 0.1 | 3.70 | 2.20 | .0004 | .0057 | .0066 | .0000 | .13 | .... | .... | .. |
| 57 | July 9 | None | Floc.veg. | Dec.veg | 0.12 | 5.00 | 2.00 | .0009 | .0104 | .0050 | .0002 | .26 | 2.0 | .... | .. |
| 58 | July 9 | None | None | Veg. | 0.10 | 4.70 | 2.10 | .0032 | .0104 | .0050 | .0002 | .20 | .... | .... | .. |
| 59 | July 9 | None | Much floc.veg | Dec.veg | 0.12 | 4.70 | 2.20 | .0032 | .0135 | .0050 | .0002 | .20 | .... | .... | .. |
| 159 | Sept.12 | None | None | Dec.veg | 0.15 | 5.10 | 3.30 | .0016 | .0112 | .0000 | .0000 | .19 | .... | .... | .. |
| 160 | Sept.12 | None | Floc.veg. | Dec.veg | 0.15 | 5.60 | 2.60 | .0026 | .0126 | .0000 | .0000 | .19 | .... | .... | .. |
| 404 | 1902 Feb. 13 | None | V. slight | Veg. | 0.1 | 5.80 | 3.40 | .0006 | .0070 | .0200 | .0000 | .10 | 1.6 | .... | .. |
| 1022 | 1903 Feb. 2 | None | None | S. veg. | 0.2 | 4.30 | 1.90 | .0000 | .0048 | .0200 | .0000 | .08 | 1.9 | .... | .. |
| 1023 | Feb. 2 | None | None | None | 0.0 | 7.30 | 3.10 | .0000 | .0014 | .0200 | .0000 | .12 | 2.9 | .... | .. |
| 1430 | Aug. 11 | Marked | Much fine veg. | V.slight | 0.15 | 6.60 | 3.40 | .0010 | .0074 | .0000 | .0000 | .15 | 1.8 | .... | .. |
| 1749 | Dec. 18 | None | Slight | None | 0.0 | 6.20 | 4.30 | .0004 | .0048 | .0400 | .0002 | .13 | 2.6 | .... | .. |
| 2117 | 1904 July 4 | Slight | Con.floc. | M. veg. | 0.2 | 4.10 | 2.30 | .0108 | .0082 | .0000 | .0000 | .15 | 1.8 | .... | .. |
| 2723 | 1905 Feb. 25 | None | Con. | V.slight | 0.10 | 5.7 | 4.0 | .0020 | .0000 | .0200 | .0000 | .20 | 1.8 | .... | .. |
| 2811 | Apr. 24 | None | Slight | None | 0.10 | 7.7 | 4.6 | .0000 | .0014 | .0050 | .0000 | .10 | 2.6 | .... | *a |
| 2851 | May 17 | Marked | Slight | None | 0.10 | 6.6 | 4.0 | .0000 | .0000 | .0150 | .0000 | .10 | 2.6 | .... | a |
| 3499 | 1906 Mar. 5 | None | Con. | None | 0.15 | 4.0 | 3.2 | .0000 | .0080 | .0100 | .0001 | .05 | 1.5 | .... | * |
| 4191 | Nov.28 | None | V. slight | None | 0.05 | 5.0 | 3.8 | .0010 | .0020 | .1000 | .0000 | .... | 3.4 | .03 | a |
| 4936 | 1907 Oct. 8 | None | Slight | None | 0.69 | 5.5 | 3.0 | .0002 | .0066 | .0040 | .0000 | .08 | 1.6 | .... | .. |
| 5073 | Dec. 13 | Slight | V. slight | S. veg. | 0.50 | 5.0 | 2.8 | .0010 | .0110 | .0100 | .0000 | .08 | 1.9 | .... | .. |
| 7697 | 1910 Mar. 9 | Sl. op. | Slight | Earthy | 0.40 | 4.1 | 2.3 | .0002 | .0078 | .0050 | .0000 | .15 | 1.4 | .... | .. |

* B. Coli present; *a* Child's Brook, proposed supply.

*Examination of Water from the Supply of Mrs. James Mitchell, Peddled in Village.*

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7698 | 1910 Mar. 9 | None | V. slight | Sl. earthy | 0.00 | 8.0 | 3.7 | .0006 | .0002 | .0050 | .0000 | .17 | 2.0 | .... | .. |

# SPECIAL REPORTS ON WATER SUPPLIES.

# CLAREMONT'S WATER SUPPLY.

By Robert Fletcher, Ph. D., Consulting Engineer, Member American Society Civil Engineers, President and Engineer Hanover Water Works Co.

Hanover, N. H., December 24, 1909.

*Messrs. H. C. Sanders, F. S. Crossman, W. E. Lawlor, Water Commissioners, Claremont, N. H.*

Gentlemen:—Complying with a request from Mr. James L. Rice, superintendent of the Claremont Water Works, and in accordance with the vote passed at the town meeting of November 6th in Claremont, I made an inspection of the reservoirs and contiguous territory on November 19th, and examined into the conditions affecting the quantity and quality of your water supply, and the conditions which must determine its continued sufficiency and safety.

The following report deals with

Firstly, the examination of the reservoir district.

Secondly, the present situation and outlook for the future supply.

Thirdly, recommendations.

Firstly. The examination included a view of the lower reservoir, capacity about 2,500,000 gallons, giving a pressure head above the square of 160 feet, equivalent to about 70 lbs. per square inch. This distributing reservoir, fed from the reservoirs on the other drainage lines when the storage is sufficient,—and in times of scarcity, replenished by pumping from the constructed wells on the island—is protected from the drainage of the ravine above it by a low wall of cemented rubble masonry and a conduit of 24-inch pipe which diverts the flow entirely around the reservoir. Hence the dwellings and outhouses on the ravine,—one set near the dam and two higher up,—do not threaten the purity of the water.

Even if the flow on this drainage line were beyond suspicion of pollution it is not wanted in the small reservoir because, after every storm, it would make deposits of silt and produce turbidity in all of the water served to the town. As previous investigations have shown that there is no suitable location on the upper reaches of this ravine for a large storage reservoir, and as the cost of raising the dam of the small reservoir would be large in proportion to the extra amount of storage gained, the present arrangement seems to be well adapted to the circumstances.

The middle reservoir with a capacity of about 3,500,000 gallons is fed from the upper reservoir and the small drainage from adjacent land, and itself feeds the lower reservoir by a suitable conduit under ground. The substantial and admirable concrete spillway here provides ample discharge for all surplus water while completely protecting the dam from injury.

The upper or main storage reservoir has a capacity of about twenty-six million (26,000,000) gallons and receives the drainage of a large territory above, principally woodland, but including also considerable mowing and pasture land on the east and northeast.

The conditions about the immediate vicinity of all these reservoirs are excellent. The low stage of the two upper ones revealed clean bottoms and margins. The superintendent spoke of intention to cut out the small hard wood growth along the feeding brooks and to promote the increase of the evergreens so as to abate the nuisance from leaves. The borders of the reservoirs are or will be cleared of hard wood growth for some rods back for the same reason. The surrounding fifty acres or more, owned by the town to safeguard the upper reservoirs, are well fenced and made secure from invasion by grazing animals by means of locked bars.

A considerable part of the territory which drains into these reservoirs was traversed from south to north in two trips afoot, and a circuit made east and west near the divide and beyond. Observation was made of the nature of the land, its soil, slopes, stream lines and its adaptability for collection and storage of water.

There was no call for an examination of the pumping plant, even if time had permitted; the construction of the wells on the island, as described, being according to well-known correct methods, and the analyses of the water by the State Board of Health from time to time giving sufficient information as to the qualities of the water.

Secondly. The present situation and outlook.

It goes without saying that this valuable property of the town, evidently managed with painstaking care and efficiency by a superintendent who thoroughly understands its conditions and needs in every detail, is an asset in more than the ordinary meaning of that term. Whatever controversy there may be about other public utilities, all are agreed that water works should be owned and operated by the community. They distribute to every man, woman and child one of the prime necessities of existence, and thus vitally affect the health, comfort and convenience of every home which they serve. In this property, more than in any other, every citizen and taxpayer should take an intelligent interest, and may properly hold toward it a sense of personal ownership. But the management must of necessity be in the hands of an expert, made such by practical acquaintance with the inexorable laws of hydraulics, the special demands of the works in every part, and the conditions of economical administration. With the growth of the community the demands upon the works must continue to increase, and the value will increase in the same degree, under wise management. But everything wears out, and a sound business policy would dictate, at the very least, the accumulation of a depreciation fund to provide for inevitable deterioration, and such replacement and improvement as ought to be foreseen. It is the cry of the demagogue that water should be as "free as air," and many people grumble when paying their water dues, as though these were a heavy tax. But no intelligent property owner will accept such doctrine and the candid man will admit that the usual water rates are really a very moderate price to pay for the benefits received; indeed, quite a small interest on such investment as he would have to make to provide for himself a water supply so good and abundant.

Your superintendent reports a probable daily consumption, during the hot, dry season, of about three quarters of a million (750,000) gallons, of which more than 330,000 gallons daily have to be pumped during September and October. Also that a little less than 100,000 gallons of the daily use is registered by meters. Evidently the ideal system must have all services metered, for only thus can waste in the houses be checked, and each consumer be made to pay according to what he uses.

These figures indicate an increasing demand which the checking of the waste may reduce to some extent, but not for a long time ahead, —while the available storage capacity scarcely exceeds (30,000,000) thirty million gallons. At the same time it is not desirable to be so much dependent upon the pumps for eking out the supply. Manifestly then the first requirement is a larger storage capacity.

Moreover, the inspection of the territory made the fact quite apparent that

Secondly, the flowage into the reservoirs should be much better safeguarded by larger control of the tributary district.



If the last condition is secured all the possibilities of the first need will at last be at command. Hence, it is in order to present some considerations bearing upon this aspect of the situation. It should be self-evident that the continued purity and safety of the surface drainage can only be assured by having entire control of the sources and the lines of stream flow. The supply depends upon the rainfall and the size of the area from which it is collected. In this case the area is hardly sufficient for the utmost needs without large increase of storage,—but, such as it is, all possibility of dangerous conditions should be removed. If there are any who would say that such a policy is prompted by mere fastidious theory, dainty sentiment or the "new fangled notions of sanitary cranks," let them consider the following facts:

The Windsor (Vt.) epidemic was not far away nor very long ago. There was a case of typhoid fever on a hill farm four miles or more distant, and in the winter time. The infection (typhoid bacillus) from dejecta was washed down the brook and into the storage reservoir just above the village. The entire water works system was infected. Hundreds contracted the typhoid fever and many died. There was the usual investigation and report after the mischief was done; the system was pronounced unsafe, and a new source of supply had to be found.

The circumstances of the epidemic in Plymouth, Pa., in 1885, were quite similar. The situation was like that of Claremont, as there were three small reservoirs fed by a mountain stream, along or near which were a very few houses. A man from one of these houses went to Philadelphia and contracted typhoid fever. It was a bad case and the man was sick many weeks. The dejecta were thrown upon the snow and frozen ground and washed into the upper reservoir when the spring thaw came. It happened that on March 26th the superintendent had to thaw out the pipe leading from the upper reservoir to those lower down. The first typhoid case appeared in town on April 9th; after April 12 from 50 to 100 cases appeared daily, and in one day 200 new cases were reported. Out of 8,000 people 1,104 had the disease (almost one in seven) and 114 died. Thus the origin of all this sorrow and desolation was proved to be miles away on the mountain side, and it appeared that the typhoid bacilli retained their virulence after lying many weeks in frozen fecal matter and after coming some miles down stream in ice cold water.

The New Haven epidemic in 1901 is equally instructive. A part of the city is supplied from Dawson Lake on West River, five miles distant. About a mile and a half above the dam a small stream flowed into the river, and about half a mile up this stream was a farmhouse, in which occurred several cases of typhoid fever during January and February. The excreta were thrown into a shallow privy vault without disinfection; this vault was 325 feet from the brook and 40 feet above it. On March 10th and 11th came a heavy rainfall of 2½ inches. Although the lake covered 60 acres and contained 300,000,000 gallons it was quite turbid on March 11th. About ten days later the epidemic began in the district supplied by Dawson Lake, seven miles distant from the source of infection. During April, May and June 514 cases occurred, resulting in 73 deaths.

The Ithaca (N. Y.) epidemic of 1903, for the time being practically broke up Cornell University. There were 1,350 cases in a population of 13,156, or more than one sick among every ten. More than 500 homes were visited and there were 82 deaths. There were 3,000 students, hundreds of whom left town, some ill with the disease; these doubtless scattered the disease elsewhere. "One episode of the epidemic is worthy of special mention, namely a secondary outbreak which resulted from the infection of a well. This well had become popular among residents of a certain district at the time when the public supply came to be distrusted, and its quality was taken for granted. But the wife of the owner was taken sick with typhoid fever during the epidemic, and her dejecta passed without disinfection through the water closet, and into a drain pipe which ran within three or four feet of the well. The joints of the drain pipe were not tight, and the well water, which had probably been for some time grossly contaminated, finally became infected. As a result about fifty cases of typhoid fever and five deaths were traced to people who used the water of this well.

In the Scranton (Pa.) epidemic a reservoir containing one billion four hundred million (1,400,000,000) gallons became infected, so that during December, 1906, and January and February, 1907, 1,155 cases of typhoid fever were reported and 111 deaths.

The sad experiences of Littleton and Woodsville in this state and St. Johnsbury, Vt., under somewhat different conditions, all teach the same lessons of the prime necessity of safeguarding and vigilantly watching the sources of supply.

Mr. George C. Whipple, in a recent address, said: "When a community has been stricken with this dread disease, and when it has been traced to the public water supply, with its branches leading into every house, public opinion is apt to emphasize its demands for pure water in a way that brings results. The influence of such an occurrence is felt not only in its own locality, but throughout the country at large. Perhaps no other single influence has saved so many lives from typhoid fever as typhoid fever epidemics themselves. A hundred deaths from the same cause occurring at once in a single community attract more attention than a thousand deaths in the same community scattered over a period of time; and if the protective measures adopted as a result of the epidemic serve to lower the general death rate even to a small extent, the ultimate saving of lives may far exceed the few lives lost during the period of excitement."

He was then urging the necessity of filtering public water supplies. Certainly that necessity is undeniable if the sources of supply are not thoroughly guarded. It is criminal to take chances when infection of the water is possible by any means.

In the light of these facts the two places or sets of buildings,—the wash from which must come promptly into the middle reservoir (unless special constructions are made on the premises to prevent, and these are constantly watched), especially when the run-off is on frozen ground,—constitute an ever-present menace to the purity and safety of your water supply.

Therefore,

Thirdly. My first recommendation is that the town obtain possession, or full right of control, of all the drainage area tributary to the upper and middle reservoirs.

Remarks: It has been shown by careful observations that grasses, oats and clover will absorb or consume from twelve one-hundredths to more than a quarter of an inch depth of water daily as a maximum; wheat somewhat less; but Indian corn in an extreme case nearly 1½ inches; while oaks and fir trees consume from one quarter to one tenth as much. In this consumption is probably included the evaporation from the plants. Hence forest growth not only protects the land from excessive evaporation, but itself requires far less of the rainfall. Therefore, the area for the collection and storage of water supply should be mostly wooded and the stream lines or brooks kept clean and clear from every form of vegetable rubbish.

Again, observations made throughout the year in Germany have shown that evaporation from water surfaces in the open country is about two and one-half times more rapid than from water surfaces shielded by forests. In extremely hot weather evaporation may be as much as one eighth to one quarter of an inch daily from open ponds. Hence the great importance of full control of all of these conditions which affect the conservation of the water supply. The experience of the Hanover Water Works Company, with a water supply gathered from about 1,200 acres, the most of which has been owned and controlled by the Company for several years, coincides with the observations referred to above.

The cost of water pumped at Claremont, if I rightly interpret the figures reported, is about forty dollars per million gallons, including depreciation of the plant. At a low rate of interest this would justify an outlay of $1,000 principal, to secure a storage of 1,000,000 gallons. In one case with which the writer is familiar the cost was $1,000 for each 3,000,000 gallons stored; in another and very favorable situation 6,000,000 gallons were stored for each thousand dollars expended on the reservoir, based on contract prices. It ought to cost less if done by force account under direction of the superintendent. Probably it would hardly be worth while for Claremont to invest in another reservoir of less than 20,000,000 gallons' capacity, meaning by this water available for delivery into the town. I would therefore make a

Second recommendation, that if a suitable site for a reservoir can be found in the collecting territory where at least 20,000,000 gallons can be stored as available supply, at a cost not exceeding $400 (four hundred dollars) per million gallons stored, it would be good policy to gain such additional storage. The site should have at least one hundred acres of collecting area tributary to it.

Your collecting area is not well adapted for cheap storage,—having a steep topography and quick run-off; but its possibilities should be studied and improved to the utmost that is financially expedient. The policy recommended will take time. The promotion of the forest growth, especially the increase of pines and spruces, will secure a better conservation of the snowfall and rainfall, and permit a more constant and long continued "ground storage." By thus utilizing all of the other possibilities of collection and storage on all of the territory within reach, it should be easily possible to double your gravity supply in the near future, that is, within a few years.

# CONCERNING CERTAIN WATER SUPPLIES.

## LACONIA.

Regulations for the protection of the purity of the waters of Lake Winnipesaukee and Lake Paugus were established by the State Board of Health, to take effect January 1, 1909, which, in substance, provide for the exclusion of sewage and other dangerous contamination from these bodies of water.

A condition dangerous to the health of the people of Laconia, by reason of that city's taking its water supply from Lake Paugus, has long existed by reason of the discharge of sewage into Lake Winnipesaukee near the channel through the water passes into Lake Paugus.

The City of Laconia, recognizing the menace to the health of its people, appointed a committee to take the matter into consideration, which committee sent the following communication to the State Board of Health:

*To the State Board of Health:*

The committee acting for the City of Laconia in the matter of your order to said city to take care of the sewage at The Weirs in said city, respectfully asks the opinion of the board upon the following questions:

If the City of Laconia should purchase the Laconia Water Company, and provide the same with a filter, and so give to its citizens pure water, would your honorable board say that no further action of your board would be necessary; or would your board in addition require a sewer system at The Weirs; or would your board require an adequate sewer system at The Weirs, and that the idea of the filter plant be abandoned?

An early answer to said questions is respectfully asked, because of some pending legislation to enable the City of Laconia to purchase the Laconia Water Company.

Respectfully yours,

(Signed) William F. Knight.
John T. Busiel.
George W. Hoyt.

February 24, 1909.

At a regular meeting of the State Board of Health, held March 1, 1909, after a full consideration of the subject, the board formulated and unanimously adopted the following, and authorized the secretary to transmit a copy of the same to the committee named, which was done:

It would seem to be irrational, illogical, and unscientific to pollute the water supply of a city, and then to establish a filtration plant, when the source of the pollution can be prevented. Especially is this true when the cost of removing the source of the pollution will not much exceed, and perhaps not even equal, the expenditure necessary to construct and maintain an efficient filtration system.



Moreover, there are other important considerations involved, outside of the urgent necessity to safeguard the water supply of the City of Laconia, in that the present and future residents, cottagers and campers upon the shore of the lake, summer visitors and the public generally should be protected in their inherent right to its waters and ice in an uncontaminated condition.

The waters of Lake Winnipesaukee and Lake Paugus are nominally of exceptional purity, as has been proven by many analyses, hence, if all sewage were excluded from Lake Paugus, there would be no necessity for filtering the water supply of the City of Laconia. The State Board of Health will, therefore, ask for the enforcement of the rules and regulations for the protection of the waters of Lake Winnipesaukee and Lake Paugus, adopted June 21, 1907, and it would recommend that the idea of establishing a filtration plant in lieu of sewage exclusion be abandoned.

## TILTON.

The following petition and statement were received at the office of the State Board of Health on January 12, 1909:

LAW OFFICE OF
JOHN M. MESERVE,
RAFFAELLY BLOCK,

TILTON, N. H., January 11, '09.

*Irving A. Watson, M. D.,*
*Concord, N. H.*

MY DEAR DR. WATSON:—I am inclosing you a petition asking that the State Board of Health investigate the waters of Lake Winnisquam and make such rules and regulations as will protect the public health.

As you know, the sewerage from the City of Laconia has been drained into this lake for several years and the conditions there are alarming to say the least.

This petition does not represent all of our strength, and should the board desire a hearing, as I am in hopes it will, we will bring more evidence before them and more signers of the petition.

Trusting that you will notify the other members of the board and also let me know of any hearing it may call in the matter, I remain,

Yours very respectfully,
JOHN M. MESERVE.

CONCORD, N. H., January 12, 1909.

*John M. Meserve, Esq.,*
*Tilton, N. H.*

DEAR SIR:—I am in receipt of your favor of January 11, inclosing a petition to the State Board of Health to establish regulations for the protection of Lake Winnisquam against any pollution that in its judgment would endanger public health.

This petition I shall lay before the board at its next meeting, which probably will not be until the third Tuesday in April, as the regular quarterly meeting has just been held. Should a special meeting be called before that date, I will then submit the petition.

I might say, incidentally, that an examination of the conditions as they exist could not be thoroughly made until after the ice has gone out of the lake.

As there has been developed within a recent period a strong sentiment for the protection of our lakes and ponds against dangerous contamination, would it not be better for you and your petitioners to submit a bill to the Legislature for such legislation as might be deemed reasonable and effective, rather than to rely upon regulations that might be established by this board, the validity of which might be questioned?

It seems to me that some general legislation, which should take effect at some reasonable time in the future would be advisable.

Very truly yours,

IRVING A. WATSON,
*Secretary.*

STATE OF NEW HAMPSHIRE.

*To the Honorable State Board of Health:*

We, the undersigned, citizens, and taxpayers of the town of Tilton in the county of Belknap and State of New Hampshire, respectfully represent to this Honorable Board:

That Lake Winnisquam, located within the county of Belknap, in the towns of Tilton, Belmont, Sanbornton, Meredith and Laconia, is a public water and the source of water and ice supply to many owners of farms and summer homes along its shores;

That they have reason to believe that said water is being contaminated and that local regulations are not sufficient or effective to prevent such pollution.

Wherefore they pray that this Honorable Board will investigate the case, and establish such regulations as the board may deem necessary for the protection of said supply, against any pollution that in its judgment would endanger public health.

Dated at Tilton, N. H., July 29, 1908.

(Signed) C. R. Gould, M. D., *Member, Board of Health.*
Arthur T. Cass, *Member, Board of Health.*
C. A. Towns, *Member, Board of Health.*
H. A. Morse,
Walter C. Wyatt, } *Selectmen.*
C. Herbert Foss,
Frank R. French.
George W. Lord.
Myron S. Calkin.
E. R. Jackson.
John G. Davis.
C. H. Thomas.
Osborn J. Smith.
John M. Meserve.
A. L. Worthen.
C. W. Abbott.
J. M. Dresser.
M. G. Keaser.

George K. James, Jr.
A. S. Brown.
W. J. Keyser.
F. M. Clark.
J. Greenwood.
J. B. Erskine, M. D.
M. C. Allen.
E. A. Cole.
L. F. Cadue.
C. E. Marden.
Elmer R. Gale.
Arthur J. Roy.
Ray H. Perkins.
H. C. Boynton.
E. F. Houghton, M. D.
Luther H. Morrill.
Fred N. Clark.
George K. Burleigh.
J. B. Smith.
George B. Rogers.



Your petitioners further say that all of the sewerage from the City of Laconia is now and has been for a long time drained into said Lake Winnisquam; that many owners of summer homes and others are daily using the water for drinking and cooking purposes; that the refuse which is cast upon the shores becomes putrid and offensive in warm weather thus endangering the lives of those who may be near; that the draining of said sewerage into said lake as aforesaid is a great public nuisance and a menace to human life. Wherefore they pray that said board will investigate the case and make such rules and regulations as said board may deem sufficient to protect the public health.

The foregoing letter and petition were presented to the State Board of Health at its regular meeting, held April 20, 1909. The protection of Lake Winnisquam would necessitate the exclusion of sewage from The Weirs and the City of Laconia and from several points from these waters, which constitutes a problem of such magnitude that the board did not think it advisable to take action at the time; the petition was, therefore, laid upon the table.

At a subsequent meeting of the board, the matter was again considered in all its phases, and the board was unanimously of the opinion that it was impracticable at present to comply with the request of the petitioners, although recognizing the great desirability of the action asked for.

## BRISTOL.

*To the State Board of Health of New Hampshire:*

We, the subscribers, residents of Bristol, Grafton County, New Hampshire, being largely dependent upon Newfound Lake, situated in the towns of Bristol, Alexandria, Hebron and Bridgewater, for our water supply for domestic purposes, believe that the water of said lake is in danger of contamination and that the local regulations are not sufficient or effective to prevent such pollution: We therefore desire that the State Board of Health investigate the case and establish such regulations as they may deem necessary to protect the public health.

Charles W. Fling.
M. W. White.
H. H. Follansbee.
Lewis W. Fling.
C. H. Dickinson.
Kenson E. Dearborn.
Wilmer C. Cox.
Amos Blake.
A. E .Macuen.
Fred H. Ackerman.
Karl G. Cavis.
William H. Crafts.
G. B. Cavis.
F. M. Robertson, M. D.
Arthur Robie.
Henry Kenney.
D. M. Calley.
William C. White.
W. H. Marston.
F. S. Kirk.
A. H. Morrill.
R. W. Musgrove.
W. A. Gregory.
S. H. Dodge.
R.·L. Pray.
George A. Robie.
C. L. Jeffroy.
E. S. Bickford.
B. H. Jewell.
B. Hadley.
Fred W. Bingham.
E. J. Glines.
Aldis J. Sanborn.
Clarence H. Webster.
G. B. Simmons.
George H. Bailey.
Samuel Reid.
Oley A. Kinley.
Frank F. Lougee.
L. L. Rollins.
F. A. Spencer.
C. A. Smith.
J. W. Coolidge.
H. T. Heath.
E. T. Hutchins.
H. H. Morrill.
C. C. Durgin.
William Henderson.
W. H. White.
I. B. Burpee.
Q. A. Ballou.
V. C. Wheet.
D. B. Weymouth.
E. E. Littlefield.
H. C. Field.
S. H. Cross.
George H. Fowler.
L. W. Heath.
E. C. Merrill.
R. C. Tenney.
Albro Wells.
J. A. Bickford.
E. M. Davis.
H. W. T. Norris.
E. E. Dickinson.
C. W. Holmes.
M. O. Edgerly.
B. M. Ames.
Fay Whipple.
E. F. King.
A. W. Chase.
J. E. Dowd.
D. Ned Trumbull.
H. G. Cate.
J. H. Breck.
Fred B. Gray.
Walter Decato.
Chester A. Tenney.
Sumner T. Smith.
H. D. Cheney.
W. J. Braley.
Alvin Goodhue.
John C. Goodell.
Denis Haley.
Will Casey.
W. D. Chandler.
E. P. Hill.
C. H. Marston.
Channing Bishop.

Early in May, 1910, following the receipt of the foregoing petition, an inspector of the State Board of Health, in company with a member of the board of health of the town of Bristol, made a careful inspection of the shores of Newfound Lake, examining into the general condition of some over sixty cottages and other buildings, so as to determine the magnitude of the problem to be solved.

Prior to the formulation of the regulations for the protection of Newfound Lake, the secretary visited Bristol and held a consultation with the Board of Water Commissioners and the board of health as to what requirements should be exacted to safeguard the waters of this lake, from which the town of Bristol takes its water for domestic and other purposes.

A full report of the inspection and the facts obtained in the consultation, above referred to, was laid before the board at its regular meeting, held August 9, 1910, at which time the following was adopted:

THE STATE OF NEW HAMPSHIRE.

WHEREAS, A legal petition has been presented to the State Board of Health, asking for the establishment of regulations to protect the purity of the water of Newfound Lake, under the provisions of Chapter 57, Laws of 1899, entitled "An Act for the Protection of Public Water Supplies," the following regulations are promulgated:

REGULATIONS OF THE STATE BOARD OF HEALTH
FOR THE
PROTECTION OF THE PURITY OF THE WATER OF NEWFOUND LAKE
In the Towns of Bristol, Bridgewater, Hebron and Alexandria.

1. No sewage from any public or private sewer or from any cottage, hotel, farmhouse, boarding-house or other abode, or from any privy, stable or out-building shall be allowed to enter Newfound Lake, or any inlet thereof.

2. No sewage of any kind or water that has been used for washing or cleansing either materials, person or foods, shall be allowed to run into said lake or into any inlet thereof, or into any excavation or cesspool in the ground, or onto the surface of the ground so near the water of said lake as to endanger its purity.

3. No dead animal or fish, or part thereof, or of any articles perishable or decayable, kitchen waste, swill or garbage shall be thrown into said lake or be deposited so near it as to be liable to endanger the purity of the water.

4. No boat either for public or private use, or houseboat or other construction for use on the lake shall keep, have or maintain a ship-closet or other construction of easement which shall permit excrement or other offal to fall or empty into the lake.

5. None of these things, materials or conditions mentioned in the foregoing regulations, or anything else that might endanger the purity of the said water or ice supply, shall be permitted to exist in such locality or manner as, in the opinion of the local

board of health, would be liable to contaminate the water or ice of the said lake or its tributaries.

6. No bathing shall be allowed in said lake so near the intake of the Bristol water supply as would be liable to contaminate the water, and the local board of health of the town of Bristol shall fix the bathing limits.

7. It shall be the duty of the board of health of the towns bordering on the lake to enforce these regulations, which shall take effect and be in force on and after September 15, 1910.

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I hereby certify that the foregoing rules and regulations were adopted at a regular meeting of the State Board of Health, held at Concord, this ninth day of August, 1910.

IRVING A. WATSON,
*Secretary.*

# FOOD AND DRUGS INSPECTION.

# REPORT OF FOOD AND DRUG INSPECTION.

By Charles D. Howard, *Chemist.*

*Dr. Irving A. Watson, Secretary State Board of Health:*

Dear Sir.—I herewith submit my report of food and drug inspection for the biennial period ending August 31, 1910.

The summary shows a total of 1,304 examinations of food and drug products. Such work has occupied but a portion of the time of this department and is exclusive of examinations of water, also of liquor inspection for the State License Commission, as well as examinations of road materials for the State Highway Department, and further examinations for the public of miscellaneous character.

During the past year the work of food and drug inspection has been placed upon a much better basis through the appointment of a regular inspector attached to your board. Thus far, however, but a small proportion of the time of this appointee has been devoted to the collection of samples. It is expected in the near future to develop a regular system of inspection, permitting of a more or less thorough check being maintained, not only as to the sale of food and drugs of legal character but upon the sanitary conditions obtaining at the places where such sales are made.

## Legislative Needs.

To this end there is urgent need of a law supplementing the present legislation relative to slaughter houses. This should be extended to include conditions, not only at stores and markets, but at every place where food products of any description are handled or stored, and, further, such a law should be made to include specific provisions for enforcement, thus extending the present investigative limitation.

At the last session of the Legislature the following bill providing for sanitary inspections in connection with the production and sale of food products was introduced:

### AN ACT

**To Promote the Sanitary Production and Distribution of Food and Defining the Duties of the State Board of Health in Relation Thereto.**

*Be it enacted by the Senate and House of Representatives in General Court convened:*

Section 1. The existence or maintenance of any unclean, unhealthful or unsanitary condition or practice in any establishment or place where food is produced, manufactured, stored or sold, or of any car or vehicle used for the transportation or distribution thereof is forbidden.

SECT. 2. For the purpose of this act the term "food" as used herein shall include all articles used for food, drink, confectionery, or condiment, whether simple, mixed, or compound, and all substance and ingredients used in the preparation thereof. And for the further purpose of this act unclean, unhealthful, or unsanitary conditions or practices shall be deemed to exist if the floors, side-walls and ceilings are not properly constructed and maintained subservient with this requirement; or if food in the process of production, storage, sale or distribution is unnecessarily exposed to flies, dust or dirt, or to the products of decomposition or fermentation incident to such production, storage, sale or distribution; or if any person is being permitted to use as a sleeping room any place where food is prepared for sale, stored, served or old; or if any employer shall knowingly permit or suffer any person who is affected swith consumption, tuberculosis or any other communicable disease to work in such place; or if there is any other condition or practice which shall be deemed as endangering the wholesomeness of food.

SECT. 3. The State Board of Health, or its inspectors, or special agents designated for that purpose, shall have full power and authority at all times to enter and inspect every building, room, or other place occupied or used for the production, storage, sale or distribution of food, and all utensils and appurtenances relating thereto. And if any person, firm or corporation is found to be violating any of the provisions of this act, then the state board of health shall issue an order to the aforesaid to abate the condition or practice in violation, within such time as may be deemed reasonably sufficient therefor. Such order shall be transmitted by registered mail and the receipt of the postoffice department therefor shall be *prima facie* evidence of its receipt by the person or persons affected.

SECT. 4. The State Board of Health is empowered to make all necessary rules and regulations for the enforcement of this act; and it shall be the duty of local boards of health to assist in carrying out the provisions of this chapter whenever so requested by the State Board of Health.

SECT. 5. Any person, firm, company or corporation violating any of the provisions of this act and failing to comply with the lawful orders and requirements of the state board of health duly made and provided in sections 3 and 4 of this act, or whoever hinders or obstructs any inspector in the pursuit of his lawful duty, shall be guilty of a misdemeanor, and upon conviction shall be punished by a fine not exceeding ten dollars.

SECT. 6. All fines collected for the violation of this act shall be paid to the state treasurer, who shall deposit such money to the credit of a fund to be used for the carrying out of the provisions of this act and for the inspection of foods and drugs, such fund to be drawn against under the approval of the governor and council.

SECT. 7. This act shall take effect and be in force upon its passage.

This bill represents in an appreciably modified form a bill proposed by the State and National Association of Food and Dairy Departments and which has already been enacted into law by a number of the states. In all, a large proportion of the states have now adopted sanitary food laws of some kind and it has become urgently necessary for the welfare of the citizens of New Hampshire that some action in this direction be taken at an early date. While the above bill contains some defects—in favor of the producer or merchant—still it could be made to serve effectively, either in its present form, or in an abridged one which would confer upon the State Board of Health authority to promulgate definitions and regulations, with a penalty for violations of such. For no satisfactory reasons this bill was unexpectedly defeated in the Senate after having received the endorsement of the House.

### FOOD STANDARDS.

A bill providing for the enactment of food standards was also defeated. It encountered violent opposition on the part of certain local distributors, but that such opposition did not originate within this state but was instigated, organized and directed through a firm of New York attorneys, and that the association which the latter represented was active in opposing similar legislation in every state of the Union, is significant of the tremendous efforts which are being brought to bear to check any and all further attemps at legislation designed to place any restraint upon the production, distribution and sale of food products.

Nevertheless, there can be no logical objection urged to the enactment of a properly flexible set of food standards. Necessarily, the quality of almost every article is measured by a standard of some kind. The desire of certain food interests to have the present chaos in this connection maintained is not inspired from any respect for the consumer's welfare. The introduction of a section into the Food and Drugs Law, providing that the standards of the United States Department of Agriculture shall become the legal standards of this state, could work no hardship to any honest manufacturer or dealer, for the reason that such standards represent certain maximum and minimum limits, so broad in their scope that any unsophisticated food product, which was strictly what it purported to be and in fit condition to be sold without any qualifying description, would have no difficulty in falling well within such limits.

### COCAINE LAW.

The enforcement of a law regulating the sale of preparations containing cocaine devolves upon this department. This law has proved in operative, due to a defect in the phraseology.

### LAW RELALING TO SALES OF RENOVATED BUTTER.

An amendment to the milk law, passed during the last session and which requires the stamping of the retail package in connection with sales of renovated butter, has been found to be faulty and insufficient in its provisions. This section should be revised.



### WEIGHTS AND MEASURES.

Statutory provisions in this connection are very meager in character. Sealers of weights and measures are instructed to inspect the scales and measures employed in the sale of commodities, but there is no provision whatever for investigation and punishment in connection with sales involving short weight or measure. The milk law contains a requirement effecting the sale of milk in this regard and the general food law touches the matter only to the extent of requiring that *if the package bear any statement of weight or measure at all* (which it need not bear) such statement must be the true one—a requirement that is somewhat superfluous in that such a matter is well covered by the general provision effecting misbranding. Aside from the above there is nothing in the statutes standing between the people of New Hampshire and the consciences of their dealers. The need of legislation of this character has been conspicuously indicated by revelations occurring in other states of late and while it is not questioned that a majority of our merchants are thoroughly honest in a desire to give full value, still, human nature is the same in this state as elsewhere.

Especially is there need of a law regulating the sale of foods by measure. As evidence of this, the large number of "short" berry boxes noticeable in our markets during the past two or three seasons may be cited. Our investigations show that the "shorts" hold about 85 per cent. only of a full, or standard, quart basket. In other words, they are less than one fifth smaller,—just small enough to make it worth while for the dealer, without being small enough for the average unwary purchaser to notice any difference. The fact that these boxes are stamped upon the bottom with the word "short" in some cases, affords no protection to the consumer, while such a box does afford an opportunity to the not over-scrupulous dealer, seeking to create competition, to sell his wares at a seemingly slightly lower price while actually receiving an excessive one. In other states laws have recently been exacted forbidding the sale of "shorts," such laws providing that the sale of berries or other commodities offered to the public in small boxes shall involve the use only of full, standard size quarts, pints or half pints.

While the food law provides that if the label upon commodities states any weight or measure, such weight or measure shall be the true one, but a small proportion of the food stuffs on sale bear such a statement. Instead, in a large proportion of cases, the packages are made to approximate in size or appearance the standard pound, quart or other unit denomination of weight or measure, being, however, usually a certain amount short of such apparent quantity. Thus goods are billed to the retailer as "ones," "threes" or "fives," the implication being that such packages contain one, three or five pounds, respectively, and when the consumer calls for such a quantity, one of these pseudo "pounds," or its multiple, is delivered. In a number of instances we have been in receipt of complaints bearing upon the now notorious deceit in connection with the sale of lard in pails, and this deception, involving the charging in of the weight of the container as a part of the price of an expensive food stuff, applies to many other articles.

Yet there seems to be no present legal redress for any of the frauds involving short measure or weight except, as already mentioned, in the instances where such net weight or measure is declared upon the package label. There is immediate need of legislation establishing the size of containers used in the sale of fruit, vegetables and articles in bulk, and providing penalties for fraudulent sales.

For the further protection of the consumer, there should be a provision requiring that when the weight or volume of a packaged article differs from what it purports to be, as, *e. g.*, a full pound or quart, such net weight or volume shall be stated upon the label. I am aware that there is considerable opposition in certain quarters to such an enactment; nevertheless, I have failed to observe any really legitimate or unanswerable argument having been advanced in support of this opposition and the only conclusion is that the latter is inspired solely by an aversion to losing the opportunity to continue enjoying the increased profits accruing as a result of deceiving the public. It is not conceivable that there can be any basis of truth in the argument that such labeling will be responsible for any real or permanent increase in the cost of any article. The increased cost involved in the packaging of articles formerly sold in bulk has already been incurred. Packers of food products invariably aim to place a certain amount of an article in a package—no more and no less, and it is as easy to make the package contain one pound as to contain uniformly fifteen ounces, only.

### False Advertising.

Since the passage of the Food and Drugs Act, one of two prominent opportunities for deception has been largely eliminated. The purveyor of dishonest or questionable products now finds it dangerous to depart too far from the truth in what he states upon his labels. But one avenue of misrepresentation is still open; though the label must now tell the truth, there is no such requirement as regards the advertising copy accepted by the average periodical. And notwithstanding the increasingly numerous "fraud orders," the mails are continuing to prove an important auxiliary to the assistance imparted through the not overparticular magazine or newspaper.



As a matter of fact, for purposes of deception, untruthful labeling becomes puny and insignificant when compared with the advertisement that daily confronts a potential victim from the latter's newspaper or some bill-board. Undoubtedly, this is where the mischief is really accomplished in the majority of instances—for the reason that the dupe rarely sees the label before purchasing, whereas, it is the advertising that induces him, not only to make the initial purchase but, by continuous "hammering" and enlisting his powers of imagination, to continue the treatment. Laws regulating advertising, although hitherto derided as "freak" legislation, are now seriously being considered as a very necessary means for checking a great evil, and already two states have recently succeeded in securing the passage of such enactments.

A prominent example of this class of advertising is furnished by the Pond's Extract Company. The following is taken from a circular letter recently received by the writer. The italics are ours:

"The chances are that you already use Pond's Extract after shaving . . . but if you do not it must be because you have never tried it. This in turn must be either because you have been told that it is '*just the same thing as witch hazel,*' or else you consider it too expensive. As for the first, the man who tells you that Pond's Extract is the same thing as *witch hazel* is either *misinformed* or has an axe to grind. Pond's Extract is *purer*, *many times stronger*, and has a softer, more agreeable odor than witch hazel. Moreover Pond's Extract is matured for two years in oak casks, a process which permits important chemical changes and *greatly enhances its healing properties*. . . . The use of Pond's Extract after shaving will cost you one-half cent more per day than *witch hazel*. . . ."

The basis of misrepresentation involved in the above and other matter is that Pond's Extract is alleged as being an entirely different thing from witch hazel—that its peculiar virtues are such as to render it a sort of general panacea for a host of diversified ills,—external, internal, acute, chronic and constitutional. On the contrary, our investigations show that this preparation does *not* differ in any essential therapeutic respect that can be detected, from any other good preparation of hamamelis and that it is, in short, nothing else than aqua hamamelis. While we are not fully prepared to deny the truth of the above claim that this product has been "matured for two years in oak casks" (a statement not confirmed by the tannin test) yet assuming that this does take place, it is difficult to see wherein such maturation could in the slightest degree enhance its value as a curative agent—though it is conceded that it might have some effect in improving it *as a perfume.*

### Prosecutions.

Upon the basis that in general an occasional prosecution for the purpose of "jogging" the public's memory is to be preferred to any extended efforts in this direction—especially where the dealer is not a wilful violator—but relatively few cases have been brought in the courts during the past two years. Those presented for trial (with convictions secured in every instance) have included mainly prosecutions for the sale of adulterated (watered) milk, vinegar, ice cream and flavoring extracts.

It has become apparent, however, that for the effective enforcement of the law, greater activity in this connection is demanded in the case of a certain class of dealers and with certain products. At the present moment a batch of cases is under consideration, and in the future it is expected that the inspector, in addition to looking after general conditions, will devote a special effort toward securing evidence necessary for the prosecution of the more flagrant violations noted.

### * Substitutes and Imitations.

For almost every manufactured article of food of standard quality, the market affords a substitute or an imitation. Manufacturers claim that the public continually clamors for "something cheap" and that it will not pay the price that genuineness and real quality demand. In reality this is more or less of a libel upon the public. It is not to be presumed that the latter is actuated in purchasing an article of small price so much by a desire to get an inferior product as to secure a bargain. The true reason for the existence of such goods is to be found in the attempt to utilize waste products, coupled with competition and the striving for greater profits; also in the fact that most of these articles are legitimate products, if sold for what they are and at

* *Sanitary Bulletin*, January–April, 1909.

proper prices. The following will serve as illustrations of some of the goods "supplied in response to the public demand":

Tomato catsups made, not from "red ripe tomatoes" (as the labels are continuing to claim in some instances), but from the offal of the canning establishments—cores, skins, rotten fruit, green fruit—all such refuse being bought up regularly by certain catsup manufacturers and coverted into catsup, usually with the addition of "a little harmless coloring," generally with some starch to impart smoothness and body, and invariably benzoate of soda—manufacturers themselves now acknowledging that the latter is unnecessary in connection with sound products.

Another class is to be found in the compound jellies and preserves, the basis of which is the "apple stock" obtained by cooking and filtering evaporator waste.

Molasses vinegar and colored spirit vinegar—perfectly wholesome in themselves—cost the dealer much less money than cider vinegar, and it is nothing unusual to find these being substituted on an order for the latter.

In most cases the public pays as much or nearly as much for the co-called "blended" maple sugar, containing perhaps 10 per cent. of maple, as for the genuine article, while the "cane and maple" syrup mixtures cost the consumer more than he would have to pay for the same quantities of maple syrup and cane sugar if bought separately.

A recent purchaser of cream of tartar discovered that he had been sold a mixture of acid phosphate and starch labeled as "cream tartar compound," notwithstanding that the regular price of the former had been paid. Investigation showed that this article had cost the retailer much less than would have cream of tartar, while the cost to the packer was less than one fourth that of the grape product.

While all of these products were, without any compunctions, formerly labeled and sold as the genuine, the advent of food laws has, of course, placed a decided check upon such practices. Nevertheless, the impulse on the part of the manufacturer to lead the purchaser to believe his product is a standard article or at least better than it actually is, seems irresistible, and apparently much money has already been expended in the purchase of legal advice relative to means of accomplishing this end and at the same time of escaping any liability under the law.

In this connection the following are offered in illustration of the labeling now being applied to certain brands of extracts. In the first example it will be noted that the manufacturer's name does not appear upon the package—quite naturally, in view of the fact that the company also makes a line of standard extracts well known throughout the state.



**HALL**

**BRAND**

**EXTRACT**

**LEMON**

---

CONTAINS

OIL LEMON 4M

60% ALCOHOL 1 OZ.

---

UNIFORM QUALITY

---

PREPARED AT

36 & 38 BROWN ST.

PORTLAND, ME.

**MANHATTAN CLUB**

**EXTRACT OF PURE**

**VANILLA**

---

FORMULA

CONTAINS 25 PER CENT

OF ALCOHOL

SATURATED WITH

PURE VANILLA BEANS

---

PREPARED BY

J. H. FOLKINS CO.

BOSTON, MASS.

A fair general test of misbranding is the ascertaining of whether or not the character of the labeling is such as to be "likely to cause confusion or mistake in the mind of the public, or to deceive purchasers" (Trademark Act of February 20, 1905). In the above case there is no warrant or justification for the use of the apothecaries' formula; such conveys no information to either purchaser or dealer. Interpreted, it means that the amount of lemon oil in this brand is but 0.83%, or but 16.6% of what standard extract of lemon will contain.

The purchaser of the above would be justified, from the labeling, in believing, not only that this is standard extract of vanilla, but, being "saturated with pure vanilla beans," is presumably one of exceptional strength. But the extract manufacturer knows that alcohol of 25% will take but little from the bean, and in fact, this extract is exceedingly weak and a very dear article for the consumer to buy.

(FACE OF CARTON.)



FOLKINS

EXTRACT

OF

ORANGE

For Flavoring Cakes, Ice Cream, Sauces, Etc.

PREPARED BY

J. H. FOLKINS & CO.

BOSTON, MASS.

(LABEL ON BOTTLE.)

CONCENTRATED

EXTRACT

OF

ORANGE

For Flavoring Ice Cream, Jelly, Sauce, Pastry, Custard, Etc.

FORMULA.

| | |
|---|---|
| Oil of orange expressed from fresh orange peel | 1.5 pts. |
| Alcohol pure, 94% | 80.0 " |
| Coloring | q. s. |
| Water | 18.50 " |
| | 100.00 |

PREPARED BY

J. H. FOLKINS CO.

CHELSEA, MASS.

(STATEMENT ON SIDE OF CARTON.)

This extract is carefully prepared from selected materials and will be found superior in strength and flavor to a similar article of any other make.

In the above case the labeling of the carton (which is the only part of the package observable until opened for use) not only contains no intimation that the article is not a standard extract, but it actually purports to be "superior in strength and flavor." The label attached to the bottle represents the contents as a "concentrated" extract, and the manufacturer then attempts to justify all this by the formula that follows, the latter including, it will be noted, "coloring," added unquestionably for the purpose of leading the consuming public unversed about formulas, to believe that the extract is of standard strength.

## Summary of Food Examinations.

Following is a summary of the food examinations made during the period covered by this report. It being the practice to collect only suspected brands, and only those kinds of food liable to adulteration or misbranding, these figures should not be construed as necessarily representing the general condition. For this reason no percentages of adulteration are here given.

| | Total samples. | Not conformable. |
|---|---|---|
| Baking powders | 13 | 2 |
| Bottled sodas and tonics | 17 | 13 |
| Butter | 39 | 22 * |
| Catsups and table sauces | 14 | 4 |
| Coffee and coffee substitutes | 7 | 5 |
| Condensed milk | 23 | 2 |
| Cream | 24 | 5 |
| Cream of tartar | 6 | 1 |
| Cocoa | 18 | 11 |
| Celery salt | 4 | 2 |
| Cider | 13 | 5 |
| Canned meats | 3 | 0 |
| Fish | 15 | 3 |
| Flavoring extracts, lemon | 35 | 21 |
| Flavoring extracts, vanilla | 35 | 16 |
| Flavoring extracts, miscellaneous | 35 | 23 |
| Honey | 8 | 0 |
| Ice cream | 128 | 68 |
| Jellies, jams and preserves | 13 | 2 |
| Lard | 4 | 0 |
| Grape juice | 12 | 7 |
| Milk | 382 | 131 |
| Maple and mixed sugars | 14 | 1 |
| Maple and mixed syrups | 22 | 6 |
| Molasses | 11 | 0 |
| Edible oils | 30 | 6 |
| Oysters | 46 | 14 |
| Spices | 26 | 1 |
| Table salt | 9 | 5 |
| Vinegar | 68 | 17 |
| Miscellaneous | 29 | 4 |
| | 1,103 | 397 |

* Includes sales of renovated butter not properly marked.

## MILK.



Three hundred and eighty-two samples have been examined, of which one hundred and thirty-one were found to be below standard, adulterated by addition of water or skimming, or classed as illegal because of dirty condition. During the past two years no instance of the use of preservatives has been encountered.

An act in amendment of section 18 of the milk law, approved April 9, 1909, provides for a reduction of the minimum standard for milk solids from thirteen per cent., as formerly required during the winter months, to twelve per cent. for all seasons. This section as amended also establishes, in the case of cream and butter, minimum fat standards of eighteen and eighty per cent., respectively, and there is a further provision affecting the labeling of renovated butter.

In connection with the milk examinations made at this laboratory, attention is given to the sanitary condition of the sample as well as to the determination of quality and freedom from adulteration. While this is most valuable work, it is hampered to some extent at present by reason of the fact that neither standards nor methods of operating have as yet been fully developed and perfected.

The following table contains data showing examinations of milk found to be watered or skimmed. While no less than thirty-two samples of watered milk are here reported it needs to be emphasized that many of these represent duplicate collections from the same dealer. Six of the latter were prosecuted, all paying fines, which ranged in amount from $10 to $50, with and without costs. Some of these cases represent, not dealers who are selling this product to New Hampshire consumers, but producers shipping to Boston contractors and concerning whom repeated complaints had been received. Relative to the question as to the extent of the sale of watered milk within the state, our only guide is the result of the examination of samples submitted by the local inspectors, and it is but rarely that such samples are found to indicate milk other than of good quality, so far as composition is concerned, although there is still a woeful lack of cleanliness apparent in connection with some of the milk produced. An effort is being made to impress the fact upon both local inspectors as well as dealers and producers that dirty milk is not only much more dangerous than watered milk but under the law its sale is just as illegal.

MILK ADULTERATED BY ADDITION OF WATER OR SKIMMING.



| No. | Producer or dealer | Total Solids per cent. | Fat per cent. | Refract. at 20° C. | Remarks. |
|---|---|---|---|---|---|
| 4142 | F. E. Brooks, Berlin (L. A. Brown)...... | 10.38 | 3.2 | 36.5 | Watered. |
| 4285 | Conway Lunch Room, Berlin............ | 11.36 | 2.5 | ........ | Skimmed. |
| 4290 | Submitted from South Acworth.......... | 9.99 | 0.5 | ........ | Skimmed. |
| 4170 | John Byk, Manchester................. | 8.12 | 0.4 | 39.2 | Skimmed. |
| 4171 | Sam Hudzik, Manchester............... | 8.20 | 0.4 | 39.6 | Skimmed. |
| 4180 | Submitted from Lincoln................ | 10.44 | 2.7 | ........ | Watered. |
| 4425 | Submitted from Berlin.................. | 10.44 | 2.8 | ........ | Watered. |
| 4455 | T. W. Beckwith, Berlin (L. French)...... | 8.67 | 2.8 | 33.2 | Watered. |
| 4476 | Submitted from Concord............... | 11.22 | ........ | 36.6 | Watered. |
| 4518 | Submitted from Portsmouth............ | ........ | 1.7 | ........ | Watered or skimmed (sour sample). |
| 4519 | Submitted from Portsmouth............ | ........ | 1.6 | ........ | Watered or skimmed (sour sample). |
| 4807 | F. E. Brooks, Berlin.................. | 11.40 | 4.0 | 36.5 | Watered. |
| 4858 | Omer Pepin, Bedford.................. | 11.34 | 3.7 | 38.0 | Watered. |
| 4859 | Omer Pepin, Bedford.................. | 11.11 | 3.7 | 38.0 | Watered. |
| 4860 | Omer Pepin, Bedford.................. | 10.49 | 3.4 | 36.8 | Watered. |
| 4861 | Omer Pepin, Bedford.................. | 10.48 | 3.7 | 36.0 | Watered. |
| 4870 | L. H. Ward, Hampton.................. | 6.92 | 2.2 | 30.0 | Watered. |
| 4862 | W. L. Hilliard, Kingston............... | 10.72 | 3.7 | 35.0 | Watered. |
| 4863 | W. L. Hilliard, Kingston............... | 11.34 | 3.5 | 38.0 | Watered. |
| 4864 | W. L Hilliard, Kingston............... | 10.32 | 3.5 | 36.0 | Watered. |
| 4865 | W. L. Hilliard, Kingston............... | 11.43 | 4.0 | 36.8 | Watered. |
| 5077 | H. P. Clough, Concord................ | 11.14 | 3.1 | 38.4 | Watered. |
| 5078 | Perley Badger, Concord................ | 10.22 | 1.4 | 40.9 | Skimmed. |
| 855 | R. P. Hanno, Lisbon................... | 10.04 | 3.3 | 34.1 | Watered. |
| 856 | R. P. Hanno, Lisbon................... | 11.84 | 4.0 | 38.1 | Watered. |
| 857 | R. P. Hanno, Lisbon................... | 9.70 | 3.3 | 34.0 | Watered. |
| 858 | R. P. Hanno, Lisbon................... | 10.04 | 3.3 | 34.5 | Watered. |
| 848 | Merrill Tewksbury, Bath............... | 11.36 | 3.9 | 38.2 | Watered. |
| 849 | Merrill Tewksbury, Bath............... | 11.22 | 3.7 | 38.2 | Watered. |
| 845 | Merrill Tewksbury, Bath............... | 11.22 | 3.7 | 38.3 | Watered. |
| 846 | Merrill Tewksbury, Bath............... | 11.16 | 3.8 | 38.1 | Watered. |
| 847 | Merrill Tewksbury, Bath............... | 10.64 | 3.4 | 37.9 | Watered. |
| 5276 | R. E. Emery, Lyndeborough............ | 10.42 | 3.0 | 35.0 | Watered. |
| 5277 | R. E. Emery, Lyndeborough............ | 10.80 | 3.1 | 35.0 | Watered. |
| 5278 | W. R. Russell, Lyndeborough........... | 11.12 | 3.2 | 38.1 | Watered. |
| 5279 | W. R. Russell, Lyndeborough........... | 11.09 | 3.4 | 37.5 | Watered. |
| 5280 | W. R. Russell, Lyndeborough........... | 10.62 | 3.2 | 36.9 | Watered. |

[1] Fine $10 and costs.

## Renovated Butter.



Twenty-two sales of unlabeled renovated butter were noted, as follows:

RENOVATED BUTTER—ILLEGAL SALES.

| No. | Dealer. | Remarks. |
|---|---|---|
| 4940 | Submitted from Keene | Renovated butter. Sold as "Elgin Creamery." |
| 4947 | Cloverdale Co., Concord | Renovated butter. |
| 5008 | W. D. Prince, Manchester | Renovated butter. |
| 4985 | G. T. Robinson, Manchester | Renovated butter. |
| 4986 | E. C. Voisard, Manchester | Renovated butter. |
| 4987 | Bourgeois & Co., Manchester | Renovated butter. |
| 4989 | Griffin & Duguay, Manchester | Renovated butter. |
| 5015 | N. Lefond, Manchester | Renovated butter. |
| 5001 | A. D. Lemay, Manchester | Renovated butter. |
| 5002 | P. J. Charron, Manchester | Renovated butter. |
| 5003 | S. E. Gagnon, Manchester | Renovated butter. |
| 5005 | Guardet & Boulanger, Manchester | Renovated butter. |
| 5006 | F. B. Johnson, Manchester | Renovated butter. |
| 5007 | Lamoureaux Bros., Manchester | Renovated butter. |
| 5014 | Manchester Grocery Co., Manchester | Renovated butter. |
| 5012 | Gorman Bros., Manchester | Renovated butter. |
| 5011 | Dumas & Prince, Manchester | Renovated butter. |
| 5123 | Submitted from Concord | Renovated butter. "Creamery." |
| 1095 | H. C. Snell, West Manchester | Renovated butter. |
| 1096 | Adelbert Lemay, West Manchester | Renovated butter. |
| 1098 | F. C. Harbour, West Manchester | Renovated butter. |
| 1033 | Cloverdale Creamery, Rochester | Renovated butter. |

## Ice Cream.

During the last legislative session the ice cream law was amended so as to permit of the use in ice cream of "not more than one fifth of one per cent. of filler." Under the latter head is included, in addition to the eggs originally allowed, such articles as gelatin, cornstarch, flour, gum tragacanth, agar-agar, Irish moss, and any other edible substance possessing the property of swelling up or gelatinizing when appropriately treated with water.

As defined by the State and National Food Standards, the term "ice cream," unless specially qualified, is logically applied only to "the frozen product made from cream and sugar, with or without a natural flavoring." While, as has been previously shown, the primary object in the use of "fillers" would seem to have been for the purpose of replacing cream in sub-standard products, yet there has been a demand from some quarters for the use of small amounts of these articles because of the property they possess of maintaining the consistency of ice cream when shipped or carted and also when kept for considerable lengths of time. Hygienically, the latter would appear to be a doubtful advantage, although it is probably true that existing commercial conditions in the ice cream business demand the use of such articles to some extent.

In the case of the samples collected under the amended law no attempt has been made to determine the proportion of filler, although in a few instances it was obvious that such must have been appreciably in excess of the one fifth per cent. allowable. That the latter may properly be regarded as a fairly liberal allowance is suggested by the fact that as little as one per cent. of gelatin is required to produce a "jelly" with water alone.

In many instances where the use of a filler is apparent, it has proved difficult to determine its exact character, frequently on account of the fact that some commercial product has been employed. These are generally mixtures, and while many of them contain starch or gelatin, or both, other constituents are generally present. These are usually of a gummy character and include such products as gum tragacanth, "sea moss farine," etc.

One of the most serious objections to fillers in ice cream is that certain ones allow of the product being whipped up to such a light and frothy consistency that a pint of such may contain actually much less butter fat, and therefore less ice cream, than another product testing considerably lower as to fat. There is a great deal of difference in this respect, and it explains why some brands of ice cream can be sold (by volume), so much cheaper than can others testing just as high. Under present conditions, with the use of a filler legally sanctioned, the only equitable way to sell ice cream is by weight.

Of the one hundred twenty-eight samples examined, sixty-eight failed to conform to requirements, generally because of deficiency in content of butter fat. In many cases this was but slight. The following represent samples found to be deficient:

| No. | Collected of | Fatpercent. |
|---|---|---|
| 4147 | C. Chickles, Penacook | 11.0 |
| 4158 | John Papoulos, Somersworth | 8.0 |
| 4159 | Eli L. Barber, Somersworth | 7.0 |
| 4160 | H. Desmarais, Somersworth | 10.8 |
| 4205 | J. F. O'Dea, Hampton Beach | 4.0 |
| 4207 | Dudley & White, Hampton Beach | 5.0 |
| 775 | O. H. Piper, Laconia | 8.4 |
| 4628 | Joseph Lazor, Nashua | 8.3 |
| 4678 | George F. Georgi, Suncook | 7.5 |
| 4691 | Edward Hoyt, Manchester | 10.5 |
| 4698 | Abbidi Mazoret, Suncook | 3.0 |
| 4715 | Push-cart dealer, Concord | 4.0 |
| 4735 | Submitted from South Lyndeborough | 9.8 |
| 4749 | Dan Daoust, Manchester | 7.1 |
| 4757 | George Varney, Dover | 9.0 |
| 5293 | George Fisk, Concord | 2.8 |
| 5175 | Submitted from Milford | 6.8 |
| 5260 | Gieomo Behnuah, Pembroke | 2.0 |
| 5213 | Joseph Dondero, Portsmouth | 10.0 |
| 5214 | P. J. Tilton, Portsmouth | 6.0 |
| 5237 | Joseph Dondero, Portsmouth | 6.7 |
| 5244 | B. M. Tilton, Portsmouth | 6.8 |
| 5276 | E. H. Libbey, Portsmouth | 8.4 |
| 5298 | C. O. Garland, Rochester | 10.6 |
| 5299 | Lightbody Drug Co., Rochester | 9.4 |
| 5305 | J. Costello, Rochester | 9.0 |

### Flavoring Extracts.

One hundred and five extracts used for flavoring purposes have been examined, sixty of which were classed as illegal. These are divided into: vanilla, total 35, illegal 16; lemon, total 35, illegal 21; miscellaneous, total 35, illegal 23. The miscellaneous extracts included orange, peppermint and wintergreen, also various "fruit" extracts not labeled to show their imitation character.

An interesting line of flavoring preparations, put out by J. M. Pitkin, Newark, N. J., consists of a mixture or emulsion of the different flavoring principles with glycerin and what appears to be gum tragacanth so as to form a paste. The manufacturer rightly claims that much of the cost of an extract is in the non-flavoring vehicle, *i. e.* the alcohol, and to this extent his scheme seems a commendable one. Unfortunately he goes altogether too far in the claims he makes as to the strength of some of his products. The tubes sell for twenty-five cents, which is emphasized as being the price one would pay for "a two-ounce bottle of good alcoholic extract," whereas it is represented that one such tube is "actually equivalent to about ten ounces of the best alcoholic extract, which would cost $1.25." As though this were putting it too modestly, in another part of the circular the value of a twenty-five cent tube in terms of standard extract is stretched up to "about a pint."

An analysis of the lemon of this brand shows but 2.83% by weight of lemon oil. This represents a quantity of oil in one tube which if, dissolved to two ounces, would give a solution of but one-fifth standard strength, or, to put it another way, the quantity of oil actually present is sufficient to make less than one-half ounce of standard extract. From which it is evident that instead of getting five times the value of two ounces of standard extract as claimed, one is in reality receiving but about one-fifth the value of such two ounces.

VANILLA EXTRACTS FOUND ADULTERATED OR MISBRANDED.

| No. | Brand. | Manufacturer. | Collected of | Remarks. |
|---|---|---|---|---|
| 4161 | Extract Vanilla | | Submitted from Manchester | Adulterated with coumarin. |
| 814 | Highly Conc. Vanilla Extract | Howe & Quimby, Claremont | Howe & Quimby, Claremont | Vanillin 0.050%. Art. colored. Sample not "highly concentrated." Misbranded. |
| 803 | Mayflower Extract Vanilla | A. Colburn Co., Philadelphia | C. M. Mann, Newport | Vanillin 0.025%; art. colored. Below standard. |
| 4324 | Bastine's Extract Vanilla | Bastine & Co., New York | Union Gro. Co., Manchester | Vanillin 0.075%. Art. colored. (Old stock). |
| 4325 | Manhattan Club Extract of Pure Vanilla | J. H. Folkins, Boston | M. D. Knox, Manchester | Vanillin 0.025. Not properly labeled. |
| 4326 | Twentieth Century Ext. Vanilla | M. D. Knox, Manchester | M. D. Knox, Manchester | Vanillin 0.250%. Vanillin content high for a natural extract. |
| 4327 | Jackson's Ext. Vanilla (marked "compound") | A. B. Jackson & Co., New York | Emery Bros. & Co., Suncook | Vanillin 0.025%. Label unsatisfactory (old stock). |
| 4328 | Fiedler's Flavor of Vanilla | Germania Medicine Co., Lawrence, Mass. | P. F. Grenier, Manchester | Vanillin 0.200%. Formula claims 0.800%. Misbranded. |
| 4495 | Granite State Premium | Granite State Tea Co., Contoocook | Submitted from Contoocook | Adulterated and misbranded; artificial product. |
| 4567 | Kellogg's Pure Extract Vanilla | F. P. Adams & Co., Boston | Poore's Market, Manchester | Adulterated with coumarin. |
| 4716* | Concentrated Extract Vanilla | C. H. Eddy & Co., Brattleboro, Vt | Submitted from Nashua | Misbranded. |
| 4780† | Compound Concentrated Extract of Water White Vanilla | Theodore Metcalf Co., Boston | J. R. Yeaton, Portsmouth | Adulterated and misbranded. |
| 5060 | Green Mountain | C. H. Eddy & Co., Brattleboro, Vt | Earl Warren, Westmoreland | Misbranded and adulterated. |
| 5061 | High Grade Ext. Vanilla | C. H. Eddy & Co., Brattleboro, Vt | Earl Warren, Westmoreland | Misbranded and adulterated. |
| 4722 | Pure Conc. Extract Vanilla | J. B. Marchand, Berlin Mills | J. B. Marchand, Berlin Mills | Adulterated with coumarin and artificial color. |

*No. 4716, conspicuously labeled as "Concentrated Extract of Vanilla" and as "Strictly Pure Extract of Vanilla." A formula showing imitation character is obscurely placed. "Guaranteed under the Food and Drugs Act."

†No. 4780, certified as "an honest extract of superlative strength, aroma, flavor and keeping qualities. It is the only extract, to my knowledge of which it can be truthfully said it is perfectly pure." This remarkable claim is reinforced by the display upon the label of a bale of vanilla beans.

ADULTERATED AND MISBRANDED LEMON EXTRACTS.

| No. | Brand. | Manufacturer. | Collected of | Lemon Oil percent. | Color. | Remarks. |
|---|---|---|---|---|---|---|
| 4271 | Extract Lemon | Carlton Hurd, Newport | Carlton Hurd, Newport | 4.50 | .......... | Below standard. |
| 784 | Pure Extract Lemon | McAndrews, Portland, Me. | Elie Chebott, Keene | 4.60 | .......... | Below standard. |
| 808 | Burlington Extract Lemon | Burlington Extract Co., Burlington, Vt. | L. A. Bean, Claremont | None | Artificial | Misbranded. |
| 810 | XXX Triple Strength Pure Extract Lemon | None given | John Lynch, Claremont | None | Artificial | Misbranded. |
| 815 | Highly Conc. Extract Lemon | Howe & Quimby, Claremont | Howe & Quimby, Claremont | 4.37 | .......... | Belowstandard and misbranded. |
| 4329 | Finberg's Extract Lemon | Jos. Finberg, Attleboro, Mass. | Emery Bros. & Co., Suncook | 6.25 | Turmeric | Art colored with turmeric, not declared on label. |
| 4330 | Stone's Extract Lemon | H. J. Stone Co., Boston | Emery Bros. & Co., Suncook | 4.37 | Artificial | Art. colored. Misbranded. |
| 4332 | Manhattan Club Pure Ext. of Lemon | J. H. Folkins & Co., Boston | M. D. Knox, Manchester | 4.37 | .......... | Below standard. |
| 4333 | Hall's High Grade Ext. Lemon | Hall Extract Co., Portland, Me. | P. F. Grenier, Manchester | 4.70 | Artificial | Below standard. |
| 4334 | Hall Brand Extract Lemon | Prepared at 36 and 38 Brown St., Portland, Me. | S. A. Bates & Co., Suncook | 0.62 | .......... | Not properly labeled. |
| 4496 | Granite State Premium | Granite State Tea Co., Contoocook | Submitted from Contoocook | Trace | Artificial | Misbranded. |
| 4549 | Alcono Lemon Flavor (paste) | J. M. Pitkin Co., Newark, N. J. | Submitted from Lakeport | 2.83 | .......... | Misbranded. |
| 4556 | Huffer's Flavor of Lemon | Germania Medicine Co., Holyoke, Mass. | Spencer Dry Goods Co., Nashua | None | Artificial | Misbranded. |
| 4557 | Eclipse Extract Lemon | Manufactured at laboratory of J. E. P. Fearing. | F. Newton, Nashua | 0.12 | Artificial | Misbranded. |
| 4558 | Lemon Flavoring | Le Lealol Prep. Co., Melrose, Mass. | F. Newton, Nashua | None | Artificial | Misbranded. |
| 4559 | Kellogg's Extract Lemon | F. P. Adams & Co., Boston | Poore's Market, Manchester | 7.3 | Artificial | Added color not declared. |
| 4561 | Leighton's Pure Extract | R. G. Leighton, Portland, Me. | Annis F. & G. Store, Nashua | 5.3 | Artificial | Added color not properly declared. |
| 4783 | Charter Oak Lemon | Hartford Extract Co., Hartford, Conn. | C. P. Carroll, Portsmouth | 4.8 | Natural | Below standard. |
| 4784 | Crompton's Bay State Lemon | None mentioned | Cater & Benfield, Portsmouth | 0.3 | Artificial | Misbranded. |
| 4924 | Pure Conc. Extract Lemon | J. R. Marchand, Berlin Mills | J. R. Marchand, Berlin Mills | 6.0 | .......... | Sample not "concentrated." |
| 908 | Bulk | .......... | Submitted from Manchester | 0.6 | .......... | Below standard. |
| 5058 | Green Mountain | C. H. Eddy & Co., Brattleboro, Vt | Earl Warren, Westmoreland | 0.5 | .......... | Misbranded. |

### Baking Powders.

Thirteen samples were examined. Two of these were improperly branded and were classed as illegal. While the character of the raw materials in baking powders differs greatly in value and while there is also some choice as regards healthfulness, yet practically all of this article now on sale is plainly labeled so as to show its composition. The requirement of ten per cent. of available gas is being uniformly met.

### Bottled Soda and Tonics.

Considerable improvement has been noted in the labeling of these goods, most of them now being branded for just what they are. In a few cases bottlers have been found who failed to use any side-labels on their bottles but depended upon the statement: "artificial color and flavor" appearing in very fine print upon the cap, as being a sufficient notice of the imitation character. In the worst case of misbranding and adulteration encountered, the manager of the company made a personal visit, submitted new labels for our approval and has promised that his goods shall give us no further trouble.

### Celery Salt.

Of the four brands examined two were classed as illegal, one of these because of adulteration with a large amount of starch, the other because of the insufficient declaration of such an addition.

### Coffee and Coffee Substitutes.

Seven samples were examined, of which five failed to satisfy requirements, one representing an ordinary coffee containing an excessive amount of dirt and refuse. Two of these were of the now defunct "Digesto" brand of alleged detannated and caffein-less coffee. With one exception all of these alleged hygienic coffees have finally been driven off the market. The notable exception is the "Cafe des Invalides," packed by S. S. Pierce Company, Boston, Mass. According to the claims of this company, an "antidote" has been added to the coffee which effectually counteracts all of the bad effects ordinarily noted in connection with the habitual use of coffee. While our examination did not go further than to show an admixture of chicory, the packers claim the presence of other constituents, although they refuse to state their character but do admit that they are common articles used in everyday cookery, not of the character of drugs and that they cannot explain why such articles should have an antidotal effect, but only know that they do have such effect. Upon this company being notified of our finding in the matter, it replied by personal visit of attorney. The latter admitted that the federal government has a prosecution pending against this product and submitted a brief showing the line of defense. This would seem to consist (a) of an exposition before a jury of the good name and fame of the S. S. Pierce Company, and (b) of the testimony of some dozens of more or less prominent witnesses who would appear and declare that they could use this coffee without experiencing any ill effects.

It is almost unnecessary to suggest that similar testimony could be adduced with regard to the virtues of the most notorious and worthless of patent medicines, provided only that the latter was extensively advertised or sold and the user's imagination was in a sufficiently receptive state. The company claims that it sells upwards of 100,000 pounds annually of this coffee and as the "antidote" claim nets it a premium of ten cents per pound over the cost of the best grades of coffee, it can well afford to go to extraordinary lengths to defend the sale of this product.

## Cocoas.

Eighteen samples, representing practically all of the brands appearing upon the local market, were examined. In connection with these analyses special attention was given to the comparative solubilities of the various brands in water at different temperatures, and, incidentally, to their miscibility, or capacity of remaining in suspension in hot water — this for the reason that there seemed good ground for questioning the propriety of the term "soluble," so commonly applied to cocoas.

The cocoa bean is found in the seed-pods of the cocoa tree (*Theobroma cacao* L.). Following their removal from the pod, or fruit, the seeds are allowed to ferment for a day or so, after which they are dried and packed for shipment. The importing cocoa manufacturer subjects these seeds to a very careful roasting, whereby flavor and aroma are developed. After crushing and winnowing out the shells, the "nibs" are ground to a pasty mass, which solidifies on cooling and which is known as chocolate.

In order that this oily paste might be more readily miscible with hot water and afford a more homogeneous liquid on boiling, it was at one time a common custom to add to the product a considerable proportion of sugar, or starch, or both. It was in this practice,— in reality nothing less than adulteration,—that the term "soluble cocoa" has its origin. The present practice in the preparation of breakfast cocoa is to remove about one half of the fat by hydraulic pressure, thus permitting the resulting product to be ground very finely, a condition most essential for the proper incorporation of the powder with boiling water. In addition, some manufacturers of so-called "soluble cocoa" subject the powder to a treatment with alkali, whereby the fatty matter undergoes incipient saponification, the object being to secure a higher degree of miscibility with water. While the following results do show that the latter is thus attained in considerable degree, there is no evidence of any appreciable increase in actual solubility.

Such an emulsification, or blending with hot water does not constitute true solution. While the actual solubility in water is dependent in some degree upon the amount of fat present, the investigations here reported tend to show that in most cases less than one fifth of cocoa powder is soluble in cold water, while even on boiling for three minutes, less than one fourth of the cocoa is actually dissolved.

So far as the nutritive value is concerned, therefore, claims based upon solubility can have no weight; neither is it conceivable that a difference in the latter of a mere three or four per cent. can of itself have any material bearing upon the palatability or flavor. The latter is in far greater degree dependent upon the variety and quality of the cocoa beans and especially upon the care and skill with which they are handled throughout their preparation.

Other things being equal, the ideal cocoa is that which is the most perfectly miscible with boiling water and which deposits the minimum of sediment on standing for a brief time. That a very large proportion of the powder used in the preparation of this beverage would be eventually deposited upon the bottom of the cup is a fact familiar to anyone who has attempted to make so-called "instantaneous" cocoa, in the preparation of which actual boiling has been omitted. Even after the three or four minutes' boiling invariably essential to the preparation of a smooth, well-blended cup, the proportion of sediment that will deposit on standing is very considerable, and this is true even of the so-called "soluble" cocoas made by the Dutch process.

That the alkali-treated cocoas, however, have some advantage in this respect over the sort depending for miscibility upon fineness of grinding and partial removal of fat is evident from a consideration of the last column of figures presented in the accompanying table of analyses. These figures, designated as the "comparative rate of sedimentation," represent the relative volumes of sediment which unit weights of the different brands of cocoa, when treated with boiling water, were found to deposit in a given time. In determining these values exactly identical conditions as to proportions, time, and manner of procedure were carefully observed.



No. 878. *Benefit Brand Breakfast Cocoa.* Direct Importing Company, Boston. Said to be "manufactured by a special process which . . . renders the cocoa treble the strength of that ordinarily sold." This statement is untrue, and the product is further held as misbranded because of the claim made for solubility.

No. 896. *Ragus Breakfast Cocoa.* Ragus Tea and Coffee Company, New York. Misbranded because of the claim that it "will be found double the strength of ordinary grades of cocoa." The sample received was found to be short in weight.

No. 910. *Grand Union Cocoa.* Grand Union Tea Company, Brooklyn, New York. Passed.

No. 911. *Lowney's Breakfast Cocoa.* Walter M. Lowney Company, Boston. Passed.

No. 912. *Wilbur's Breakfast Cocoa.* H. O. Wilbur & Sons, Philadelphia. Passed.

No. 913. *Baker's Broma.* Walter Baker & Co., Dorchester, Mass. Represented as being a "combination of the Cocoa-Nut with other ingredients, innocent, invigorating, and agreeable . . ." The analysis shows this product to contain over twenty per cent. of cane sugar and a large proportion of arrowroot starch. Notwithstanding the dilution with these much cheaper substances and the fact that three times the usual quantity is specified to be used, this preparation retails at the same price as pure cocoa. In view of the large admixture of other substances, the display upon the outside of the package of a representation of some cocoa-pods is of questionable legality.

No. 914. *Runkel's Pure Breakfast Cocoa.* Runkel Bros., New York. Represents that the removal of the excess of oil "renders the powder perfectly soluble in hot water or milk and increases the strength three-fold as compared with chocolate or similar preparations containing sugar, starch or arrowroot." This statement is untrue and misleading. The can is made with a raised bottom, thereby giving the package a fictitious appearance of size.

No. 915. *Berry, Dodge Company's Cocoa.* Berry, Dodge Company, Newburyport, Mass. The analysis indicates this to be an alkali-treated cocoa. Passed.

No. 916. *Cloverdale Extra Quality Breakfast Cocoa.* The Cloverdale Company, Boston. Passed.

No. 917. *Huyler's Cocoa.* Huyler's, New York. Misbranded because of claim for solubility.

No. 5075. *Phillips' Digestible Cocoa.* Charles H. Phillips Chemical Company, New York. Instead of removing the fat, as is usually done, the manufacturers of this brand claim, while retaining this element, to have increased its digestibility by "the admixture of a suitable proportion of pancreatin, phosphates and sugar." Investigation fails to show any evidence whatever of the presence of either pancreatin or added phosphates. Cane sugar, however, was found to the extent of over thirty per cent. In the labeling of another package, evidently of somewhat later date, the manufacturers have evidently deemed it best to omit the reference to the presence of pancreatin. This sample is held as both adulterated and misbranded, for the reason that, although consisting of very nearly one-third cane sugar, the only reference to which is in some fine print on the back of the can, the principal label not only contains nothing to suggest its compound character but another label on the side of the package represents the contents as being "pure cocoa."

No. 5076. *Baker's Breakfast Cocoa.* Walter Baker & Co., Ltd., Dorchester, Mass. The label represents that the process used is such as to render the product "treble the strength of cocoa as usually prepared." The claim is also made that it "has more than three times the strength of cocoa mixed with starch, arrow-root or sugar." The first of these claims is untrue and the second is misleading, for the reason that it carries the inference that cocoa ordinarily suffers these additions, whereas such is of rare occurrence. The sample is further misbranded on account of the claims for solubility.

No. 5105. *Suchard's Soluble Cocoa.* Ph. Suchard, Neuchatel, Switzerland. The claim that "most of the cocoa butter has been eliminated" is untrue. This brand not only contains more than one half of the fat originally present but this residual portion is greater than the average. The sample is further misbranded, in addition to the claims for solubility, in that it is represented that "all indigestible constituents . . . have been completely eliminated." The claim that "it is free from alkali" constitutes another count for misbranding, in that it is sought to imply by this statement that the product has not been alkali-treated, whereas the analysis indicates the contrary, and that this brand is no freer from alkali than are others similarly treated.

No. 5106. *Bensdorp's Royal Dutch Cocoa. Pure. Soluble.* Amsterdam, Holland. This is an alkali-treated cocoa. The manufacturers claim that it is of "double strength" and that one-half teaspoonful only is required to a cup. While there can be no such thing as a pure cocoa of "double strength" in an absolute sense (except by the total elimination of fat), still as the analysis does indicate that the rate of sedimentation in the case of this brand is approximately one half that manifested by some of the others, it is possibly true that a cup with standard "body" can be prepared from this brand with one half the ordinary quantity. But it should be borne in mind that the true value of cocoa as a beverage is very largely dependent upon its stimulating and aromatic qualities, and, by boiling, the latter are extractable from any well-ground cocoa with comparative facility. In fact practical cup tests indicate that for the securing of equal flavor and aroma about the same proportions must be used with this brand as with the poorest miscible ones. Misbranded.

No. 5107. *Van Houten's Pure Soluble Cocoa.* C. J. Van Houten & Zoon, Weesp, Holland. Use of alkali suggested by labeling and confirmed by analysis. Represented as being a "highly concentrated cocoa." A circular accompanying introductory samples claims it to be "completely soluble; there is no sediment nor waste, and no boiling is required." The manufacturers elsewhere admit, however, that "unless absolutely boiling water is used, the best results can only be obtained by boiling the cocoa for about three minutes," thus practically admitting that for proper preparation, boiling for this brand is as essential as it is for any other. Misbranded.

No. 943. *Rockwood & Co.'s Semper Idem Breakfast Cocoa.* Rockwood & Co., New York. Improperly represented as being an "Extract of Cocoa." Misbranded.

Following the above report, which appeared in the issue of the *Bulletin* for April, 1910, an extensive correspondence ensued between this office and various manufacturers of cocoa. Most of the latter sought to deny the truth of the contentions set forth in the above and one of these (the Van Houten Company) submitted an elaborate and wordy printed brief (in itself an admission that they had before been called upon to defend and justify their labeling) containing the testimonials of various Continental chemists and physicians. The manufacturers of the Bensdorp brand, however, have adopted a different course. The matter was at once taken up by the local importers with the Holland manufacturers with the result that we have recently been informed that the latter have decided to accede to the points made in the above report and the label which they submit and claim they will henceforth use has been shorn of all objectionable language.

RESULTS OF THE EXAMINATION OF COCOA.

| No. | Brand. | Net weight claimed, oz. | Net weight found, oz. | Price per can, cents. | Equivalent cost per pound, cts. | Total ash, per cent. | Insoluble ash, per cent. | *Alkalinity of ash. | Fat, per cent. | Refraction of fat at 40° C. | Fiber, per cent. | Direct polarization. | Cane sugar, per cent. | Added starch. | Soluble in cold water, per cent. | Soluble at 65° C., per cent. | Soluble in boiling water, per cent. | Comparative rate of sedimentation. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 878 | Benefit | ..... | 3.9 | 9 | 37 | 5.00 | 3.50 | 4.2 | 23.10 | 47.6 | 4.30 | 0 | 0 | 0 | 20.4 | 22.1 | 25.3 | 82 |
| 896 | Ragus | 8 | †6.7 | 20 | 48 | 5.40 | 3.60 | 5.5 | 23.00 | 47.3 | 4.50 | 0 | 0 | 0 | 19.3 | 21.3 | 24.0 | 97 |
| 910 | Grand Union | 8 | 8.2 | 25 | 49 | 5.40 | 3.45 | 4.4 | 24.25 | 47.5 | 4.45 | 0 | 0 | 0 | 19.9 | 21.6 | 23.2 | 80 |
| 911 | Lowney's | 8 | 7.7 | 25 | 52 | 5.40 | 3.60 | 5.0 | 22.75 | 47.5 | 4.50 | 0.8 | 0 | 0 | 20.7 | 22.2 | 24.8 | 86 |
| 912 | Wilbur's | 8 | 8.2 | 25 | 49 | 4.55 | 2.45 | 4.2 | 30.15 | 47.1 | 3.75 | 0 | 0 | 0 | 17.0 | 19.2 | 21.0 | 98 |
| 913 | Baker's Broma | 8 | 3.0 | 25 | 50 | 1.45 | 1.00 | 2.0 | 26.05 | 47.0 | 1.10 | 24.0 | 22.5 | large | 38.1 | ....... | 40.7 | ..... |
| 914 | Runkel's | 3.2 | 3.5 | 10 | 46 | 5.50 | 3.65 | 4.9 | 24.15 | 47.4 | 3.85 | 1.2 | 0 | 0 | 19.7 | 21.5 | 22.8 | 98 |
| 915 | Berry, Dodge | ..... | 3.4 | 10 | 47 | 7.85 | 1.95 | 9.7 | 23.00 | 47.5 | 3.55 | 1.0 | 0 | 0 | 21.6 | ....... | 24.4 | 61 |
| 916 | Cloverdale | ..... | 4.0 | 10 | 40 | 5.40 | 3.20 | 6.1 | 23.70 | ....... | ....... | 1.2 | 0 | 0 | 20.1 | 22.0 | 24.2 | 81 |
| 917 | Huyler's | 8 | 8.0 | 25 | 50 | 4.90 | 3.15 | 5.4 | 27.50 | ....... | ....... | 0 | 0 | 0 | 18.0 | 19.5 | 21.1 | 87 |
| 5075 | Phillips' | 8 | 8.2 | 38 | 74 | 2.65 | 1.55 | 3.3 | 32.40 | ....... | ....... | 32.0 | 30.7 | 0 | 43.7 | ....... | 45.7 | ‡80 |
| 5076 | Walter Baker's | 8 | 8.2 | 23 | 45 | 5.15 | 3.30 | 5.4 | 27.75 | ....... | ....... | 1.2 | 0 | 0 | 19.0 | 20.6 | 21.8 | 110 |
| 5105 | Suchard's | 4 | 4.4 | 25 | 91 | 7.00 | 2.10 | 7.8 | 32.05 | ....... | ....... | 0.4 | 0 | 0 | 17.7 | 19.7 | 23.8 | 49 |
| 5106 | Bensdorp's | 8 | 8.0 | 35 | 70 | 6.50 | 2.20 | 7.5 | 28.55 | ....... | ....... | 0 | 0 | 0 | 17.7 | 20.2 | 24.7 | 48 |
| 5107 | Van Houten's | ..... | 2.7 | 15 | 90 | 8.10 | 1.65 | 8.0 | 29.50 | ....... | ....... | 3.2 | 0 | 0 | 19.8 | 20.8 | 23.7 | 58 |
| 943 | Rockwood's | 8 | 7.7 | 25 | 52 | 6.07 | 4.22 | 5.7 | 20.55 | ....... | ....... | 0.8 | 0 | 0 | 20.9 | 25.5 | 25.9 | 80 |

* cc. of n-10 alkali for 1 gram cocoa, using methyl orange.

† A second package was found to contain 7.25 ounces.

‡ Corrected for cane sugar content.

## Cider.

Of the thirteen samples of sweet cider examined, five were found to contain added preservatives, that in two cases being salicylic acid, with benzoic acid in the other three. Most of these were sold by Manchester vendors. The salicylic acid cases were prosecuted.

## Canned Meats.

Three samples of canned meats were received, all of which were found to be of good quality and correctly labeled. The net weight stated upon the cans in each case was found to be the true one.

## Fish.

Fifteen samples, mainly representing canned sardines, were examined. The analysis was directed toward determining the truth of the claim that the goods were packed in olive oil. In one instance only was any ground detected for disputing this claim, and the evidence in this case was not satisfactorily conclusive.

## Honey.

Eight samples were examined, none of which afforded evidence of adulteration or misbranding.

## Maple Products.

The samples examined include fourteen of sugar and twenty-two of syrups, the result indicating one of the former and six of the latter as being adulterated or misbranded. The adulterated sugar sample was submitted from a ten-pound can of soft sugar. None of the syrups sold as straight maple were found to be adulterated, the illegal syrup cases consisting of improperly labeled brands of mixed syrups.

## Molasses.

Eleven samples of molasses were examined for added glucose, with negative results in each case.

## Spices.

Twenty-six samples were examined, all but one of which were found to be of standard quality. The varieties examined include: pepper, nine samples; ginger and cloves, three samples; allspice, four samples; mace, two samples; cassia, cayenne and nutmeg, one sample of each.

## Oysters.

On September 15, 1909, the following order was issued:



### Notice to Dealers in Oysters.

The addition of water to shucked oysters, by both packer and retailer, is a practice that has long been recognized as of rather common occurrence. A still more frequent practice is to be found in the shipment to the retailer of oysters refrigerated in the shipping package by the direct addition of ice.

In their proper character shucked oysters consist principally of the solid (unbloated) meat, and the proportion of liquid should be small. It is obvious that the addition of either water or ice must result in a dilution necessarily involving a lowering of the quality. The first is solely for purposes of fraud, while the second not only materially inflates the volume of the product but is unsanitary, as well as wholly unnecessary.

Ice packed around the container holding the oysters, in shipping cans made for that purpose and which are largely used in many localities, secures the necessary refrigeration.

At a regular meeting of the State Board of Health, the following resolution was therefore adopted:

Whereas, Since the addition of water or ice to shucked oysters has the effect of lowering, depreciating and injuriously affecting their strength, quality and purity, therefore be it

*Resolved*, That as such condition constitutes an adulteration under the Statutes of the State, the sale of oysters so adulterated will be contested.

Dealers are hereby instructed not to accept oysters to which water or ice has been added, and they are cautioned not to add ice to oysters nor to dilute them with water.

Per order,

IRVING A. WATSON,
*Secretary.*

Concord, N. H., September 15, 1909.

The response on the part of the dealers to the order issued September 15 last, relative to the shipment and handling of oysters, has proved to be quite prompt, and most gratifying results are already noticeable. One year ago almost no oysters were being received in double packages, icing by direct contact being the rule. At the present time, our inspection has thus far failed to reveal a single instance where the latter is being practised. Moreover, the amount of liquid, *i. e.*, water, present in oysters as on sale today has very greatly decreased over that noted in the past. The consumer is, therefore, not only receiving the benefit of better and more sanitary methods of handling, but he is getting more oysters for his money. Very much of the credit for this is due to the jobbers, without whose active coöperation doubtless but little could have been accomplished in this brief time. In fact, that the former method of shipment will soon be a thing of the past is evident from an order recently issued in this connection by the Federal Board of Food and Drug Inspection, which becomes effective May 1 of this year.

No official standard for the amount of water permissible has as yet been fixed. It should be understood that oysters are washed after shucking, so that the liquid mixed with them as they come to the consumer, does not, as is frequently supposed, represent the natural liquor. Furthermore, if "bloating" or "drinking" in fresh water has been practised, the proportion of solid matter in the meats will be appreciably diminished, as a result of the abnormal swelling in volume. Pending the adoption of a standard, this department will hold a water content representing free liquid in excess of 17 per cent. or total solids less than 10 per cent., as excessive. That this is a liberal margin is evident, not only from investigations made elsewhere, but from the results shown in the following table. These data indicate a range in free liquor content of from 2.3 per cent. to 37 per cent., with an average of 13.3 per cent. Forty per cent. of the samples contained less than 10 per cent. free liquor. But one sample contained less than 10 per cent. total solids, the highest content being 21.9 per cent., with an average of 15.4 per cent. Approximately 70 per cent. of the samples showed a total solid content of 15 per cent. or over. The prices charged ranged from thirty-five cents to fifty cents per quart, and in general there is but little apparent relation between price and quality.

None of the samples received were found to contain any added preservative. The following table gives the results of examination of some of the samples received during the past two years:

EXAMINATION OF OYSTERS.

| No. | Dealer. | Price per quart. | Free liquor %. | Total solids %. |
|---|---|---|---|---|
| 4855 | Submitted from Concord | $0.35 | 6.0 | ........... |
| 4944 | Jameson Fish Market, Concord | ............ | 21.2 | 10.9 |
| 4945 | Philbrick Fish Market, Concord | .35 | 25.1 | 13.0 |
| 4949 | John E. Berry, Concord | .40 | 28.6 | 9.7 |
| 4952 | Nolan & Corbett, Concord | .45 | 20.1 | 15.1 |
| 4951 | James Martin, Concord | .45 | 19.0 | 15.1 |
| 4950 | Gale & Brown, Concord | ............ | 8.3 | 15.4 |
| 4953 | H. H. Chamberlin, Concord | .40 | 6.5 | 16.3 |
| 4954 | Lyster Brothers, Concord | .40 | 12.2 | 16.3 |
| 4960 | G. B. Whittredge, Concord | .45 | 9.8 | 15.6 |
| 4961 | Concord Cash Market, Concord | .40 | 28.3 | 12.4 |
| 4962 | C. F. Bunker, Concord | .45 | 16.3 | 17.4 |
| 4963 | A. F. Heath, Concord | .50 | 5.0 | 21.9 |
| 4964 | A. L. Maher, Concord | .45 | 25.2 | 14.4 |
| 4965 | H. H. Crockett, Concord | ............ | 13.8 | 14.4 |
| 4971 | C. D. Steele, Manchester | .40 | 11.0 | 17.8 |
| 4972 | Twentieth Century Market, Manchester | .40 | 21.0 | 11.5 |
| 4973 | C. E. Newcomb, Manchester | .40 | 11.0 | 17.1 |
| 4974 | Annis Flour & Grain Co., Manchester | .40 | 11.0 | 17.0 |
| 4993 | E. S. Newton, Manchester | ............ | 11.0 | 13.0 |
| 4994 | Gorman Brothers, Manchester | .45 | 19.0 | 18.9 |
| 4995 | G. T. Robinson, Manchester | .35 | 13.0 | 15.2 |
| 4996 | E. C. Voisand, Manchester | .45 | 19.0 | 15.0 |
| 5023 | A. D. Prince, Manchester | .40 | 25.0 | 16.6 |
| 5026 | Wiggin, Young & Co., Manchester | .40 | 8.0 | 14.6 |
| 5027 | Lamoureaux Brothers, Manchester | .40 | 14.0 | 19.1 |
| 5028 | Annis Flour & Grain Co., Manchester | .40 | 2.7 | 18.6 |
| 5024 | Dumas & Prince, Manchester | .40 | 37.0 | 12.5 |
| 5075 | E. Quirin, Manchester | .40 | 23.0 | 12.7 |
| 5032 | Cortland Provision Co., Dover | ............ | 2.3 | 19.3 |
| 5033 | H. D. Philbrick, Dover | ............ | 5.2 | 15.8 |
| 5034 | E. H. Gowen & Son, Dover | ............ | 9.2 | 14.7 |
| 5035 | Colbath Brothers, Dover | ............ | 6.6 | 16.5 |
| 5036 | Eben Berry, Dover | ............ | 3.1 | 18.9 |
| 5037 | Globe Market, Dover | ............ | 2.5 | 15.7 |
| 5038 | Gray's Grocery, Dover | ............ | 6.6 | 19.1 |
| 5039* | Clement's Restaurant, Dover | ............ | 23.7 | 20.4 |
| 5040 | People's Market, Dover | ............ | 9.8 | 16.5 |
| 5041 | R. A. Newton, Portsmouth | ............ | 11.4 | 14.1 |
| 5042 | John Holland, Portsmouth | ............ | 5.6 | 18.7 |
| 5043 | John O. Downs, Portsmouth | ............ | 6.1 | 16.8 |
| 5044 | Kershaw & Hodgdon, Portsmouth | ............ | 14.6 | 17.6 |
| 5045 | John McIntyre, Rochester | ............ | 8.9 | 15.8 |
| 5046 | F. R. Adams, Rochester | ............ | 10.1 | 13.5 |
| 5047 | Joseph Norris, Rochester | ............ | 19.8 | 13.3 |
| 5048 | J. C. Hurd, Rochester | ............ | 7.1 | 17.1 |

* Shell oysters. Natural liquor.

## Grape Juice.

Twelve samples, representing eleven different brands of grape juice, were submitted to a complete analysis. With one possible exception, there is reason to believe that all of these represent the genuine, undiluted juice of the grape. Some of the samples, however, were much more cloudy, and showed more sediment than others, and while a certain amount of cloudiness seems unavoidable in the pure, untreated article, yet it is apparent that, in one or two cases, an excess was attributable to undue extraction of seeds and skins. One sample contained added cane sugar, the presence of which, not being declared upon the label, must be regarded as an adulteration. While most of the samples contained no more than the merest traces of alcohol, or none at all, one brand is classed as adulterated and misbranded because of the presence of 0.83 per cent. of this compound. Considerable variation in the amount of acid is noticeable, the latter being in greatest amount in the white juices.

No. 5163. *Walker's Grape Juice.* Grape Products Co., North East, Pa. "The brand that raised the standard." This product has of late been extensively advertised, the principal claims for its purity being based upon the absence of any opacity and the alleged complete absence of tannin or other astringent substances. Examination, however, shows not only that it is the thinnest of any of the juices examined, but that it does contain tannin in appreciable quantity. Of two samples examined, both were found to be materially short of the volume claimed. Misbranded.

No. 5164. *Welch's Grape Juice.* Welch Grape Juice Co., Westfield, N. Y. Passed.

No. 5176. *Duffy's Grape Juice.* Sterilized 1842. Non-alcoholic. Unfermented. American Fruit Products Co., Rochester. Contains an unnecessary amount of alcohol for a pure, carefully made product. Held as adulterated and misbranded.

No. 5175. *Randall's Gold Medal Brand.* Chatauqua Fruit Co., Ripley, N. Y. "It makes new blood." The sample received showed an excessive amount of opacity and sediment, and the proportion of sugar in the solids is the lowest of any of the unsweetened juices.

No. 5176. *Bass Islands Unfermented Catawba Grape Juice.* Bass Islands Vineyards Co., Sandusky, Ohio. Short of volume claimed. Misbranded.

No. 5186. *Indian Head Irondequoit Unfermented Grape Juice.* Irondequoit Fruit Juice Co., Rochester, N. Y. Passed.

No. 5192. *Meier's Grape Juice (Catawba).* John C. Meier Grape Juice Co., Silverton, Ohio. Represented as containing 0.034 per cent. of sulphurous acid. Through the use of the latter compound this product has been bleached almost to whiteness. It is questionable if a product thus treated is a suitable article for "the sick and convalescent," as claimed. The use of sulphur dioxide as an antiseptic, whether declared upon the label or not, is illegal in New Hampshire. Adulterated.

No. 5194. *Naboth Pure Unfermented Concord Grape Juice.* Naboth Vineyards, Brocton, N. Y. Contains added cane sugar, not declared. Adulterated.

No. 5195. *Princess Indian Head Brand Grape Juice (Catawba).* Irondequoit Fruit Juice Co., Rochester, N. Y. Passed.

No. 1122A. *Fenner's Chatauqua Grape Juice.* Fenner Grape Juice Co., Westfield, N. Y. Passed.

No. 1123A. *Vineland Grape Juice.* Vineland Grape Juice Co., Vineland, N. J. Passed.

RESULTS OF THE EXAMINATION OF GRAPE JUICE.

| Number. | Brand. | Manufacturer. | Cost, cents per bottle. | Volume claimed, ounces. | Volume found, ounces. | Specific gravity at 15.5°C. | Extract, grams in 100 c.c. | Alcohol, %. | Total acids, as tartaric, %. | Volatile acids, as acetic, %. | Poparization, undiluted. a | Poparization, undiluted. b | Glucose. | Cane sugar. | Reducing sugars, grams in 100 c.c. | Per cent. reducing sugars in extract. | Ash, %. | Alkalinity of soluble ash. | Preservatives. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5163 | Walker's.......... | Grape Products Co., North East, Pa. | 25 | 16 | 15.2 | 1.0609 | 15.84 | Traces | 1.07 | .03 | —19.5 | —19.5 | 0 | 0 | 12.45 | 78.6 | .33 | 25 | 0 |
| 5164 | Welch's.......... | Welch Grape Juice Co., Westfield, N. Y. | 50 | 32 | 32.0 | 1.0750 | 19.50 | Traces | 0.81 | ...... | —21.7 | —23.9 | 0 | Slight | 15.46 | 79.2 | .39 | 25 | 0 |
| 5165 | Duffy's .......... | Am. Fruit Products Co., Rochester, N. Y. | 18 | .... | 14.8 | 1.0627 | 16.57 | 0.83 | 0.93 | .02 | —20.8 | —20.8 | 0 | 0 | 15.20 | 91.7 | .28 | 20 | 0 |
| 5166 | Walker's.......... | Grape Products Co., North East, Pa. | 25 | 16 | 14.6 | 1.0597 | 15.48 | ........ | ...... | ...... | ...... | ...... | .... | ........ | ........ | ........ | .... | ..... | |
| 5175 | Randall's.......... | Randall Grape Juice Co., Ripley, N. Y. | 25 | .... | 15.2 | 1.0763 | 19.81 | None | 1.27 | 0.02 | —21.0 | —21.6 | 0 | 0 | 12.52 | 63.2 | .36 | 28 | 0 |
| 5176 | Bass Islands' Catawba | Bass Islands' Vineyards Co., Sandusky, Ohio | 05 | 4 | 3.9* | 1.0803 | 20.86 | None | 1.17 | 0.02 | —26.8 | —26.8 | 0 | 0 | 13.68 | 65.5 | .17 | 16 | 0 |
| 5186 | Indian Head....... | Irondequoit Fruit Juice Co., Rochester, N. Y. | 25 | 16 | 16.0 | 1.0769 | 20.02 | 0.15 | 0.87 | 0.02 | —28.0 | —28.0 | 0 | 0 | 15.49 | 77.4 | .40 | 28 | 0 |
| 5192 | Meier's.......... | J. C. Meier Grape Juice Co., Silverton, Ohio | 10 | .... | 3.6* | 1.0795 | 20.73 | 0.15 | 1.23 | ...... | —27.0 | —27.0 | 0 | 0 | 16.29 | 78.0 | .27 | 10 | Present† |
| 5194 | Naboth.......... | Naboth Vineyards, Brocton, N. Y. | 25 | .... | 16.0 | 1.0818 | 21.25 | Traces | 0.88 | 0.01 | —12.4 | —26.8 | 0 | Present | 12.72 | 59.9 | .22 | 16 | 0 |
| 5195 | Princess.......... | Irondequoit Fruit Juice Co., Rochester, N. Y. | 25 | 16 | 15.9 | 1.0843 | 21.91 | None | 0.96 | 0.01 | —30.5 | —34.0 | 0 | Slight | 15.65 | 71.4 | .22 | 20 | 0 |
| 1122A | Fenner's.......... | Fenner's Grape Juice Co., Westfield, N. Y. | 10 | .... | 4.0* | 1.0768 | 19.94 | None | 0.76 | 0.03 | —22.2 | —24.0 | 0 | Slight | 14.95 | 74.9 | .27 | 23 | 0 |
| 1123A | Vineland.......... | Vineland Grape Juice Co., Vineland, N. Y. | 10 | .... | 3.6* | 1.0789 | 20.49 | None | 1.02 | ...... | —22.5 | —25.4 | 0 | Slight | 15.47 | 75.0 | .30 | 23 | 0 |

* Average of four bottles.
†Stated to contain .034 per cent. of sulphur dioxide; found, .022 per cent.

## Table Salt.

Nine brands were examined, of which four represent prepared salt. Two imported brands are included.

The standard of the State and National Food Departments defines table and dairy salt as a "fine-grained crystalline salt containing on a water-free basis not more than one and four-tenths per cent. of calcium sulphate, nor more than five-tenths per cent. of calcium and magnesium chlorides, nor more than one-tenth per cent. of matters insoluble in water."

None of the samples were found to violate the letter of the above requirements, although the sum of the sulphates present in one of the imported brands, if calculated as gypsum, would be considerably in excess of the limit for this constituent. The principal impurity of the New York and Michigan salt is sulphate of calcium (gypsum). Calcium and magnesium chlorides are vigorous moisture absorbents and as the proportion of such compounds in this salt is relatively small, the latter, unlike that produced from the Ohio Valley brines, can be stored in sacks without taking up excessive moisture.

It has long been recognized that if salt be mixed with five to ten per cent. of corn starch the troublesome property of becoming moist in warm weather is obviated. The fact that a smaller admixture of certain other materials will afford the same result now receives extensive commercial application. The compounds noted in these prepared brands are the phosphates and carbonates of lime and magnesia, the proportion used ranging from as little as six tenths of one per cent. to nearly three per cent.

In so far as sentiment may be the ruling cause, the demand on the part of a certain class of consumers for salt from "across the water" will doubtless continue, regardless of considerations of either price or quality. But if the two well-known specimens here reported may be accepted as typical, it would seem that in neither respect can the British product compare with the American. These brands contained the least actual salt of any in the list, while the price was approximately double that for the corresponding American article.

No. 4813. *Purity Salt* (*prepared*). International Salt Company, New York. Labeled as containing over 99% of high grade Purity Salt and less than one per cent. of phosphate. The analysis indicates the drier to consist of calcium phosphate in the proportion of 0.626%. Notwithstanding this insignificant amount, the quantity of moisture in this brand is extremely small. While the product is remarkable in this respect, there are several other salts in the list that show a trifle less of soluble impurities.

No. 4814. *Ivory (Compound) Salt.* Worcester Salt Company, New York. Labeled as containing 99% of high grade table salt, with one per cent. of carbonate of magnesia. The analysis shows that the amount of drier (1.80%) is considerably in excess of this guaranty.

No. 4815. *Extra Refined British Table Salt.* Crosse & Blackwell, London, Eng. Contained in a stone-ware jar. Notwithstanding that this is the most expensive salt sampled, it contained the largest amount of impurities. For this reason the designation "Extra Refined" is held as misbranding.

No. 4816. *Peerless Brand Granulated Salt.* Charles E. Moody & Co., Boston. Packed in bags. The proportion of insoluble matter in this brand is slightly greater than in any of the other plain salts and the solution afforded is the darkest.

No. 4817. *Crystalline Salt.* Crystalline Salt Company, Boston. Packed in bags. The claim on the package that this brand is "entirely free from lime and other impurities found in common salt" is untrue and amounts to misbranding.

No. 4818. *Worcester Brand Salt.* Worcester Salt Company, New York. Packed in bags. Of the three bag samples this gives the whitest solution.

No. 4819. *Shaker Table Salt.* Diamond Crystal Salt Company, St. Clair, Mich. Labeled as containing 1.75% of calcium carbonate as drier. The analysis shows 1.67% of carbonates. A slip attached to the package contains the misleading statement that this is "the only salt in the world over 99% pure." * It is true, however, that the salt used in the preparation of this brand is the purest of the samples here reported.

No. 4822. *Diamond Crystal Table Salt.* Diamond Crystal Salt Company, St. Clair, Mich. Packed in cartons.

No. 4823. *Prepared Cerebos Table Salt.* Cerebos, Ltd., London, Eng. The carton shows a formula claiming: "Refined table salt, 97.82%; calcium phosphate 1.63%; magnesium phosphate 0.44%; sodium phosphate 0.11%. The analysis shows a somewhat higher proportion of drier than these figures indicate—the amount used being the greatest in any of the prepared samples.

* Some of the advertising issued by the manufacturers of this brand is open to objection in that it carries the inference that the averag brand of table salt contains excessive and dangerous quantities of impurities—an imputation that is not borne out by the facts. Furthermore it should not be forgotten that the manufacturers themselves admit the actual addition to this product for drying purposes of as much as 1.75% of a lime compound.

## ANALYSES OF TABLE SALT.

| Number. | Brand. | Moisture. Per cent. | Calculated to water-free basis. Calcium sulphate. Per cent. | Calcium chloride. Per cent. | Magnesium sulphate. Per cent. | Magnesium chloride. Per cent. | Sodium sulphate. Per cent. | Insoluble matter. Per cent. | Total soluble impurities. Per cent. | Pure salt. Per cent. | Price per package, cents. | Cost per pound, cents. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4815 | Extra Refined British (jar) | .000 | 1.100 | .000 | .042 | .000 | 1.464 | .028 | 2.606 | 97.400 | 20 | 9.7 |
| 4816 | Peerless (bag) | .910 | .992 | .166 | .000 | .052 | .000 | .048 | 1.210 | 98.742 | 5 | 2.0 |
| 4817 | Crystalline (bag) | .810 | .940 | .070 | .000 | .012 | .000 | .014 | 1.022 | 98.964 | 5 | 2.0 |
| 4818 | Worcester (bag) | .390 | .994 | .000 | .000 | .030 | .000 | .025 | 1.024 | 98.950 | 10 | 2.0 |
| 4822 | Diamond Crystal (carton) | .027 | .410 | .000 | .012 | .007 | .000 | .010 | .429 | 98.560 | 10 | 3.0 |

## ANALYSES OF PREPARED TABLE SALT.

| Number. | Brand. | Moisture. Per cent. | Calculated to water-free basis. Calcium sulphate. Per cent. | Calcium chloride. Per cent. | Magnesium sulphate. Per cent. | Magnesium chloride. Per cent. | Sodium sulphate. Per cent. | Insoluble matter. Per cent. | Total soluble matter. Per cent. | Total soluble impurities. Per cent. | Actual salt present. Per cent. | Purity of salt used in mixture. Per cent. | Price per package, cents. | Cost per pound, cents. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4813 | Purity | .090 | 1.062 | .058 | .000 | .048 | .000 | .626 | 99.370 | 1.168 | 98.206 | 98.830 | 10 | 4.3 |
| 4814 | Ivory | .560 | .493 | .000 | .630 | .247 | .000 | 1.800 | 98.200 | 1.370 | 96.830 | 98.500 | 10 | 5.0 |
| 4819 | Shaker | .050 | .204 | .070 | .000 | .017 | .000 | 1.670 | 98.330 | .291 | 98.049 | 99.710 | 10 | 4.7 |
| 4823 | Cerebos | .185 | .646 | .000 | .225 | .000 | .189 | 2.905 | 97.095 | 1.060 | 96.035 | 98.913 | 12 | 8.7 |

### Examination of Drugs and Proprietaries.

The following summary shows the results in this connection:



| | Total. | Not conformable. |
|---|---|---|
| Camphorated oil | 6 | 5 |
| Lime water | 10 | 3 |
| Milk Sugar | 13 | 2 |
| Precipitated sulphur | 5 | 1 |
| Spirits camphor | 11 | 7 |
| Spirits anise | 21 | 6 |
| Spirits peppermint | 23 | 17 |
| Spirits wintergreen | 13 | 9 |
| Tincture iodine | 15 | 8 |
| Proprietaries and miscellaneous examinations | 84 | .. |
| Totals | 201 | 58 |

### Camphorated Oil.

The pharmacopœial requirement is 20 per cent. of camphor. Very few of the preparations on sale have been found to contain as large an amount of camphor as this. The products of this description to be found at the grocery stores are on nearly every case deplorably deficient. Even in the case of the druggists' preparations the results are far from satisfactory. Some druggists, it might seem, are of the opinion that ten per cent. of camphor is sufficient, or it is conceivable that in some cases the druggist may confuse the requirement for this product with that of the spirits of camphor, which is ten per cent.

### Precipitated Sulphur.

But one sample of adulterated precipitated sulphur was received and this doubtless represented old stock. There has been a very marked improvement made in the character of this drug of late.

### Milk Sugar.

There seems to be an impression, doubtless based upon formerly existing conditions, that milk sugar is an article peculiarly liable to adulteration. Physicians are apparently skeptical as to the fitness for milk modification of the lower priced brands and, according to statements coming to our notice, as much as sixty cents a pound is sometimes charged for an article presumed to be of exceptional quality. The list here presented includes practically all of the better known brands upon the market. The price paid was from twenty-five cents to forty cents per pound. In no case was gross adulteration detected—such as with cane-sugar, starch, glucose or excess of albuminoids. But one sample failed to comply with the requirements of the Pharmacopœia, in this case there being an excessive amount of mineral matter. * Some of these brands were much better than others, however; that is they were cleaner, freer from lint, dust and odors and small residues of albuminoids and mineral matter. A point of some interest in connection with these examinations is in the fact that while the lowest priced brands proved to be somewhat inferior, contrary to what might be expected, some of the better known brands—those usually selling at a premium—were not only found to be no better in any respect than the majority, but were not so good even. That a well-packed article of excellent quality can be produced to sell at a moderate price is evident from the following analyses:

No. 4461. Milk Sugar in bulk; Powers-Weightman-Rosengarten Company.

No. 4462. Patch's Powdered Milk Sugar, E. L. Patch Company, Boston.

No. 4480. Milk Sugar, Merck's, highest purity, powdered; E. Merck & Co., New York.

No. 4500. Squibb's Milk Sugar, E. R. Squibb & Sons, New York.

No. 4502. Powdered Sugar of Milk, Schieffelin & Co., New York.

No. 4503. Rexall Sugar of Milk; United Drug Company, Boston. "A chemically pure and sterile product;" guaranteed free from all adulterants, etc.

No. 4505. Sugar of Milk; Billings-Clapp Company, Boston.

No. 4506. Sugar of Milk; U. S. P., Powers-Weightman-Rosengarten Company, Philadelphia.

No. 4507. Milk Sugar in bulk.

No. 4636. Wyeth's Pure Powdered Milk Sugar; John Wyeth & Brother, Philadelphia.

* A second sample of the Rexall brand, purchased July 15, 1910, of A. J. Precourt & Co., Manchester, was found to have an ash content of 0.84%. This sugar is sold under guaranty No. 238 and is represented as being "absolutely free from impurities."

RESULTS OF EXAMINATION OF MILK SUGAR.

| Number. | Brand. | Container. | Net weight, ozs. | Price per lb., cents. | Total ash, per cent. | Total sediment, per cent. | Mineral sediment, per cent. | c. c. $\frac{n}{10}$ alkali required for 100 gms. | Cane sugar. | Glucose. | Starch. | Sulphur dioxide. | 20 per cent. solution in hot water shows: Color. | Turbidity. | Sediment. | Cloud with 1 c. c. acid mercuric nitrate solution. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4461 | Powers & Weightman............ | Bulk. | ...... | 35 | 0.25 | .035 | .006 | 5.0 | 0 | 0 | 0 | 0 | None | V. slight | Slight | Slight | Standard. |
| 4479 | Patch's.......................... | Tin. | 16.0 | 35 | 0.01 | .017 | .005 | 1.5 | 0 | 0 | 0 | 0 | None | None | V. slight | V. faint | Standard. |
| 4480 | Merck's.......................... | P. bd. | 15.3 | 35 | 0.03 | .026 | .006 | 2.5 | 0 | 0 | 0 | 0 | V. slight | Slight to moderate | Slight | Slight | Standard. |
| 4500 | Squibb's......................... | Tin. | 16.0 | 40 | 0.18 | .041 | .022 | 3.0 | 0 | 0 | 0 | 0 | None | Slight moderate | Slight | Slight | Standard. |
| 4502 | Schieffelin's...................... | P. bd. | 16.7 | 35 | 0.02 | .015 | ...... | 3.0 | 0 | 0 | 0 | 0 | V. slight | Slight to moderate | V. slight | Slight | Faint odor of toilet soap. |
| 4503 | Rexall............................ | P. bd. | 15.9 | 25 | 0.49* | .032 | .007 | 2.0 | 0 | 0 | 0 | 0 | None | V. slight | Slight | Faint | Ash in excess of legal limit. |
| 4504 | Patch's.......................... | Tin. | 16.0 | 35 | 0.02 | ...... | ...... | 1.5 | 0 | 0 | 0 | 0 | None | None | V. slight | V. faint | Standard. |
| 4505 | Billings, Clapp.................. | Tin. | 16.9 | 35 | 0.19 | .014 | .002 | 3.0 | 0 | 0 | 0 | 0 | Slight | None | Slight | V. faint | Standard. |
| 4506 | Powers & Weightman............ | W. box. | 15.8 | 35 | 0.02 | .014 | ...... | 2.0 | 0 | 0 | 0 | 0 | None | None | V. slight | V. faint | Standard. |
| 4507 | Bulk.............................. | ........ | ...... | 35 | 0.02 | .012 | ...... | 2.0 | 0 | 0 | 0 | 0 | V. slight | None | V. slight | V. faint | Standard. |
| 4508 | Merck's.......................... | P. bd. | 15.9 | 35 | 0.02 | .023 | ...... | 3.0 | 0 | 0 | 0 | 0 | V. slight | Slight to moderate | Slight | Slight | Standard. |
| 4636 | Wyeth's.......................... | P. bd. | 16.1 | 25 | 0.20 | ...... | ...... | 3.7 | 0 | 0 | 0 | 0 | V. slight | Moderate | Slight | Considerable | Odor of toilet soap; relatively appreciable albuminoid content. |

*Soluble ash 0.33 per cent., mainly gypsum.

### Spirits of Anise.

The requirement is ten per cent. of oil of anise. Of the twenty-one samples of this preparation received, six were found to be deficient. One of these samples, submitted from Keene, was found to contain less than five per cent. of oil. The other deficient samples showed 8.6, 8.7, 8.6 and 6.5 per cent. of oil respectively. This may be accepted as a very satisfactory condition, especially in view of the fact that extensive deficiencies in this preparation have recently been discovered in other states and nothing has hitherto been done in this connection in this state.

### Spirits of Camphor.

Most of the seven preparations found deficient represented samples purchased at grocery stores.

### Spirits of Peppermint and Wintergreen.

The preparations of this description dispensed by druggists are for the most part either up to standard or deviate from such but slightly. As usual, the grocery store products are the offenders. A few of these, while probably really designed for the most part for flavoring purposes, were classed as adulterated or misbranded because of improper labeling. No. 4370, Solar Brand Essence of Peppermint, put up for C. A. Weston & Co., Portland, Me., bore a formula claiming:

"Oil peppermint 3m, 50% alcohol, 1 oz." This is an example of a type of "essence" put up by a well-known Portland extract manufacturer. These preparations are not handled by druggists, and the formula, not being intelligible to either dealer or consumer, is not proper notice that the article is less than one fifteenth of standard strength. Notwithstanding this, the price is identical with that usually charged for the latter. Whether or not the allegation is true that the principal use of these preparations is as a beverage, the fact remains that their composition is such as to fit them for this purpose, and for very little else.

### Tincture of Iodine.

Of the fifteen samples received, eight were found to contain less than the required amount of iodine. In but one case was the deficiency an appreciable one, this preparation, put up by C. H. Eddy & Co., Brattleboro, Vt., containing but 61 per cent. of the required amount.

# PROPRIETARIES AND MISCELLANEOUS.

## A. D. S. Headache Wafers.

A ten-cent package contains four wafers, each represented as carrying four grains of acetanilide. The analysis shows this to be correct, the other constituents being milk sugar and caffein. While the preparation differs in no essential from the numerous other preparations of this kind on the market, yet the accompanying reading matter is designed to lead the user to believe that the above is "perfectly safe," as, unlike the ordinary variety, it is alleged to "cure the head without injuring the heart." Manufactured by American Druggists' Syndicate Company, New York.

## Nature Tissue Tablets.

According to the statement upon the package, these tablets "supply the waste and degeneration of tissue and arrest the decay and failing of old age. These are a tissue food and not a medicine. They give strength and tone to the entire system and prevent disease. They are used in liver, stomach and kidney troubles, and should be taken where there is any breaking down of the tissues." Manufactured by the Toxo-Absorbent Company, Rochester, New York. The above represents one of the baldest kinds of false claims conceivable. These tablets are in no sense a food and they cannot possibly do the things claimed for them. The manufacturer gives a dissertation upon the value of "getting back to earth," and the conclusions that he draws as to the benefits of dirt-eating are skilfully calculated to redound to his advantage. To be sure, common earth is cheap enough, but this will not serve because it is not pure, whereas the Toxo-Absorbent product is specially taken from the bowels of the earth, where all matter is necessarily in a sterile, uncontaminated condition.

The analysis shows about 50% of a clayey earth, mixed with about 10% of carbonate of magnesia, some charcoal, and an aromatic of the nature of a carminative.

## Obesity Tablet.

Dr. F. J. Kellog's Obesity-Reducing Tablets. "A safe fat reducer." Guaranteed under the Food and Drugs Act, by F. J. Kellog, Battle

Creek, Mich. This preparation seems to consist principally of cooked starch, apparently wheat. Examinations were made for arsenic and for other substances of a deleterious nature, with negative results. It is difficult to understand how the preparation can accomplish what is claimed for it.

### Diozo.

Prepared by the Parker Chemical Company, Chicago. Consists of a tin box with perforations and designed to hang up on the wall; sells for fifty cents. The apparatus is represented as "constantly throwing off minute crystals which ozonify and purify the air." This is a misstatement, so far as the ozonification is concerned, although it does undoubtedly give forth infinitesimal traces of vapor sufficient to produce a distinct odor. Also represented as destroying "microbes and disease germs. Prevents spread of contagion, imparts a refreshing and healthful odor to the sick room, and is most beneficial in relieving colds, whooping cough, croup, asthma, bronchitis, catarrh, diphtheria, lung trouble."

These claims are too strong by far. The contents of the box consist of a half pound cone composed of a crystalline mass of crude naphthalene—one of the higher distillates from coal-tar containing beside naphthalene, small proportions of carbolic acid and allied bodies. While it is known that such products do tend to volatilize slightly on exposure to the air, nevertheless the claims made for this article are in general of a decidedly misleading character and druggists and others are therefore warned that the present labeling is in violation of the Food and Drugs Act.

### Straw's Odor-No.

A liquid disinfectant prepared by the Odor-No Chemical Company, Boston, Mass. Sells for 50 cents per bottle. Is a colorless, nearly tasteless, non-corrosive liquid, exhibiting a very faint odor suggestive of perfume. Represented as a non-poisonous agent for the destruction of germs and odors, also to be used as a douche for the cure of sore-throat and leucorrhœa, and as a spray for purifying the atmosphere of sick-rooms, schools, churches, etc. The manufacturers submit a certificate from a bacteriologist testifying to the efficiency of this preparation as a germicide.

The analysis shows this product to consist of about one per cent. of boracic acid, less than one half per cent. of formaldehyde and three per cent. of alcohol. While there is no doubt that such a preparation will do what is claimed for it, nevertheless the public should not be unwittingly beguiled into paying fifty cents for an article consisting of but a fraction of a cent's worth of the most common antiseptic agents, mingled with water.



No. 4297. "*Egyptian Spray.*" Egyptian Spray Manufacturing Company, Boston, Mass. Designed for application to floors, furniture, automobiles, etc. A yellow, clear, oily liquid possessing an odor of oil of mirbane, the latter being found to be present on examination. In view of the very poisonous character of oil of mirbane (nitro-benzol) and the fact of cases being on record of serious results following the mere inhalation of this substance under certain circumstances, the use of this product as a floor dressing cannot be recommended from a hygienic standpoint.

No. 4372. *Hazeltine's "Pain-Ease."* Manufactured by George K. Hazeltine, Concord. This preparation, one-time known as "Liquid Electricity," purports to contain 15.80% of alcohol and is intended as a remedy for rheumatism. The analysis shows 1.41% of extractive and mineral matter, in which was identified sulphate of iron, ammonium chloride, sodium chloride, menthol and a pungent principle, probably capsicum. The sample contained no alkaloids nor chloroform.

No. 4403. "*Honest Scotch Snuff.*" Manufactured by American Snuff Company. This brand was submitted for the purpose of ascertaining the possible presence of opiates, etc. No additions of this nature were detected.

No. 537. *Le Baume Rhumal* (Cough Balsam). L. R. Baridon, Montreal. Said to "destroy the microbe or germ of the most dreadful diseases." Sample contains alcohol and morphine, not declared. Misbranded.

No. 3974. *Nurses' and Mothers' Treasure.* P. E. Picault, Montreal. Sample contains 6.60 per cent. alcohol, not declared. Misbranded.

No. 4515. *Gauvin's Aniseed Syrup.* J. A. E. Gauvin, Montreal. The English labeling contains a declaration showing "one-fourth grain morphine acetate and six per cent. spirit of wine" per ounce. The designation "spirit of wine" does not comply with the legal requirements. Misbranded.

No. 4517. *Children's Comfort.* George E. Fairbanks, Worcester, Mass. No declaration as to alcohol or morphine. The following are among the claims made for this preparation: "It is a concentrated Food." "It does away with dangerous narcotics." "Is safe and reliable." "Remember, mothers, . . . that your children will grow healthy and strong by its use." These claims are not only all untrue but are most vicious, considering the impression they are calculated to create in the mind of the average user of such nostrums. Sample contains morphine. Misbranded.



No. 4464. *Auto-Masseur.* A treatment for obesity. Manufactured by "Prof." S. H. Burns, 1300 Broadway, New York. Consists of an elastic belt carrying a metallic spiral ring about five inches in diameter, the latter intended to be worn over the umbilicus. The ring consists of two parts, one half brass, the other brass, silver plated, the ends being connected by spirals of fine wire soldered together. In addition to this interesting appliance there are two "accelerating auxiliaries"—"Absorbine" and "Shrinkine." The "Shrinkine" was not submitted but the "Absorbine," a bit of which is to be "rubbed over the deepest accumulations of fat for five minutes," seems to consist of nothing more powerful than "unguentum aquae rosae." The manufacturer is confident that "simply wearing my Auto-Masseur, regardless of age or sex, will permanently reduce superfluous flesh from all parts—face, chest, back, hips, legs, or abdomen." Nor is this all, for we read that "rheumatic and nervous affections, indigestion, flatulency, constipation, female weaknesses, weak circulation and fatty degeneration of the heart, lungs, kidneys, and liver yield quickly to its curative action." It is almost unnecessary to suggest that the dieting recommended, in conjunction with the simple massage treatment involved, is altogether responsible for any improvement that may be noted.

No. 4473. *Gillespie Scalp Invigorator.* Gillespie Manufacturing Company, Boston. Claims 25 per cent. alcohol. The analysis shows 23.93 per cent. alcohol with 2.91 per cent. solids, the latter consisting principally of glycerin, with some cantharides and a trace of salt. Passed.

No. 4463. *Eckman's Alterative.* Eckman Manufacturing Company, Market and Sixth Streets, Philadelphia, Pa. Price, $2.00 per bottle (half pint). "For all throat and lung diseases, including tuberculosis." Guaranteed under the Food and Drugs Act. We read that this preparation was perfected by a veterinary surgeon, who first demonstrated its curative (?) properties upon cattle and later upon a member of his family. The present proprietors of this alleged remedy issue a booklet abounding in claims to the effect that the preparation is a cure for consumption. "We do not claim to cure tuberculosis in the last stage, although we have such cases on record." The analysis shows 6.80 per cent. of total solids on evaporation, consisting mainly of calcium chloride, the quantity of this salt found, calculated to the anhydrous condition, amounting to 3.59 per cent. Some suspended matter noted consisted of powdered clove. The preparation is held as misbranded.



No. 4481. *Kosine.* "For the relief and cure of epilepsy, etc." Kosine Company, Washington, D. C. This was found to consist essentially of a combination of bromides with antipyrin. The analysis shows antipyrin, 0.64 per cent.; ammonium bromide, 4.97 per cent.; fixed bromides (as sodium bromide), 2.40 per cent. Antipyrin is a powerful depressant, in this respect being in the same class with such dangerous drugs as acetanilid, phenacetin and similar compounds. It seems unfortunate that the law requiring a declaration upon the label of the presence in any preparation of the last-named bodies was not made to include antipyrin. Passed.

No. 4824. *Robinson's Patent Barley.* "For Infants' Food, Barley-Water and Pudding." Keen, Robinson & Co., Ltd., London, Eng. The examination fails to indicate that this preparation differs in any essential, or in fact is anything more, than simple barley flour. If it contains any diastatic ferment the latter must be present in an inappreciable quantity, as the starch seems to undergo no material hydrolysis when heated at the appropriate temperature. In view of this fact, one of the suggestions appearing upon the label to the effect that the barley be "mixed with warm water to the consistency of milk, and then to add to cold milk and given through the bottle" appears open to criticism. Notwithstanding that the use of barley-water as a constituent of the infant dietary is extremely common, this imported product seems to be the only source of barley—aside from the whole grain—that is carried to any extent by local dealers. The popular half-pound size retails for eighteen to twenty cents, which, in view of the low cost of the grain, seems an unwarrantable price for the American consumer to be called upon to pay.

No. 4712. *Dar-Lin-Oil.* Hemlock Oil Company, Derry. This preparation consists of a combination of essential oils and pungent substances, among which seems to be included the highly pungent oil of mustard. Its action is that of a counter-irritant. Contains no constituents requiring declaration.

No. 4711. *Pain-Anodyne.* Layfayette Company, Berlin and Montreal. Represents an alcoholic solution, similar in general character to the preceding. Properly labeled.

No. 4710. *Wilson's Headache Powders.* Wilson Pharmacy, Berlin. The declaration relative to the presence of acetanilid and phenacetin appears upon the back of the packet, instead of upon its face where it should be. Misbranded.

No. 4708. *German Fir.* Dilliard Remedy Company, East Bangor, Pa. Labeled in bold type as a "cough and consumption cure." Label contains no statement of the presence of alcohol and opiates. Misbranded.



No. 4713. *Moxie.* Moxie Nerve Food Company of New England, Boston. Labeled as being a "compound for the nervous system—of great value in restoring lost nervous energy." Contains no saccharin nor constituents requiring declaration; the claims for this preparation, however, are somewhat questionable.

*Mt. Madison Neurene Nerve Food.* Harriman Spring Company, Gorham. Represented that it "builds up nerve tissues, tones up the heart, gives power to the brain." Questionable labeling. Even if drugs existed that could do all these things, such would have no proper place in a preparation designed to be sold as a beverage by the general dealer.

No. 4714. "*Yo-Yo.*" The Yo-Yo Company, Sudbury, Mass. Represented as "a most delicious, refreshing and healthful beverage, from the uva ursi herb, nature's own kidney food, with a combination of other native herbs that have proved the best known tonic for indigestion and rheumatism." Contains extractive matter, 6.01 per cent.; mineral matter, trace; alcohol, 1.05 per cent. No salicylic acid.

*Hill's Cascara-Bromide-Quinine.* W. H. Hill Company, Detroit, Mich. Recommended not only for the cure of colds, coughs, catarrh, bronchitis and La Grippe, but for headache, for constipation and for use as a general tonic. This preparation contains acetanilid, and an extensive practise with the manufacturers is the house-to-house distribution of free samples, the latter being contained in an envelope. The only intimation given of the presence of acetanilid is the statement on a fac-simile of the regular package which appears upon the back of the envelope, whereas the law requires that such information shall be given upon the principal label, *i. e.*, in this case the face of the envelope—it being most properly held by the federal authorities that free samples are not exempt from this requirement. Some of the statements contained in the circular accompanying the samples are not only untrue and misleading, but are calculated to be vicious in their consequences. Thus these tablets are represented as containing "no mineral poisons or *injurious drugs*," whereas acetanilid,—used in the absence of skilled oversight, is now well recognized as being a dangerous substance. The circular also devotes considerable space to the advocacy of the use of these tablets as a "tonic laxative," and, in fact, as a general tonic, advancing the argument that they "can be carried in the pocket and swallowed when needed." The regular and harmful drugging with acetanilid to which these suggestions must lead is only exceeded in reprehensibility by that involved in the promiscuous distribution of the samples. The latter are thrown about everywhere and must be not infrequently picked up and swallowed by children. There would seem, in fact, to be need of a law prohibiting the indiscriminate distribution of drugs in the manner here shown.

*Hay's Hair Health.* Philo Hay Specialty Company, Newark, N. J. In a previous issue of the *Bulletin* (April, 1907) this preparation was found to contain lead acetate and sulphur and was reported as misbranded. A recent examination shows substantially the same composition, but the false statements as to its character and what this preparation will accomplish no longer appear upon the label. However, the proprietors have no scruples over continuing their misrepresentations in their advertising, a recent advertisement representing that "It is not a dye. It contains no chemicals—no dye substances. It doesn't color hair, but restores it. It brings back the exact color and luxuriant beauty of youth—puts it back in the precise condition it was in before it began to turn gray or to fade." Until such time as the law requiring truthfulness in labeling shall be extended to include advertising, there will be no legal means of preventing resort to this method of deluding the public.

No. 4735. *Queen of Beauty Louisenbad Reduction Salt.* Karl Landshut, importer, Chicago. "Obtained by concentration." "A remedy for obesity without the use of drugs, dieting, or exercise." "It is a concentration of bath salts such as are contained in the wonderful bath springs of Europe." "Louisenbad Reduction Salt brings these famous baths to your own tub." Analysis shows the following composition:

| | |
|---|---|
| Sodium chloride | 31.77% |
| Sodium sulphate | 34.43% |
| Potassium sulphate | 32.31% |
| Calcium sulphate | 0.73% |
| Magnesium sulphate | 0.15% |
| Silica | 0.03% |
| Iron and alumina | 0.01% |
| Loss on ignition | 0.27% |
| | 99.70% |

The above therefore indicates that the preparation is approximately a mixture of equal parts common salt, sulphate of soda and sulphate of potash. It is not conceivable that the proprietors would follow the roundabout method of preparing a simple mixture of this character by concentration of a natural water, as they claim to do. An inquiry in this connection addressed to the importer brought only an evasive reply; but even though the product was as represented, it could have no possible advantage over a common mixture costing one tenth as much.

No. 5050. *Parnotis.* H. S. Peterson & Co., Chicago. This is another recent addition to the list of so-called "obesity reducers." While the proprietor guarantees the product under the Food and Drug Act, he is very non-committal as to what it will do. In fact the only information in this connection to be gleaned from the label is the statement: "Use Parnotis for making Flesh Reducing Remedy," accompanied by the directions, which instruct to dissolve contents of package in one and one-half pints of water and take a tablespoonful three times daily before meals. The preparation, which costs fifty cents per quarter pound package, consists of a pale-yellowish, perfumed powder, soluble in water to a slight turbidity. While no printed claims are made to this effect, circulation seems to have been given to the impression that thyroid is the active principle, a view which the color and general appearance might tend to bear out. Analysis, however, fails to give any evidence of the presence either of this or of any other organic substance, save the perfume and a trace of coloring matter. A mixture of bicarbonate and sulphate of soda is all that the examination reveals.

*Viavi Treatment.* Inquiries have been received as to the character and value of the remedies and treatment involved in the so-called "Viavi System of Hygiene." Although this self-styled "Health Movement" has already been pretty thoroughly exposed,[1] the appearances are that it is still in a fairly "healthy" condition, so far as its continuance as a source of revenue to its promoters is concerned. On page 81 of "The Great American Fraud," we find the Viavi Company classified as "a fake concern which preys upon impressionable women." It "has organized its elaborate 'lecture bureau,' mostly women, to spread its doctrines, the chief of which is that every woman has something wrong with her, and that whatever it is, Viavi preparations alone will cure it." The hand-book entitled "Viavi Hygiene" consists of a clever dissertation on the value of the "Viavi Treatment" as applied to the ills of womankind—a book well calculated to be convincing to the average woman, although, for the medical practitioner, abounding in amusing statements, than which no better evidence could be wished as to the true character of the system. In short, the treatment, based as it is largely upon the observance of personal cleanliness and the application of simple massage, involves no new ideas, and we are unable to find any warrant for the claim that the medicines possess any special or remarkable value as "food for the nerves and tissues," or that there is anything at all unusual or peculiar about them, aside from the exorbitant price charged therefor.

No. 5128. *Whitcomb's Rheumatic Indian Liniment.* C. Whitcomb, Apthorp. Thus product, which claims to be a cure for a great variety of ailments, including "paralyzed limbs" and "kidney complaint," was found to consist principally of petroleum benzine, together with some other volatile oils. Misbranded.

EXAMINATION OF LIQUORS FOR THE STATE LICENSE COMMISSION.

During the two-year period ending August 31, 1910, one hundred and three samples of liquors have been submitted by agents of the State License Commission, the results of the examinations having been duly reported to the body. This represents a notable falling off as compared with the number hitherto received from this source. Most of the samples consisted of whiskey, a few of which were found to be markedly deficient in alcoholic content. Aside from the alcoholic content the only question liable to arise in connection with a distilled liquor is as to its proper branding and sale. Numerous examinations for wood alcohol and other deleterious constituents, made at this laboratory, have uniformly afforded negative results.

The following letter, recently addressed by me to the State License Commission, is suggestive of the questions arising as to the proper branding of distilled liquors:

*State Board of License Commissioners,*
*Concord, N. H.*

GENTLEMEN:—The recent decision of the president as to what may be sold as "whiskey" under the federal act of June 30, 1906, is not only somewhat revolutionary in character, but is opposed to the legal standards in force in a number of states. Nevertheless, notwithstanding its antagonism of certain fundamental principles, in my opinion this ruling will ultimately obtain as the guide by which the proper designation of whiskey will be determined.

The vital point at which this dictum conflicts with the views of food officers is in the declaration that neutral spirits (alcohol) when reduced to potable strength (with water), and colored and flavored, is entitled to be known as whiskey, and that a mixture of such with straight whiskey may properly be designated a blend—assuming the latter word to refer to a mixture of like substances. It should be noted, however, that the president's ruling is to the effect that the variety of whiskey must be declared upon the package label, *e. g.*, "neutral spirit whiskey" must be labeled as such, and a mixture of the latter with straight whiskey should be designated as a blend of neutral spirits and straight whiskey.



In the past, most of the samples submitted at this laboratory have been drawn from barrels, such samples having been for the most part undesignated. Since no added deleterious matter is now ever present in commercial whiskey, and as the question under the president's ruling becomes almost wholly one of grade or kind, *i. e.*, of labeling, future samples should as far as possible represent original packages. Except as to the proportion of alcohol (always low in neutral spirit whiskey). The analysis of an undesignated barrel sample has no significance of any value.

Respectfully,

(Signed) C. D. HOWARD,

*Chemist.*

January 11, 1910.

# INFLAMMABLE STOVE-POLISH.

In a suit brought before the Hillsborough County Court as a result of injuries attending the use of an inflammable stove-polish, the jury has recently awarded the plaintiff damages in the sum of $7,000. The victim, a young woman, was so severely burned as to be permanently injured and disfigured as a result of applying this polish to a stove the fire in which was low. The case was vigorously contested, having been before the courts nearly three years, and once before the Supreme Court.

The polish in question was known as "6-5-4 Self-Shining Stove Lustra," manufactured by Crosby & Co., Detroit, Mich. An investigation of this polish showed that it not only gave off inflammable vapors at the ordinary temperature but that it continued to do this when cooled to a point twelve degrees below the freezing temperature, and furthermore, that at a temperature but little above the freezing point the application of a lighted match was sufficient to cause the preparation to take fire and burn continuously. A distillation showed the polish to consist in part of highly inflammable constituents, as follows:

| | |
|---|---|
| Petroleum ether | 1.5% |
| Gasoline | 9.0% |
| Naphtha | 30.0% |
| Petroleum benzine | 32.0% |
| Residuum | 27.5% |

Not only is this product highly inflammable but the vapors when ignited in a confined space, as the firebox of a stove, would tend to explode. In this case the inflamed contents of the can were thrown upward against the breast and face of the user. Nevertheless, the label contained no warning that there was anything dangerous about the article and it was alleged that the latter was represented to the plaintiff by the salesman as being perfectly safe.

Even at the present time the "caution" which the label of this product bears is inconspicuously placed and is so worded as to be calculated to lead the user to believe that the statement has to do more with securing the maximum of efficiency rather than conveying a suggestion of any particular danger. "Let the label tell the truth" is a slogan that should be given wider application. Already, as a result of similar occurrences, the city of New York has recently adopted an ordinance regulating the sale and storage of such articles, this ordinance providing among other things that such polishes must be packed in tin cans with a screw top, containing not more than one quart and bearing in letters a quarter of an inch high the label: "Danger; this can contains dangerous inflammable liquid," as well as a warning against the use of the contents within fifteen feet of any fire.

Incidentally the above case is of interest in connection with the enforcement of the food and drug law of this state in that it seems to definitely establish the responsibility of the store proprietor for the statements of his salesmen.

# THE INSPECTION OF WATER SUPPLIES AT SUMMER HOTELS AND BOARDING HOUSES.

By C. D. Howard, *Chemist.*

Following is a preliminary report of the inspection of water supplies at the New Hampshire vacation resorts. These samples were collected by the inspector of the Board during July and August, 1910.

In addition to taking samples of water, the inspector has noted conditions about the source of supply, such as the neighborhood of cesspools, stables, etc., the use of lead or galvanized iron pipe, the degree of cleanliness of the premises, and other conditions liable to have a bearing upon the quality of the water supplied the guests.

As a whole, the results are highly gratifying. In the mountain district the supplies in the majority of cases are drawn from springs, which are generally located upon some mountain side, far remote from any chance of organic contamination. As was anticipated, these waters show a high degree of organic purity. Unfortunately, in a very few cases, representing otherwise water of excellent quality, the proportion of dissolved lead found was sufficient to render the water either wholly unfit or objectionable for drinking. This was also true in a limited number of instances where galvanized pipe is in use. This form of pipe is not proving wholly satisfactory for use with many of our spring waters, in that the latter are prone to take up greater or less quantities of the zinc coating. While dissolved zinc in drinking water is by no means as dangerous as lead, still, in the quantities occasionally observed, its presence is, to say the least, objectionable.

Farther south, in the lake and coast districts, wells seem to be the prevailing source of supply for the hotels, although here too, many springs of excellent quality are to be found. These wells are generally located close to the buildings, and for this reason there is far greater chance for contamination than is the case with the mountain springs. While the majority of the supplies sampled in the lake and country districts has been found to be good, still in one or two sections we have encountered a surprisingly large proportion of polluted wells. In all such cases the proprietors have been advised that this water must not be served to guests and that other arrangements must be made immediately.

Along the coast it is apt to prove a somewhat difficult matter to secure a supply free from excessive quantities of salt water and which shall be satisfactorily free from organic matter or from the products of oxidation of the latter. Most of the wells are rather shallow and frequently consist merely of a pipe, with strainer, sunken a few feet in the sand. While no cases of gross pollution have been found at the beaches this season, a number of the supplies have been objected to as not being sufficiently pure for table purposes.

Lack of proper maintenance has not infrequently been responsible for our criticism of supplies which were very evidently of inherent purity. In addition to taking the usual precautions for the exclusion of sewage contamination, it is very desirable that open wells and springs be carefully examined at the beginning of each season and unless simple inspection indicates an absolutely clean condition, the source should be pumped or dipped out and the bottom and side walls scraped and rinsed. Such a state of affairs as the growth upon the masonry of ferns, or even of moss (noted in two or three cases), should not be tolerated. It is also very desirable that the well or basin be cemented up for several inches above the surface of the ground, and if the adjacent soil is at all loose, the cement should also be continued down into the well for a sufficient distance to insure the exclusion, not only of surface water, but of such chance visitors as toads, snakes, etc.

Two points that may be emphasized are that pure ground water requires no ventilation, and that exposure to sunlight—instead of being beneficial—is apt to be positively detrimental. We have evidence of this fact in the odors and growths that speedily develop whenever a ground water is stored in an open reservoir. Therefore, the supply should be provided with a sound tight cover.

The detailed report following includes only the names of those from whose supplies samples have been taken and the analysis of which, in connection with the local inspection, has warranted a classification of reasonably good and safe quality. Where the analysis has indicated not exceeding 0.5 parts of zinc, the supply has been accepted for the present. Aside from the possibility of question here involved, it is believed that every one of the supplies herein mentioned is usable with safety—the greater number, indeed, representing waters of an unusual degree of excellence. Premises on which the source of supply has been found to be polluted, or to which serious objection has been made, will be subjected to a second inspection later.

Because of prevailing natural conditions at the beaches, a few sources at the latter places have been accepted that would hardly have passed muster if located inland. It should not be inferred, however, that these necessarily represent bad or unsafe water. The names of many of the leading hotels in some of the localities do not appear in this list, for the reason that such have the town or precinct supply—water of excellent quality in every case. Further, there are a number of places in almost every town visited that it has proved impracticable to cover during this season, although it is expected to reach these eventually.

ANALYSIS OF WATER SUPPLIES AT

(Results are given in

| Number. | Town. | Name of House. | Owner. | Source. |
|---|---|---|---|---|
| 8148 | Hampton........ | Maplehurst.................. | C. F. Wood.... ............. | Well........ |
| 8151 | Hampton........ | Garland House............. | A. D. Garland............... | Well........ |
| 8152 | Hampton........ | The Willows................ | I. E. Leavitt................. | Spring...... |
| 8161 | Little Boar's H'd | Batchelder's................ | A. Batchelder............... | Well........ |
| 8162 | Little Boar's H'd | Batchelder's..... ........... | A. Batchelder.......... .... | Driven well |
| 8163 | Rye....... ...... | R. J. Locke's....... ......... | R. J. Locke.................. | Well ....... |
| 8164 | Rye............. | Rising Sun Cottage......... | Mrs. E. B. Philbrick........ | Well........ |
| 8167 | Rye............. | Drake House................ | A. J. Drake.................. | Well........ |
| 8165 | Rye............. | The Farragut............... | W. E. Carter................ | Well ....... |
| 8172 | Rye............. | Sawyer's.................... | Horace Sawyer............. | Cistern...... |
| 8089 | Franconia.. ..... | Spooner Farm..... ......... | Henry Spooner.............. | Spring...... |
| 8023 | Franconia........ | Forest Hills Hotel. ........ | Frank H. Danforth.......... | Spring...... |
| 8024 | Franconia........ | Whitney Farm ...... ....... | F. Whitney................... | Spring...... |
| 8065 | North Conway... | Echo Farm.......... ........ | A. E. H. Brooks............. | Spring...... |
| 8076 | North Conway... | Ledgeview Farm.. ......... | Israel C. Davis............. | Well........ |
| 8062 | Intervale........ | Maple Villa ..... ........... | George S. Gale.. ........... | Spring...... |
| 8059 | Intervale.... .. | Intervale Farm..... ........ | Mrs. Frank Carleton........ | Spring...... |
| 8058 | Intervale........ | Pitman Hall................. | Walter Pitman.. .. .. ..... | Spring...... |
| 8056 | Intervale........ | Pequawket Inn.............. | C. C. Small.................. | Spring...... |
| 8092 | Ossipee.......... | Edgerly Farm............... | John A. Edgerly............ | Well ....... |
| 8074 | Jackson.......... | Eagle Mountain House..... | C. E. Gale & Son............ | Stream...... |
| 8077 | Jackson.......... | Eagle Mountain House..... | C. E. Gale & Son........... | Spring...... |
| 8078 | Jackson.......... | Perkins Cottages... ....... | C. B. Perkins................ | Spring...... |
| 8080 | Jackson.......... | Jackson Falls House........ | Trickey Bros................ | Spring...... |
| 0296 | Jackson.......... | Cliff Cottage................ | C. F. Perkins.... ........... | Spring...... |
| 8811 | Ashland.. ....... | Harvard Camp.............. | Harvard Camp Association | Spring...... |
| 8186 | Holderness...... | Deephaven Camp........... | Alice M. Bacon.............. | Spring...... |
| 8185 | Holderness...... | Algonquin Camp............ | E. Demeritte.... ........... | Well........ |
| 8183 | Holderness...... | Old Willoughby House... . | H. J. Bennett................ | Spring...... |
| 8187 | Holderness. .... | The Homestead.....[House | Mrs. F. B. Boynton.... .... | Spring...... |
| 8188 | Holderness...... | Mt. Morgan Mineral Spring | E. C. Bennett............... | Spring...... |
| 8189 | Holderness...... | Asquam House............. | H. F. Dorr................... | Spring...... |
| 8263 | Wilton........... | Abbott Hill-top Farm....... | G. P. Chandler.............. | Well........ |
| 8270 | Amherst.......... | Grand View House......... | J. F. McGuiness ............ | Well........ |
| 8278 | Amherst.......... | Baboosic House............ | W. H. Colston........ ...... | Well........ |
| 8300 | Sunapee.......... | The Burkehaven............ | F. H. Davis.................. | ? |
| 8303 | Sunapee.......... | Granliden.................. | W. W. Brown................ | Well........ |

[1] For the summarized results of this inspection, see page 228.

## SUMMER HOTELS AND BOARDING HOUSES.[1]



**parts per 100,000.)**

| Number. | Pipe. | Appearance. | | | | Ammonia. | | Nitrogen as | | Chlorine. | Hardness. | Lead. | Zinc. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Free. | Albuminoid. | Nitrates. | Nitrites. | | | | | |
| 8148 | Galvanized. | None.... | None...... | None.... | 0.05 | .0016 | .0014 | .005 | .0000 | .30 | 3.9 | .... | tr. | .. |
| 8151 | Galvanized. | None.... | V. slight.. | None.... | 0.05 | .0010 | .0006 | .003 | .0000 | .75 | 3.9 | .... | .4 | .. |
| 8152 | Source....... | None.... | V. slight.. | None.... | 0.05 | .0018 | .0024 | .005 | .0000 | 1.90 | 3.2 | ... | ... | .. |
| 8161 | Galvanized. | None.... | None...... | None ... | 0.05 | .0068 | .0004 | .003 | .0000 | 4.70 | 6.0 | .... | .0 | .. |
| 8162 | Galvanized. | None.... | None...... | None.... | 0.00 | .0004 | .0010 | .200 | .0000 | 4.30 | 6.0 | .... | .0 | .. |
| 8163 | Galvanized. | None.... | None...... | None... | 0.05 | .0004 | .0026 | .150 | .0000 | 27.+ | 7.4 | .... | .0 | * |
| 8164 | (Source).... | None.... | V. slight.. | None.... | 0.05 | .0010 | .0036 | .015 | .0000 | 2.90 | 4.6 | .... | ... | .. |
| 8167 | Galvanized. | None.... | Slight..... | None.... | 0.00 | .0002 | .0014 | .175 | Tr. | 12.30 | 6.7 | .... | .4 | * |
| 8165 | Galvanized. | V. slight | None...... | S. earthy | 0.05 | .0016 | .0038 | .005 | Tr. | 3.90 | 9.6 | .... | ... | .. |
| 8172 | Galvanized. | None.... | None...... | None.... | 0.10 | .0020 | .0035 | .003 | .0000 | 1.10 | 3.9 | .... | tr. | .. |
| 8039 | Lead........ | None.... | V. slight.. | None.... | 0.05 | .0030 | .0006 | .003 | .0000 | .10 | 1.9 | .015 | ... | .. |
| 8023 | (Source).... | None.... | S. floc...... | None.... | 0.00 | .0010 | .0015 | .005 | .0000 | .15 | 1.2 | .... | ... | . |
| 8024 | ? | None.... | V. slight.. | None.... | 0.05 | .0020 | .0010 | .050 | .0000 | .05 | 1.9 | .0 | 0 | .. |
| 8065 | Galvanized. | V. s. opal | Slight.... | None.... | 0.10 | .0005 | .0010 | .005 | .0000 | .05 | 1.9 | .0 | .6† | .. |
| 8076 | Galvanized. | None.... | Slight..... | None.... | 0.00 | .0030 | .0025 | .003 | .0000 | .04 | 0.6 | .... | .0 | .. |
| 8062 | Galvanized. | V. slight | V. slight.. | None.... | 0.15 | .0010 | .0015 | .005 | .0000 | .05 | 0.9 | .... | .0 | .. |
| 8059 | Lead, gal.... | None.... | V. slight.. | None.... | 0.00 | .0006 | .0010 | .005 | .0000 | .04 | 2.6 | .037 | .0 | .. |
| 8058 | Galvanized. | None.... | V. slight.. | Earthy.. | 0.05 | .0005 | .0020 | .005 | .0000 | .04 | 0.6 | .... | tr. | .. |
| 8056 | Plain iron... | None.... | S. ferrug.. | None.... | 0.10 | .0005 | .0010 | .003 | .0000 | .05 | 2.6 | ... | ... | .. |
| 8092 | Galvanized. | None.... | None...... | None.... | 0.05 | .0005 | .0010 | .010 | .0000 | .45 | 4.0 | .... | .0 | .. |
| 8074 | Galvanized. | None.... | V. slight.. | S. earthy | 0.05 | .0010 | .0025 | .010 | .0000 | .04 | 0.4 | .... | tr. | .. |
| 8077 | Galvanized. | None.... | None...... | None.... | 0.00 | .0005 | .0015 | .045 | .0000 | .05 | 2.6 | .... | .0 | .. |
| 8078 | (Source).... | V. slight | V. slight.. | None.... | 0.05 | .0015 | .0020 | .040 | .0000 | .10 | 3.9 | .... | ... | ‡ |
| 8080 | Galvanized. | None.... | Sl. floc.... | None.... | 0.00 | .0020 | .0020 | .005 | .0000 | .05 | 1.9 | .... | .0 | .. |
| 8096 | Galvanized. | None.... | Sl. floc.... | None.... | 0.10 | .0010 | .0015 | .003 | .0000 | .05 | 1.2 | .... | .0 | .. |
| 8211 | (Source).... | None.... | None...... | None.... | 0.05 | .0005 | .0005 | .005 | .0000 | .05 | 2.6 | .... | ... | :. |
| 8186 | Galvanized. | None.... | Slight..... | None.... | 0.00 | .0005 | .0011 | .003 | .0000 | .20 | 4.6 | .... | .5† | .. |
| 8185 | Galvanized. | V. slight | V. slight.. | Slight... | 0.05 | .0010 | .0015 | .003 | .0000 | .50 | 1.9 | .... | .0 | .. |
| 8183 | Lead........ | None.... | None ..... | None ... | 0.00 | .0005 | .0011 | .003 | .0000 | .05 | 2.6 | .012 | ... | .. |
| 8187 | Galvanized. | V. slight | V. slight.. | None.... | 0.15 | .0010 | .0021 | .003 | .0000 | .10 | 3.9 | .... | .0 | .. |
| 8188 | Lead.... (tle | None.... | None...... | None.... | 0.00 | .0012 | .0006 | .003 | .0000 | .05 | 2.6 | .025 | ... | § |
| 8189 | (Water-bot- | None.... | V. slight.. | None.... | 0.00 | .0010 | .0010 | .010 | .0000 | .40 | 3.9 | .... | ... | .. |
| 8263 | Galvanized. | S. opal.. | None...... | S. earthy | 0.05 | .0015 | .0015 | .075 | .0000 | .30 | 1.2 | .... | .0 | .. |
| 8270 | (Source).... | None.... | V. slight.. | None.... | 0.05 | .0015 | .0020 | .050 | .0000 | .30 | 1.2 | .... | ... | .. |
| 8273 | (Source).... | V. slight | None...... | None.... | 0.00 | .0010 | .0010 | .020 | .0000 | .20 | 4.6 | .... | ... | .. |
| 8300 | Lead, gal... | None.... | None...... | None.... | 0.05 | .0005 | .0005 | .050 | .0000 | .10 | 2.6 | .00 | .3 | .. |
| 8303 | Galvanized. | None ... | None...... | Slight.... | 0.00 | .0010 | .0050 | .003 | .0000 | .10 | 0.4 | .... | .0 | ‖ |

* Receives some salt water.

† Considerable zinc.

‡ Spring by roadside; good water but surface covered with road dust and sample showed coli. Ordered to be properly covered.

§ Not a mineral spring.

‖ Cleaning well advised.

## ANALYSIS OF WATER SUPPLIES AT

(Results are given in



| Number. | Town. | Name of House. | Owner. | Source. |
|---|---|---|---|---|
| 8063 | Bethlehem....... | ................................ | A. C. Otto.................... | Spring...... |
| 8070 | Bethlehem....... | Turner's Tavern ............ | George H. Turner...... ... | Spring...... |
| 8069 | Bethlehem....... | ..................... ......... | R. H. Gardner........ ...... | Spring...... |
| 8061 | Bethlehem....... | Farm Cottage................ | Mrs. Laura M. Phillips..... | Spring...... |
| 8075 | Bethlehem....... | Fitzgerald Cottage.......... | Mrs. M. B. Fitzgerald...... | Spring...... |
| 8071 | Bethlehem....... | The Maplewood. ........... | L. H. Cilley ................. | Spring...... |
| 8062 | Bethlehem....... | ................................ | James Endey................ | Spring...... |
| 8026 | Lisbon........... | Hotel Lookoff........... .... | A. E. Safford................ | Spring...... |
| 8022 | Lisbon........... | Hill-Rest....... ........... | H. M. Smith.................. | Spring...... |
| 8021 | Lisbon........... | Miramonte................... | A. B. Atwood................ | Spring...... |
| 8025 | Lisbon.......... . | The Jessemine .............. | Mrs. L. J. Jessemine........ | Spring...... |
| 8027 | Lisbon........... | The Echoes.................. | A. E. Jessemine.......... ... | Spring...... |
| 8028 | Lisbon........... | Sunset Hill House..... ..... | S. F. Hoskins..... ......... | Spring...... |
| 8029 | Lisbon........... | The Homestead............. | Simeon Bowles..... ........ | Spring...... |
| 8030 | Lisbon........... | The Highland Farm ..... .. | W. D. Smith................. | Spring...... |
| 8248 | Lisbon........... | Peckett's..................... | R. P. Peckett................ | Spring...... |
| 8050 | Fabyan's......... | Fabyan House.............. | Barron, Merrill & Barron | Spring...... |
| 8049 | Bretton Woods.. | Mount Pleasant Cottage.... | Bretton Woods Co........ . | Spring...... |
| 8051 | Bretton Woods.. | Mount Pleasant Hotel...... | Bretton Woods Co.. ....... | Spring...... |
| 8052 | Crawford's....... | Crawford House .. ......... | Barron, Merrill & Barron | Spring...... |
| 8054 | Crawford's....... | Crawford House ............ | Barron, Merrill & Barron | Spring...... |
| 8053 | Bretton Woods.. | Mount Washington Hotel.. | Bretton Woods Co.......... | Spring...... |
| 8038 | Lincoln .......... | Flume House............... | L. W. Blankenship ......... | Spring...... |
| 8128 | Lakeport......... | Lakeshore Farm ............ | Mrs. I. P. Wilkinson........ | Well........ |
| 8118 | Laconia.......... | Grand View House......... | O. C. Johnson.............. | Well........ |
| 8116 | Laconia ......... | The Lakeside............... | H. H. Bennett.............. | Spring...... |
| 8117 | Laconia.......... | Lakeview Inn............... | J. O. Bennett........ ....... | Spring...... |
| 8122 | Laconia.......... | Wadleigh Farm............. | E. C. Hayward.......... .. | Well........ |
| 8124 | Meredith ........ | Mountain View House...... | W. H. Keyser....... ...... | Well........ |
| 8126 | Meredith ........ | Clover Ridge Farm......... | M. C. Brown ............... | Spring...... |
| 8285 | Meredith ........ | Bear Island House......... | O. H. Lewis ............... | Well........ |
| 8095 | Wolfeboro....... | Lake and Mountain House. | Henry Morgan............. | Well........ |
| 8094 | Wolfeboro....... | Hersey Farm............... | J. H. Hersey............... | Well.. ..... |
| 8093 | Wolfeboro....... | Haynes Farm............... | Alice M. Haynes........... | Spring...... |
| 7921 | Tamworth........ | Chocorua House .. ........ | Chocorua House Syndicate | Well........ |
| 8091 | Tuftonborough.. | Bonnyview Farm............ | F. A. Doe.................... | Well........ |
| 8286 | Moultonborough | The Homestead............. | G. A. Blanchard............ | Well........ |
| 8224 | Sandwich ........ | Sandwich House ............ | E. Merryfield............... | Well........ |
| 8227 | Sandwich ........ | Wayside Farm .............. | C. A. Foursins ............. | Spring...... |
| 8228 | Sandwich ........ | Hotel Commonwealth ...... | C. S. Burnham ............. | Well........ |
| 8232 | Sandwich ........ | Moulton Farm.............. | H. E. Moulton.............. | Spring...... |
| 8190 | Holderness...... | Mt. Livermore House....... | F. J. Pease........... ...... | Spring...... |
| 8191 | Holderness...... | Hillside Cottage ............ | A. Fellis..................... | Well........ |
| 8193 | Holderness...... | Central House............... | J. S. Davison .............. | Spring...... |
| 8192 | Holderness...... | Winona Fields .............. | Fessenden & Lakeman..... | Well........ |
| 8180 | Center Harbor .. | Oakhurst..................... | Mrs. G. W. Lorey.......... | Well........ |
| 7955 | Center Harbor .. | Moulton Hotel..... ......... | S. L. Emery................. | Spring.. ... |
| 8213 | Center Harbor .. | The Colonial................. | W. A. Maclean............. | Spring...... |
| 8206 | Center Harbor .. | Cluster Cove...... .......... | C. E. Goodrich............ . | Spring...... |
| 8205 | Center Harbor .. | Orchard Farm............. | A. J. Smith ................ | Well........ |
| 8204 | Centre Harbor .. | Maple Cottage . ............ | E. G. Moulton........... ... | Well........ |
| 8145 | Hampton Falls.. | The Wellswood. ............ | S. A. Gove.................. | Spring...... |
| 8147 | Hampton Falls.. | Hampton Falls House...... | D. F. Batchelder............ | Spring...... |
| 8144 | Hampton ........ | Elmwood Farm....... ...... | Mrs. S. S. Walton.......... | Well....... |

[1] For the summarized results of this inspection, see page 228.

## SUMMER HOTELS AND BOARDING HOUSES.[1]

. parts per 100,000.)



| Number. | Pipe. | Appearance. | | | | Ammonia. | | Nitrogen as | | Chlorine. | Hardness. | Lead. | Zinc. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Turbidity. | Sediment. | Odor. | Color. | Free. | Albuminoid. | Nitrates. | Nitrites. | | | | | |
| 8063 | Lead & galv. | None.... | None..... | None.... | 0.10 | .0030 | .0020 | .007 | .0000 | .06 | 1.2 | .012 | .0 | .. |
| 8070 | Galvanized. | None.... | None...... | None.... | 0.05 | .0010 | .0010 | .010 | .0000 | .05 | 1.2 | .... | .0 | .. |
| 8069 | Lead & galv. | None.... | Slight..... | None.... | 0.05 | .0010 | .0020 | .005 | .0000 | .04 | 1.9 | .025 | .0 | .. |
| 8061 | Galvanized. | V. slight | V. slight.. | None.... | 0.10 | .0010 | .0020 | .003 | .0000 | .10 | 6.3 | .... | .0 | .. |
| 8075 | (Source).... | None.... | V. slight.. | None.... | 0.00 | .0030 | .0020 | .050 | .0000 | .10 | 2.6 | ... | .... | .. |
| 8071 | Galvanized. | None.... | None...... | None ... | 0.10 | .0050 | .0040 | .003 | .0000 | .07 | 2.6 | .... | tr.. | * |
| 8082 | Lead... .... | None.... | Slight..... | None ... | 0.00 | .0020 | .0025 | .005 | .0000 | .04 | 2.6 | .037 | .... | .. |
| 8026 | (Source).... | None.... | None...... | None.... | 0.05 | ...... | ...... | .010 | .0000 | .20 | 1.9 | .... | .... | .. |
| 8022 | Lead........ | None.... | None...... | None.... | 0.00 | .0025 | .0015 | .005 | .0000 | .10 | 4.6 | .012 | ... | .. |
| 8021 | Galvanized. | None.... | None...... | None.... | 0.00 | .0020 | .0010 | .050 | .0000 | .18 | 2.9 | .... | .4 | .. |
| 8025 | Lead, gal... | Slight... | Con. floc.. | S. earthy | 0.05 | .0020 | .0010 | .020 | .0000 | .10 | 4.6 | .012 | .0 | † |
| 8027 | Galvanized. | None.... | V. slight.. | None.... | 0.05 | .0010 | .0005 | .010 | .0000 | .25 | 2.7 | .... | .0 | .. |
| 8028 | Cem.lin.iron | S. opal.. | V. slight.. | None.... | 0.05 | .0010 | .0010 | .005 | .0000 | .10 | 2.2 | .... | .... | .. |
| 8029 | Lead........ | None.... | None...... | None.... | 0:05 | .0010 | .0015 | .005 | .0000 | .05 | 2.6 | .025 | .... | .. |
| 8030 | Lead, gal... | V. slight | V. slight.. | S. earthy | 0.00 | .0010 | .0005 | .005 | .0000 | .05 | 1.4 | .037 | .0 | .. |
| 8248 | Galvanized. | None.... | None...... | None.... | 0.05 | .0018 | .0004 | .020 | .0000 | .57 | 4.6 | .... | .8‡ | .. |
| 8050 | Plain iron... | None.... | None...... | None.... | 0.20 | .0010 | .0025 | .007 | .0000 | .04 | 1.9 | .... | .... | .. |
| 8049 | Galvanized. | None.... | None ..... | None.... | 0.05 | .0010 | .0025 | .005 | .0000 | .04 | 1.3 | ... | .0 | .. |
| 8051 | Galvanized. | None.... | None...... | None.... | 0.00 | .0005 | .0008 | .003 | .0000 | .04 | 1.9 | .... | .0 | .. |
| 8052 | Galvanized. | None ... | None...... | None.... | 0.05 | .0004 | .0008 | .005 | .0000 | .04 | 1.9 | .... | .4 | .. |
| 8054 | (At source). | None.... | None...... | None.... | 0.00 | .0006 | .0008 | .005 | .0000 | .04 | 1.9 | .... | .... | .. |
| 8053 | Plain iron... | None.... | V. slight.. | None.... | 0.05 | .0006 | .0020 | .003 | .0000 | .04 | 1.2 | .... | .... | .. |
| 8033 | Wooden .... | None.... | None...... | None.... | 0.15 | .0006 | .0050 | .015 | .0000 | .08 | 1.2 | .... | .... | .. |
| 8123 | Galvanized. | S. opal.. | S. floc... | None.... | 0.05 | .0004 | .0032 | .005 | .0000 | .08 | 2.6 | .... | .0 | .. |
| 8118 | Lead........ | None.... | None...... | None.... | 0.00 | .0005 | .0003 | .020 | .0000 | 1.80 | 2.6 | .012 | .... | .. |
| 8116 | Galvanized. | None.... | V. slight.. | None.... | 0.00 | .0015 | .0010 | .005 | .0000 | .05 | 1.2 | .... | .0 | .. |
| 8117 | Galvanized. | S. opal.. | V. slight.. | Slight... | 0.05 | .0008 | .0006 | .003 | .0000 | .10 | 1.2 | .. . | .0 | .. |
| 8122 | (Source).... | V.S.opal | None...... | None.... | 0.05 | .0010 | .0046 | .020 | .0000 | .35 | 3.3 | .... | ... | § |
| 8124 | Lead........ | None.... | None... .. | None.... | 0.05 | .0008 | .0016 | .020 | .0000 | .45 | 2.6 | .012 | .... | .. |
| 8126 | Galvanized. | None.... | V. slight.. | None.... | 0.00 | .0006 | .0024 | .010 | .0000 | .12 | 3.2 | .... | .6‡ | .. |
| 8285 | (Source).... | None.... | None...... | None.... | 0.05 | .0008 | .0050 | .005 | .0000 | .15 | 1.9 | .... | .... | § |
| 8095 | (Source).... | None ... | Slight..... | None.... | 0.05 | .0030 | .0085 | .050 | .0000 | .30 | 1.9 | .... | .... | .. |
| 8094 | (Source).... | None.... | None...... | None.... | 0.00 | .0011 | .0020 | .005 | .0000 | .25 | 2.6 | .... | .... | .. |
| 8093 | Lead........ | None.... | V. slight.. | None.... | 0.00 | .0005 | .0010 | .020 | .0000 | .25 | 1.9 | .012 | .... | .. |
| 7921 | Galvanized. | None.... | None ..... | S. earthy | 0.00 | .0015 | .0020 | .005 | .0000 | .25 | 0.4 | .... | .... | .. |
| 8091 | (Source)... | None.... | Slight..... | None.... | 0.00 | .0025 | .0020 | .005 | .0000 | .15 | 0.4 | .... | .... | .. |
| 8286 | ? | None ... | None...... | None ... | 0.05 | .0004 | .0004 | .010 | Tr. | .21 | 1.9 | .000 | .0 | .. |
| 8224 | (Source).... | None.... | V. slight.. | Slight... | 0.00 | .0014 | .0046 | .040 | .0000 | .61 | 5.3 | .... | .... | .. |
| 8227 | Lead........ | None ... | None...... | V. slight | 0.00 | .0012 | .0016 | .030 | .0000 | .57 | 3.2 | .020 | .... | .. |
| 8228 | Iron......... | None.... | V. slight.. | S. earthy | 0.05 | .0008 | .0012 | .005 | .0000 | .15 | 1.9 | .... | .... | .. |
| 8282 | Lead........ | None.... | V. slight.. | None.... | 0.00 | .0004 | .0014 | .005 | .0000 | .12 | 3.9 | .040 | .... | .. |
| 8190 | Galvanized. | None.... | V. slight.. | None.... | 0.05 | .0008 | .0010 | .010 | .0000 | .10 | 1.9 | .... | .0 | .. |
| 8191 | (Source).... | None.... | None...... | None.... | 0.05 | .0010 | .0015 | .003 | .0000 | .10 | 1.2 | .000 | .0 | .. |
| 8193 | Lead........ | None.... | V. slight.. | None.... | 0.00 | .0005 | .0005 | .003 | .0000 | .05 | 2.6 | .037 | .... | .. |
| 8192 | Lead........ | None.... | None...... | None.... | 0.05 | .0010 | .0008 | .003 | .0000 | .10 | 1.9 | .012 | .... | .. |
| 8180 | Lead........ | None.... | None...... | None.... | 0.05 | .0002 | .0004 | .005 | .0000 | .08 | 1.9 | .000 | .... | .. |
| 7955 | Galvanized. | None.... | S. earthy.. | S. earthy | 0.05 | .0010 | .0010 | .015 | .0000 | .12 | 3.6 | .... | .... | .. |
| 8213 | Galvanized. | None.... | None...... | Slight... | 0.05 | .0010 | .0045 | .005 | .0000 | .10 | 1.7 | .... | .0 | .. |
| 8206 | Tin-lin. lead | None.... | None...... | None.... | 0.00 | .0015 | .0010 | .200 | Tr. | .85 | 3.9 | .010 | .... | .. |
| 8205 | (Source).... | None.... | None...... | None.... | 0.00 | .0005 | .0018 | .003 | .0000 | .35 | 2.6 | .... | .... | .. |
| 8204 | Wood ....... | None.... | V. slight.. | Slight... | 0.05 | .0010 | .0010 | .025 | .0000 | .90 | 3.2 | .... | .... | .. |
| 8145 | Galvanized. | None.... | Slight..... | None.... | 0.05 | .0026 | .0018 | .045 | .0000 | .75 | 3.2 | .... | .0 | .. |
| 8147 | Lead........ | V. slight | None...... | S. earthy | 0.00 | .0016 | .0004 | .005 | .0000 | .75 | 4.6 | .000 | .... | .. |
| 8144 | (Source).... | None.... | Slight..... | None.... | 0.05 | .0014 | ‖.0048 | .020 | .0000 | .55 | 1.9 | .... | .... | .. |

*Slight excess of organic matter present. Cleaning spring advised. Latter is remote from any chance of pollution.

† Sample taken shortly after a shower; said to be normally clear.

‡ Considerable zinc.

§ Cleaning well advised.

‖ Well stones heavily moss-grown.

## SUMMARY OF WATER SUPPLY INSPECTION OF SUMMER RESORTS.



| Town. | Acceptable. | Non-acceptable. | Excessive lead. | Total supplies examined. |
|---|---|---|---|---|
| Amherst | 2 | 1 | 1 | 3 |
| Ashland | 1 | 1 | 0 | 2 |
| Bethlehem | 7 | 2 | 1 | 9 |
| Center Harbor | 6 | 9 | 0 | 15 |
| Conway | 6 | 1 | 1 | 7 |
| Crawford Notch District | 6 | 0 | 0 | 6 |
| Franconia | 3 | 1 | 1 | 4 |
| Hampton | 4 | 6 | 0 | 10 |
| Hampton Falls | 2 | 0 | 0 | 2 |
| Holderness | 10 | 0 | 0 | 10 |
| Jackson | 5 | 0 | 0 | 5 |
| Laconia | 5 | 1 | 1 | 6 |
| Lincoln | 1 | 0 | 0 | 1 |
| Lisbon | 8 | 1 | 1 | 9 |
| Meredith* | 3 | 4 | 3 | 7 |
| Moultonborough | 1 | 3 | 0 | 4 |
| North Hampton | 2 | 1 | 0 | 3 |
| Ossipee | 1 | 3 | 0 | 4 |
| Rye | 5 | 5 | 0 | 10 |
| Sandwich | 4 | 2 | 0 | 6 |
| Sunapee | 2 | 1 | 0 | 3 |
| Tamworth | 1 | 0 | 0 | 1 |
| Tuftonborough | 1 | 3 | 0 | 4 |
| Wilton | 1 | 0 | 0 | 1 |
| Wolfeboro | 3 | 0 | 0 | 3 |
| Totals | 90 | 45 | 9 | 135 |
| Per cent | 67 | 33 | 6.7 | |

* Including Bear Island.

# INVESTIGATION OF THE WATER SUPPLY OF THE TOWN OF ANTRIM.

During September, 1908, the water supply of Antrim developed a bad taste and odor. Following is a report of the result of an investigation caused to be made by the Board:

*To the Board of Water Commissioners, South Antrim Village Precinct, N. H.:*

Gentlemen: An inspection of your water system made by me September 29, 1908 at the request of the Board of Health, shows the following facts:

I find the supply consists of a pond of sixteen acres located about four miles from the village, the water being conducted thereto by a wooden main. This pond, an elongated oval in shape, lays in a wrinkle, or "fault" occurring on a hillside, so that the depth increases very gradually from the upper shore; the lower shelves off rather abruptly to a maximum depth of twelve or fifteen feet at high water. The strainer at the intake was found to be located in eight feet of water.

The shores and bottom, though underlayed by sand, are covered by a shallow deposit of black mud which in places approaches muck in character; this represents partly wash of alluvial soil from the hillside, partly decomposed vegetation. The shores are fringed by a tangle growth of under-brush, necessarily inundated at times and now including quite a little material that is rotting along the edge of and in the water. Back from the shores a few rods the pond is practically surrounded by open pasturage. The pond has no inlet nor outlet whatever, and as no evidence has ever been discovered of distinct springs, it seems probable that this sheet of water consists merely of a sink supplied by seepage from the hillside.

While there is no habitation on the water-shed and no chance for the entrance of human sewage, nevertheless, a rather serious circumstance exists in that herds of cattle have access to the shores of the pond at every point. Not only must the latter receive a certain amount of contaminated pasture-wash with every shower, but a place was discovered at the northern shore where the odor alone and independent of the tracked up condition of the ground, furnished ample evidence that the cattle make this a daily drinking and wallowing place.

The immediate cause leading to an investigation was the observing a day or two previously of considerable numbers of dead tadpoles along the shores of the pond. Simultaneously the water developed a very offensive odor and appearance and the Board of Health very properly ordered that its use for domestic purposes be discontinued. At the pond a slight fishy odor was plainly distinguishable in places and the dead tadpoles were found to be rather numerous. A few were observed alive, though in a very feeble condition. These tadpoles were rather remarkable for size, the length in some cases being as much as three inches. According to authorities, the period of metamorphosis is from three to four months, the tadpoles ordinarily assuming the frog character by the first of October, although it is nothing unusual under certain conditions for them to go into the mud at about this date and hibernate in the undeveloped condition.

That the destructive cause was one not confined in its effect to tadpoles was evident from the finding of four or five dead perch floating on the surface. Among the causes that might be ascribed are, the introduction of some parasite into the water, a stagnant condition involving insufficient air to support life, or a noxious state of the water due to the influx of foreign matters. That the latter was responsible became plainly evident from the laboratory examination of samples of water taken from the pond and from the tap. These samples indicated a much worse condition of the water than was evident from the inspection, the analysis indicating not only the presence of much animal detritus, with epithelial cells, etc., but a state of gross pollution, explainable under the circumstances only by the entrance of leachings from cattle manure. The dead tadpoles are therefore to be considered as one of the effects, —not the primary cause of the foul condition of the pond. Just why a similar condition has never developed hitherto is somewhat difficult to understand. Previous analyses have been uniformly favorable, although that of March, last, was noticeably abnormal in some respects, as mentioned at the time.



At present the water can be considered as only suitable for sprinkling and for fire purposes. The condition of the pond will doubtless improve rapidly as decomposition continues, and in time the water will become usable. The time necessary will depend somewhat upon future weather conditions and the early exclusion of the cattle from the shores. This pond is altogether too small in area for the existence of spots such as that previously referred to to be tolerated, and the shores will have to be fenced for a distance of several rods from the water, at the least. In addition, a day or so spent by a couple of men with a team of horses in removing the decaying snags and rubbish, and giving the shores a general cleaning up, would be most advantageous.

Reference was made to the fact that the practice of bathing in this pond is not altogether unknown. This cannot be too severely condemned. The penalty for violating the properly attested and published regulations of your Board of Health is $10 for each offense, and one or two prosecutions in this connection would doubtless be all that was necessary.

Respectfully submitted,

CHARLES D. HOWARD,

September 30, 1908. *Chemist.*

Measures were promptly taken toward clearing up and fencing the pond. It proved that the condition of the latter cleared up quite rapidly—more so than was anticipated. Analyses were made at frequent intervals and within thirty days from the date of the complaint the original condition of purity was found to have become re-established.

# REPORT UPON THE NEW FILTER OF THE FRANKLIN WATER WORKS.

During April, 1910, samples of water forwarded to this laboratory from the Franklin supply were found to react for the presence of colon bacilli and an order was accordingly issued directing boiling of the water until an investigation as to the probably cause and significance of this appearance could be made. This order apparently having given rise to some local apprehension as to the efficiency of a filter recently established for filtering the water of the Pemigewasset River, a careful inspection was made of the working of the system. The following is from the report of the chemist to the board of water commissioners:

"I was particularly interested in examining the contrivance placed in operation sometime ago by your Board for the purpose of filtering the water of the Pemigewasset River. This filter is installed in an excavation made at some distance from the river bank and consists in part of a top layer of four or five feet of fine sand underlaid by a stratum of gravel. Under the latter, and covering the impervious clay bottom is a net-work of open-jointed drain-tile, which conduct into a large filter-well forty feet in diameter by about thirty feet in depth, located at one end of the filter-bed. On higher ground above the latter is a second excavation into which river water is pumped and from whence, after subsidence and removal of most of the suspended matters, it passes through a gate to the surface of the filter.

"The specific criticism uttered by certain of the local users, to the effect that the filter-bed will eventually become so foul and germ-laden as to be ineffective, is unfounded. Except that the upper sand layers were not so carefully graded as to size of particles, the filter differs in no essential affecting its capabilities from any of the well-known and much more expensive affairs, examples of which are to be found throughout the country. In fact, in a general way, this filter-bed is very similar in its make-up to those in use, and so favorably known, at Albany, New York. It differs of course in that it lacks the expensive concrete wall and bottom construction. While in its present aspect perhaps not what might be called a " pretty " job of construction, still this feature will be vastly improved and a very creditable appearance secured when the margins are evened up and the embankments and surrounding soil grassed over.

"The only cleaning that any of these filters anywhere receive, year in and year out, consists merely in the occasional paring off of the upper inch of dirty sand. Inçonceivable as it always is to the layman, it is in this slimy film that two-thirds of the purification occurs. In fact, a filter cannot do good work until this film is established, and it is not advisable to remove it until it becomes so thick as to seriously retard filtration. I may state that, to start with, the river water is of much better character than the raw water of the majority of cities using filters,—Somersworth, for a near-by instance. This filter should render the water perfectly safe and good.

"The apparent apprehension caused by the recent "boiling" notice is of course regrettable. Nevertheless, on the findings, and considered wholly in the light of a precautionary measure, which it was, there is no warrant for the somewhat severe criticism which the issuance of this notice seems to have provoked. As has already been pointed out, intestinal bacteria are very widely sown by the agency of both man and animals. Their occasional accidental introduction into a supply from the latter source is not only always possible but is in nowise serious; and it was probably what occurred in this case, as it appears from the testimony and an examination of the pumping records that river water was not being used at all during the time in question. Water being an unfavorable medium, unless the pollution is continuous, colon bacilli very rapidly die out following their introduction; but it is because their *persistent* presence might be due to the entrance of human sewage, with the always possible accompaniment of typhoid, that the unexplained finding of these bacteria in a public water-supply should always be a matter for prompt investigation, if the officials are to do their duty by the public."

FRANKLIN, N. H., September 16, 1910.

*Mr. C. D. Howard, State Laboratory, Concord, N. H.:*

My dear Sir: It seemed desirable by comparative examinations to get a line on the work of our filter. We had asked so much of you that I had not the courage to impose this work on you, and so sent some samples to Mrs. Richards. The report recently received confirms so clearly the many examinations of the river and other water which you have made and justifies so thoroughly the favorable anticipations you had the kindness to express of the work of our rather crudely constructed filter that I thought you might like to see it. I therefore enclose the same. Please return in enclosed envelope.

Sample 2 shows the partial purification effected by precipitation and storage before the water is let on to the filter. Sample 3 contains only the effluent of the filter. Sample 4 is from the large well and contains in addition whatever the ground water and natural filtration from the settling basin may add to the effluent of the filter. Sample 5 is the water as furnished the public. These samples were taken when the river was in flood and probably more contaminated than usual.

Any suggestions or comment that you may think will aid us will be gratefully rceeived.

Thanking you for past courtesies, I am,

Very truly,

(Signed) F. N. PARSONS,

The report referred to shows that this filter is capable of doing excellent work—and especially is this true if we consider that the samples were not taken in connection with any pre-arranged "test" but, on the contrary, were collected under conditions more unfavorable than the ordinary.

It is particularly interesting to note the value of the preliminary sedimentation as an agency in the elimination of bacteria. Thus the report indicates that as a result of this sedimentation alone, a reduction was effected of 75% of the total number of bacteria present in the raw water. A similar purification occurred with regard to the removal of sewage bacteria, which were present in the river water at this particular time. The sample from the filter-well showed a reduction of over 98% of the total bacteria, with no colon bacilli, while the sample from a down town store contained bacteria equivalent to a total removal of *over* 99%.

## INSPECTION OF NEWMARKET AND EXETER WATER SUPPLIES.

*Dr. Irving A. Watson, Secretary, State Board of Health:*

Dear Sir: I beg to submit to you herewith a report of the results of inspections made by me October 29, 1909, of the water supplies of the town of Newmarket and Exeter.

### *Newmarket Supply.*

This inspection was made at the request of the board of water commissioners of the town of Newmarket. I find that the supply has its source in springs which form a small brook of about one and one half miles in length to the point of the latter's discharge into the Piscassett River. This brook flows through a very gently sloping, unpopulated and somewhat marshy water-shed, consisting partly of woodland but mainly of pasturage. The soil consists of clay loam underlaid by a heavy clay, in consequence of which the brook, as it progresses toward the river, assumes a considerable turbidity. With a view to eliminating this condition from the water as supplied, a number of years ago a course of ten-inch open jointed pipe of about 1,500 feet length was laid in the bed of the brook and covered by a layer of gravel.

That this serves in some degree for the removal of suspended matters is evident from a comparison of the brook-water with that in the intake well. It would seem also that there must be a certain amount of bacterial filtration, this because of the fact that, whereas the tap water practically never shows the presence of colon bacilli, examinations have indicated that the latter are almost always to be found in the brook-water—as could hardly be otherwise, in view of the total lack of any attempt at the exclusion of cattle from the water shed.

However, the filtration referred to is far from being altogether effective for the removal of turbidity under all conditions, and as might be expected, there is also more or less trouble from clogging, with a consequent reduction in the volume of water available. I was informed that the average daily pumpage is about 160,000 gallons and that during thirty-seven days of the current year it had been found necessary to supplement the spring water by drawing from the Piscassett River. The latter not a large stream and while it is doubtless true as stated that little or no sewage enters it above the village, still I had occasion to draw attention to the existence of a pig-pen located immediately on the bank and but a few rods from the point of intake.

Aside from the use of the river water, the only objectionable sanitary feature in connection with this water-supply is the existence of the pasturage referred to, and its elimination, it appears, would involve the purchase of an entire farm. For a more effective removal of the suspended clayey matters, the installation of a system of "rapid" or mechanical sand filtration would be required, such type of filter being much better adapted to the needs in this case than the ordinary form of sand bed.

### *Exeter Water Supply.*

At the same date, a brief inspection was also made of the supply and filter-plant of the Exeter Water Works.

In this case, the source is a long and very narrow pond of about three fourths mile in length, lying one mile northeast of the town and formed partly by springs, partly by a small brook which enters at the eastern extremity. The immediate water-shed is unpopulated and is mostly wooded, although there is a small acreage in pasture.

The pumping station, with dam and filter-plant are located at the western extremity. The latter was installed some years ago for the purpose of removing the clayey turbidity always present in this water and at times very marked. There is the usual sedimentation basin, where the raw water is treated with the alum solution and the suspended matters allowed to settle out as much as possible before conducting upon the filter beds. It is found necessary to wash the latter two to four times daily. The daily pumpage at present is 400,000 to 600,000 gallons, and the dose of alum used, as nearly as could be estimated, ranges from one to two grains per gallon, the larger amount being required during rainy or windy weather, at which times the pond becomes excessively turbid. The filtered water is bright and clear and our analyses indicate a satisfactory quality.

Respectfully submitted,

C. D. HOWARD,

November 1, 1909. *Chemist.*

# INVESTIGATION OF THE LACONIA WATER COMPANY'S SUPPLY.

**Complaint having been made of a peculiar taste which developed in this supply an investigation was made, with the following result:**

*Mr. Frank P. Webster, Superintendent Laconia Water Company, Laconia, N. H.:*

Dear Sir: I beg to submit you the following report relative to my investigation of the source and character of the taste now occurring in your water supply.

I learn that the taste complained of was first noted about three weeks ago in the water supplied on certain streets in Laconia. Samples forwarded for examination at about this time gave the usual favorable analysis. Later, a sample taken from the reservoir showed a slightly unpleasant odor, although the analysis was substantially the same as that of the others. None of these samples were tasted. In the absence of any definite understanding of the matter it was assumed at that time that the trouble might be attributable to some condition existing in the reservoir.

On January 23, I personally investigated the local situation. The taste of the water as drawn from a tap at the Electric Lighting Company's office, also at the Business School, was found to be quite marked, being oily in character, together with a suggestion of leather. It was found that this taste was not so noticeable in the cold, freshly drawn water if swallowed quickly but that if a quantity be held in the mouth a few seconds before swallowing, the oily "after-taste" was brought out with great distinctness. An inspection made of the reservoir revealed no conditions to which any exception could be taken. The latter is well protected, with clean edges, and through holes cut in the ice an apparently clean bottom was observed. The taste was here noticeable, and that this could not be attributable to any condition of the reservoir was demonstrated by the fact that such was also detected in the water as pumped directly from the intake at the pumping station.

The shores of Black Brook, which discharges into the lake about one half mile north of the intake, were examined for a short distance above the railroad. The oily taste was found to be quite absent from the brook water. The latter was plainly noticeable, however, at a spot near the middle of the lake one half or three fourths mile north of the intake, where ice was being cut by the Independent Ice Company.

January 25 samples were taken (a) from the open lake in front of the ice-houses, (b) near intake, (c) just above mouth of Black Brook, and (d) Weirs Channel. The oily taste and odor were found to be very marked in samples (a) and (b) but wholly absent from (c) and (d). The brook water carries somewhat more dissolved organic matter than the lake water. The chemical analyses of the three other samples all indicated water of excellent quality. Biological examinations made of all four samples showed in (d) very few organisms, the sediment consisting mainly of plant detritus. Organisms in (c) not numerous but these were found to consist mainly of asterionella—the number not being sufficient, however, to cause appreciable taste or odor. No protozoa observed. In the case of samples (a) and (b) the concentrates from sand filtration showed a highly marked odor and taste and the following organisms of the protozoan class were noted: *Uroglena* (numerous), *synura* (numerous) and *dinobryon.*



All of these organisms are notorious for the production of marked odors and tastes, *uroglena* being especially bad in this respect. These characters are due to the elaboration by the organism of an essential oil. In fact I find that the taste may be exactly duplicated by shaking a drop of cod liver oil with a few ounces of water. Boiling for a period of not less than five minutes seems to be sufficient to entirely eliminate both taste and odor.

These organisms are undoubtedly normally present in small numbers in the water of this as of most lakes. Their present abundance may be explained by the almost unprecedented low stage of water now existing, in conjunction with the fact that the rains following the fall drouth washed into the lake an abundant food supply for their sustenance. Unfortunately there is not much probability of improvement until the coming of the spring freshets, which will serve to dilute the water. Meanwhile boilingwill eliminate the taste,and if the latter should continue after the ice leaves, the installation of some form of aërating devicewould undoubtedlyresult in improvement.

I would recommend that the intake be extended into the lake a little further than at present; not only would this tend to the securing of a little cleaner water, but it is possible that if the latter were drawn from a greater depth much of the present trouble might be avoided, this because of the fact that the organisms referred to are apt to be most numerous nearer the surface.

With regard to the question of deleteriousness of these organisms, or of the minute quantities of oil secreted, it may be stated that such can have no effect upon any normal healthy person, although it is of course to be recognized that any disagreeable taste or odor may sometimes be responsible indirectly and through esthetic conductors, in bringing about some slight disturbance in the case of invalids or those of delicate constitutions. For all such a present remedy is to be found in boiling or thorough aëration of the water.

Respectfully submitted,

C. D. HOWARD,

January 27, 1909. *Chemist.*

## REPORT ON THE WHITEFIELD SUPPLY.

Question having risen as to certain features in connection with the water-supply of the town of Whitefield, an investigation was caused to be made by the Board. The following report was submitted:

*Dr. G. H. Morrison, Chairman, Board of Health, Whitefield, N. H.:*

Dear Sir: In connection with an inspection made of your water supply August 16, 1909, in reference to means for the exclusion of sewage therefrom, I beg to submit the following report with recommendations:

I find your main source of supply to have its origin in a mountain brook fed by springs. This water is piped to a distributing reservoir located near the base of the mountain at a point about six miles from the village. Lying on the water-shed between the source and the reservoir and possibly one fifth mile above the latter on a moderately sharp slope, is a single farm, the property of Merrill Brothers. In connection with the installation of improvements in the farm house, the question of the proper disposal of the sewage has arisen.

To this end four propositions have been submitted, (1) to allow the sewage and household wastes to flow out upon the surface of the ground, (2) their collection in a cesspool, and (3) and (4), their removal beyond possibility of contaminating the reservoir by means of a sewer,—one plan being to extend such sewer for some distance in a northerly direction so as to discharge into the Cherry Pond water-shed, so-called, the other to run a sewer in a southwesterly direction to a point beyond a certain apple tree and south of the reservoir, at which point it is claimed that a narrow divide of land will serve to divert the sewage sufficiently to prevent its reaching the reservoir.

The first proposition, for obvious reasons, has already been rejected, and the second should not be considered in the form as intended. As regards (3) and (4) I am of the opinion that a sewer in either of the directions indicated would afford a perfectly safe and satisfactory arrangement. The second route as indicated above would of course be the less expensive, and I believe that if such sewer were to be extended well down below the apple tree mentioned and to near the edge of the woods, the latter growth would undoubtedly serve to absorb and render innocuous the matters discharged.

Another plan (and the least expensive) that is quite feasible and should prove very satisfactory, would be to install a modified form of cesspool, or "septic tank." A contrivance of this nature is described in detail by Prof. Fletcher in *Sanitary Bulletin* No. 4, Vol. 3, a copy of which is enclosed herewith. Owing to the sharp pitch of the land and the character of the latter, the effluent drain referred to could be constructed very readily and could, of course, be extended a sufficient distance to assure perfect safety. Points that should be observed in this connection are, the construction of a receiving well of generous size, to cement the latter perfectly tight and to so place the effluent sewer that there would be no possible danger of stoppage from freezing.

Devices of this character are now being very commonly recommended for the disposal of sewage and, with proper construction and care, they serve the purpose very well.

In this connection I desire to call the attention of your Board to the very objectionable condition of affairs involved by the existence of this farm on the water-shed. I am informed that the manure of some forty head of cattle is annually deposited on the slopes above the reservoir. During the spring freshets the tendency is for this material to be washed down more or less into the reservoir, and though it is represented that at such times the reservoir is cut out and draught made direct from the upper source, still, an unsafe condition is involved. In view of the fact that the upper supply is not sufficient and it is found necessary to maintain this distributing reservoir at its present location below the highway, and also in view of the fact that it is represented that the erection of summer cottages on this land in the future is not improbable, the precinct should give careful consideration to the desirability of acquiring this farm and reforesting it.

Respectfully submitted,

C. D. HOWARD,

August 20, 1909 *Chemist.*

# BACTERIOLOGICAL EXAMINATIONS.

# BACTERIOLOGICAL EXAMINATIONS MADE AT THE STATE LABORATORY OF HYGIENE.

During the fiscal period embraced by this report 10,874 bacteriological examinations for the detection of disease were made at the State Laboratory of Hygiene, being nearly five thousand more examinations than ever before made for a like period. It certainly shows the growing appreciation of the medical profession of the efforts being made by the state to assist them in the investigations of certain disease conditions.

In addition to this, and not included in the above figures, there were made several hundred bacteriological examinations of water supplies, for the colon bacillus and other organisms. This latter work was done in connection with chemical examinations, the results of which are given in the reports of the chemist to the different towns and cities, corporations and individuals. The positive results of the examinations for the colon bacillus are shown in this volume, in the tabular report of the examinations of "Water Supplies of Cities and Towns."

Aside from the increased demand for examinations in the bacteriological department, there are other evidences of the profession's appreciation of the work that is being done for them and for the public. There is also a much better understanding than heretofore on the part of the profession as to interpretation and application of the results reported to them.

RECORD OF SPUTUM EXAMINATIONS IN SUSPECTED CASES OF TUBERCULOSIS FOR THE FISCAL PERIOD ENDING AUGUST 31, 1910.

| City or Town. | Number cases. | Positive. | Negative. | 1–10. | 10–20. | 20–30. | 30–40. | 40–50. | 50–60. | 60–70. | 70–80. | 80–100. | Male. | Female. | Number examined. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acworth | 1 | .... | 1 | .... | 1 | .... | .... | .... | .... | .... | .... | .... | 1 | .... | 2 |
| Alstead | 11 | 3 | 8 | .... | .... | 2 | 2 | 1 | 1 | 2 | 3 | .... | 7 | 4 | 14 |
| Alton | 2 | .... | 2 | 1 | 1 | .... | .... | .... | .... | .... | .... | .... | 2 | .... | 2 |
| Amherst | 3 | 3 | .... | .... | .... | .... | .... | 1 | .... | 1 | 1 | .... | 1 | 2 | 4 |
| Andover | 6 | 1 | 5 | 2 | .... | 2 | .... | 1 | .... | 1 | .... | .... | 3 | 3 | 6 |
| Antrim | 1 | 1 | .... | .... | .... | .... | .... | .... | .... | 1 | .... | .... | 1 | .... | 1 |
| Ashland | 39 | 13 | 26 | .... | 4 | 12 | 13 | 3 | 4 | 1 | 2 | .... | 24 | 15 | 39 |
| Ashuelot | 2 | 2 | .... | .... | .... | 1 | 1 | .... | .... | .... | .... | .... | 2 | .... | 2 |
| Barnstead | 5 | 2 | 3 | 1 | .... | 2 | .... | 1 | 1 | .... | .... | .... | 4 | 1 | 7 |
| Bartlett | 16 | 1 | 15 | 1 | 3 | 3 | 5 | 4 | .... | .... | .... | .... | 4 | 12 | 17 |
| Bath | 1 | .... | 1 | .... | .... | .... | .... | .... | .... | 1 | .... | .... | 1 | .... | 1 |
| Belmont | 3 | 2 | 1 | .... | 2 | .... | 1 | .... | .... | .... | .... | .... | 2 | 1 | 3 |
| Berlin | 105 | 17 | 88 | 5 | 10 | 46 | 27 | 12 | 3 | 2 | .... | .... | 53 | 42 | 105 |
| Bethlehem | 18 | 6 | 12 | .... | 2 | 6 | 6 | 1 | 2 | 1 | .... | .... | 3 | 15 | 20 |
| Brookfield | 1 | .... | 1 | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... | 1 | 1 |
| Brookline | 2 | 1 | 1 | .... | .... | .... | .... | 1 | .... | 1 | .... | .... | .... | 2 | 2 |
| Boscawen | 5 | 1 | 4 | .... | .... | .... | 1 | 1 | .... | 1 | 1 | 1 | 2 | 3 | 7 |
| Bristol | 2 | .... | 2 | .... | .... | .... | .... | .... | 2 | .... | .... | .... | 1 | 1 | 2 |
| Campton | 1 | .... | 1 | .... | .... | .... | .... | 1 | .... | .... | .... | .... | 1 | .... | 1 |
| Canaan | 5 | 3 | 2 | .... | 1 | 2 | .... | 2 | .... | .... | .... | .... | .... | 5 | 5 |
| Canterbury | 1 | .... | 1 | .... | .... | 1 | .... | .... | .... | .... | .... | .... | 1 | .... | 1 |
| Center Harbor | 2 | 2 | .... | .... | .... | .... | 1 | .... | 1 | .... | .... | .... | 2 | .... | 2 |
| Centerville | 1 | .... | 1 | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1 | .... | 1 |
| Charlestown | 6 | 1 | 5 | .... | 2 | .... | 2 | 1 | .... | 1 | .... | .... | 2 | 4 | 6 |
| Chester | 1 | 1 | .... | .... | 1 | .... | .... | .... | .... | .... | .... | .... | 1 | .... | 1 |
| Claremont | 40 | 15 | 25 | 3 | 5 | 8 | 9 | 9 | 3 | 1 | 1 | 1 | 10 | 30 | 43 |
| Colebrook | 1 | .... | 1 | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... | 1 | 1 |
| Concord | 326 | 56 | 270 | 13 | 40 | 77 | 76 | 52 | 35 | 23 | 10 | .... | 236 | 190 | 449 |
| Conway | 10 | 5 | 5 | .... | 1 | 2 | 2 | 2 | 1 | 2 | .... | .... | 4 | 6 | 10 |
| Deerfield | 1 | .... | 1 | .... | .... | .... | .... | .... | .... | 1 | .... | .... | .... | 1 | 1 |
| Deering | 1 | .... | 1 | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... | 1 | 1 |
| Derry | 27 | 10 | 17 | 1 | 6 | 7 | 5 | 3 | 3 | .... | 1 | 1 | 22 | 5 | 32 |
| Dover | 160 | 43 | 117 | 3 | 17 | 59 | 34 | 23 | 13 | 6 | 5 | .... | 198 | 72 | 309 |
| Durham | 7 | 3 | 4 | .... | .... | 2 | 1 | 3 | 1 | .... | .... | .... | 2 | 5 | 7 |
| Easton | 1 | .... | 1 | .... | .... | 1 | .... | .... | .... | .... | .... | .... | .... | 1 | 1 |

RECORD OF SPUTUM EXAMINATIONS IN SUSPECTED CASES OF TUBERCULOSIS FOR THE FISCAL PERIOD ENDING AUGUST 31, 1910.—*Continued.*



| City or Town. | Number cases. | Positive. | Negative. | 1–10. | 10–20. | 20–30. | 30–40. | 40–50. | 50–60. | 60–70. | 70–80. | 80–100. | Male. | Female. | Number Examined. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Enfield | 10 | 3 | 7 | 1 | 2 | 3 | 2 | 1 | ..... | 1 | .... | ... | 3 | 7 | 10 |
| Epping | 9 | 4 | 5 | .... | 2 | 1 | 2 | ..... | 2 | 1 | 1 | .. | 3 | 6 | 13 |
| Exeter | 43 | 4 | 39 | 1 | 9 | 12 | 19 | 5 | 3 | 3 | 1 | ... | 27 | 16 | 50 |
| Farmington | 18 | ..... | 18 | 3 | 3 | 3 | 2 | 2 | 4 | 1 | .... | ... | 8 | 10 | 22 |
| Freedom | 3 | ..... | 3 | .... | 1 | 1 | ..... | ..... | ..... | 1 | .... | ... | 1 | 2 | 3 |
| Fitzwilliam | 7 | 1 | 6 | 1 | 1 | 3 | 1 | ..... | ..... | 1 | .... | ... | 3 | 4 | 8 |
| Franconia | 2 | 1 | 1 | .... | ..... | ..... | 1 | ..... | ..... | 1 | .... | ... | 2 | ...... | 2 |
| Franklin | 76 | 14 | 62 | 2 | 6 | 17 | 15 | 16 | 4 | 11 | 3 | 2 | 40 | 36 | 106 |
| Fremont | 4 | 1 | 3 | .... | 1 | 2 | ..... | ..... | 1 | ..... | .... | ... | ...... | 4 | 4 |
| Gilmanton | 1 | ..... | 1 | .... | ..... | ..... | 1 | ..... | ..... | ..... | .... | ... | ...... | 1 | 1 |
| Goffstown | 7 | 2 | 5 | .... | 1 | 2 | 2 | 1 | ..... | ..... | 1 | ... | 4 | 3 | 10 |
| Gorham | 9 | 2 | 7 | .... | ..... | 1 | 3 | 2 | 1 | 2 | .... | ... | 4 | 5 | 11 |
| Grasmere | 30 | 14 | 16 | .... | 3 | 8 | 4 | 4 | 4 | 7 | .... | ... | 22 | 8 | 41 |
| Greenland | 7 | 1 | 6 | .... | 2 | ..... | 2 | 2 | ..... | 1 | .... | ... | 4 | 3 | 7 |
| Greenfield | 1 | ..... | 1 | .... | ..... | ..... | ..... | ..... | ..... | 1 | .... | ... | ...... | 1 | 1 |
| Greenville | 7 | 3 | 4 | .... | 3 | 2 | 1 | ..... | 1 | ..... | .... | ... | 6 | 1 | 7 |
| Groveton | 6 | 1 | 5 | .... | 2 | 1 | 1 | 1 | 1 | ..... | .... | ... | 2 | 4 | 6 |
| Hampton | 8 | 4 | 4 | .... | 3 | 3 | 2 | ..... | ..... | ..... | .... | ... | 6 | 2 | 14 |
| Hanover | 67 | 7 | 60 | 1 | 12 | 31 | 13 | 4 | 3 | 3 | .... | ... | 58 | 9 | 85 |
| Haverhill | 3 | 2 | 1 | .... | ..... | ..... | 1 | 1 | 1 | ..... | .... | ... | 2 | 1 | 5 |
| Henniker | 1 | ..... | 1 | .... | ..... | 1 | ..... | ..... | ..... | ..... | .... | ... | ...... | 1 | 1 |
| Hill | 2 | ..... | 2 | .... | 1 | ..... | ..... | 1 | ..... | ..... | .... | ... | 2 | ...... | 3 |
| Hillsborough | 20 | 2 | 18 | 1 | 4 | 1 | 3 | 4 | 3 | 1 | 3 | ... | 10 | 10 | 25 |
| Hinsdale | 10 | 1 | 9 | 1 | ..... | 1 | 3 | 1 | 2 | 2 | .... | ... | 5 | 5 | 10 |
| Hooksett | 2 | ..... | 2 | .... | 1 | ..... | ..... | 1 | ..... | ..... | .... | ... | 2 | ...... | 3 |
| Hudson | 2 | ..... | 2 | .... | 1 | 1 | ..... | ..... | ..... | ..... | .... | ... | 1 | 1 | 4 |
| Keene | 92 | 18 | 74 | 3 | 10 | 20 | 34 | 8 | 6 | 10 | 1 | ... | 40 | ...... | 119 |
| Kingston | 5 | 2 | 3 | .... | ..... | 2 | 2 | ..... | 1 | ..... | .... | ... | 2 | ...... | 5 |
| Laconia | 36 | 11 | 25 | .... | 2 | 16 | 10 | 5 | 3 | ..... | .... | ... | 12 | 24 | 45 |
| Lancaster | 23 | 7 | 16 | .... | 1 | 12 | 5 | 3 | 1 | 1 | .... | ... | 12 | 11 | 29 |
| Lebanon | 39 | 12 | 27 | 1 | 6 | 12 | 9 | 9 | 2 | ..... | .... | ... | 14 | 25 | 55 |
| Lempster | 3 | ..... | 3 | .... | 1 | ..... | 1 | ..... | 1 | ..... | .... | ... | 2 | 1 | 4 |
| Lincoln | 15 | 6 | 9 | .... | 1 | 5 | 7 | 2 | ..... | ..... | .... | ... | 9 | 6 | 16 |
| Lisbon | 10 | 5 | 5 | .... | ..... | 4 | 3 | 1 | ..... | 2 | .... | ... | 4 | 6 | 10 |
| Littleton | 76 | 8 | 68 | 3 | 10 | 16 | 18 | 15 | 10 | 3 | 1 | ... | 45 | 31 | 121 |

RECORD OF SPUTUM EXAMINATIONS IN SUSPECTED CASES OF TUBERCULOSIS FOR THE FISCAL PERIOD ENDING AUGUST 31, 1910.—*Continued.*



| City or Town. | Number cases. | Positive. | Negative. | 1–10. | 10–20. | 20–30. | 30–40. | 40–50. | 50–60. | 60–70. | 70–80. | 80–100. | Male. | Female. | Number examined. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Londonderry | 1 | .... | 1 | .... | 1 | .... | .... | .... | .... | .... | .... | ... | 1 | .... | 1 |
| Loudon | 2 | 1 | 1 | .... | .... | .... | .... | .... | 2 | .... | .... | ... | 4 | 2 | 2 |
| Lyme | 11 | 4 | 7 | .... | 4 | 1 | 2 | .... | 2 | 2 | .... | ... | 1 | 7 | 11 |
| Lyndeborough | 2 | .... | 2 | .... | .... | .... | .... | 2 | .... | .... | .... | ... | .... | 1 | 2 |
| Madison | 1 | .... | 1 | .... | .... | 1 | .... | .... | .... | .... | .... | ... | .... | 1 | 1 |
| Manchester | 318 | 84 | 234 | 3 | 38 | 109 | 97 | 36 | 19 | 12 | 4 | ... | 176 | 142 | 368 |
| Meriden | 6 | .... | 6 | 4 | 1 | 1 | .... | .... | .... | .... | .... | ... | .... | 6 | 7 |
| Milford | 6 | 1 | 5 | .... | 2 | 1 | 1 | 1 | .... | 1 | .... | ... | 2 | 4 | 6 |
| Monroe | 1 | .... | 1 | .... | .... | .... | .... | 1 | .... | .... | .... | ... | 1 | .... | 1 |
| Mountainville | 1 | .... | 1 | .... | .... | 1 | .... | .... | .... | .... | .... | ... | .... | 1 | 1 |
| Nashua | 169 | 47 | 122 | .... | 23 | 39 | 42 | 36 | 14 | 10 | 5 | ... | 93 | 76 | 217 |
| New Boston | 9 | 1 | 8 | .... | .... | 2 | 1 | 2 | 3 | 1 | .... | ... | 4 | 5 | 11 |
| New London | 4 | 1 | 3 | .... | .... | 2 | 1 | .... | .... | .... | 1 | ... | 2 | 2 | 4 |
| Newmarket | 3 | 2 | 1 | .... | .... | 1 | 1 | .... | .... | 1 | .... | ... | 1 | 2 | 4 |
| Newport | 19 | 8 | 11 | .... | 5 | 5 | 1 | 3 | 3 | 1 | 1 | ... | 11 | 8 | 25 |
| Northwood Ridge | 6 | 3 | 3 | .... | 2 | 2 | 1 | 1 | .... | .... | .... | ... | 2 | 4 | 6 |
| Nottingham | 4 | 3 | 1 | .... | .... | 2 | .... | 1 | 1 | .... | .... | ... | 4 | .... | 4 |
| Orford | 3 | .... | 3 | .... | .... | 1 | 1 | 1 | .... | .... | .... | ... | 2 | 1 | 3 |
| Ossipee | 1 | 1 | .... | .... | .... | 1 | 1 | .... | .... | .... | .... | ... | 1 | .... | 2 |
| Peterborough | 5 | 2 | 3 | 1 | 1 | .... | 1 | .... | 1 | 1 | .... | ... | 2 | 3 | 7 |
| Pittsfield | 11 | 4 | 7 | .... | 3 | 2 | .... | 2 | 2 | 2 | .... | ... | 5 | 5 | 10 |
| Pembroke | 15 | 10 | 5 | .... | 1 | 4 | 5 | 4 | 1 | .... | .... | ... | 6 | 9 | 19 |
| Plymouth | 20 | 6 | 14 | 2 | 4 | 5 | 3 | 5 | .... | .... | 1 | ... | 11 | 9 | 33 |
| Portsmouth | 98 | 21 | 77 | 2 | 5 | 29 | 25 | 21 | 6 | 5 | 5 | ... | 39 | 59 | 129 |
| Raymond | 2 | 1 | 1 | .... | .... | 1 | .... | .... | .... | 1 | .... | ... | 2 | .... | 2 |
| Rochester | 26 | 4 | 22 | 2 | 4 | 5 | 6 | 6 | 1 | 2 | .... | ... | 14 | 12 | 34 |
| Salem Depot | 1 | .... | 1 | 1 | .... | .... | .... | .... | .... | .... | .... | ... | .... | 1 | 1 |
| Sandwich | 8 | 2 | 6 | .... | .... | 5 | 2 | .... | .... | .... | 1 | ... | 4 | 4 | 11 |
| Sanbornville | 2 | 1 | 1 | .... | .... | 1 | 1 | .... | .... | .... | .... | ... | 1 | 1 | 5 |
| Somersworth | 34 | 12 | 22 | 1 | 3 | 9 | 12 | 4 | 2 | 3 | .... | ... | 18 | 16 | 39 |
| Stewartstown | 5 | 2 | 3 | 1 | 3 | 1 | .... | .... | .... | .... | .... | ... | 2 | 3 | 5 |
| Stratford | 8 | 1 | 7 | .... | 2 | 1 | 1 | 2 | 1 | 1 | .... | ... | 5 | 3 | 13 |
| Sunapee | 4 | 2 | 2 | .... | 1 | 1 | 1 | 1 | .... | .... | .... | ... | 3 | 1 | 5 |
| Suncook | 34 | 5 | 29 | 1 | 4 | 5 | 5 | 8 | 4 | 4 | 3 | ... | 17 | 17 | 38 |
| Sutton | 4 | 1 | 3 | .... | .... | .... | 3 | .... | .... | .... | .... | ... | 1 | 3 | 4 |

RECORD OF SPUTUM EXAMINATIONS IN SUSPECTED CASES OF TUBERCULOSIS FOR THE FISCAL PERIOD ENDING AUGUST 31, 1910.—*Concluded.*



| City or Town. | Number cases. | Positive. | Negative. | 1-10. | 10-20. | 20-30. | 30-40. | 40-50. | 50-60. | 60-70. | 70-80. | 80-100. | Male. | Female. | Number examined. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Swanzey ........ | 9 | 2 | 7 | .... | ..... | 2 | 2 | 2 | 2 | 1 | .... | ... | 5 | 4 | 10 |
| Temple.......... | 1 | 1 | ....... | .... | ..... | ..... | ..... | ..... | 1 | ..... | .... | ... | 1 | ...... | 4 |
| Tilton........... | 7 | 1 | 6 | .... | 1 | 3 | 1 | 1 | ..... | 1 | .... | ... | 3 | 4 | 10 |
| Troy............ | 12 | ..... | 12 | .... | 3 | 2 | 1 | 2 | 2 | 2 | .... | ... | 4 | 8 | 12 |
| Tuftonborough... | 1 | 1 | ....... | .... | ..... | ..... | 1 | ..... | ..... | ..... | .... | ... | ...... | 1 | 1 |
| Walpole......... | 6 | ..... | 6 | .... | 1 | ..... | 2 | ..... | ..... | 2 | 1 | ... | 4 | 2 | 8 |
| Warner.......... | 8 | 8 | ....... | .... | 2 | 2 | 1 | 1 | 1 | ..... | 1 | ... | 5 | 3 | 8 |
| Warren.......... | 4 | 2 | 2 | .... | 1 | 1 | 1 | 1 | ..... | ..... | .... | ... | 2 | 2 | 5 |
| Wilton.......... | 7 | 1 | 6 | .... | ..... | ..... | 2 | ..... | 3 | ..... | 2 | 2 | 5 | 2 | 11 |
| Winchester....... | 3 | ..... | 3 | .... | 1 | 1 | 1 | ..... | ..... | ..... | .... | ... | 2 | 1 | 3 |
| Whitefield....... | 27 | 4 | 23 | .... | 5 | 10 | 5 | 2 | ..... | 5 | .... | ... | 8 | 19 | 28 |
| Wolfeboro....... | 13 | 3 | 10 | .... | 5 | 3 | 2 | 1 | 1 | 1 | .... | ... | 2 | 11 | 15 |
| Woodsville....... | 21 | 4 | 17 | .... | ..... | 3 | 5 | 8 | 4 | ..... | 1 | ... | 7 | 14 | 23 |
| Not stated....... | 14 | 1 | 13 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | .... | ... | 7 | 7 | 16 |
| Totals......... | 2,444 | 585 | 1,849 | 68 | 313 | 682 | 594 | 368 | 201 | 150 | 61 | 7 | 1,008 | 1,436 | 3,491 |

During the period covered by this report 3,491 examinations of sputum were made for the bacillus of tuberculosis, as against 2,238 for the like previous period. The examinations represent 2,444 individual cases.

Of the total number of specimens examined, 585 were positive, 1,849 negative. The ages of the patients, in ten-year periods, and the sex are given in the accompanying table.

The laboratory furnishes free outfits for all the bacteriological work, a supply being kept by a sufficient number of druggists to accommodate the profession. All of the outfits referred to are mailable. The one for collecting sputum is sent out containing a solution of carbolic acid into which the sputum is deposited, the bacilli being immediately killed by it, so that there is no danger of infection in transmitting through the mails or in handling in the laboratory. The instructions sent out with the outfit are as follows:

NEW HAMPSHIRE

STATE BOARD OF HEALTH.

LABORATORY OF HYGIENE.

This SPECIMEN will be examined for TUBERCLE BACILLI if ALL QUESTIONS on enclosed card are answered, otherwise not.



Add expectoration discharged in morning to CARBOLIC SOLUTION in sputum cup. PUT CORK IN FIRMLY to avoid leakage.

SPECIMENS WILL NOT BE ACCEPTED UNLESS SUBMITTED IN THE BOTTLES PROVIDED FOR THE PURPOSE BY THE LABORATORY.

SPECIMENS WILL NOT BE EXAMINED IF THERE IS ANY SPUTUM ON THE OUTSIDE OF THE BOTTLE.

Purulent, cheesy and muco-purulent sputum most frequently contain the bacilli; pure mucous, blood or saliva do not as a rule contain the bacilli.

Patient should be told to deposit results of coughing in the specimen bottle, and not merely to spit in the vessel. When hemorrhage has occurred, some purulent, cheesy or muco-purulent sputum should, if possible, be collected for the examination.

PATIENT SHOULD TOUCH BOTTLE AND CORK AS LITTLE AS POSSIBLE. BE VERY SURE THAT PATIENT DOES NOT PERMIT SPUTUM TO COME IN CONTACT WITH OUTSIDE OF BOTTLE OR CORK.

These rules have been adopted because the examination of tuberculous sputum entails some danger to the examiner, if indiscriminate outfits are used or if the material is carelessly collected.

All charges for transmission must be paid by the party sending the specimen; and also telegraph or telephone charges in reporting results. Report will be sent by mail, as soon as possible, unless otherwise ordered.

Send specimen to Concord or Hanover, as may be most convenient.

The card referred to in the above suggestions, is for the purpose of keeping a record in this department, the facts of which may be of value when taken in connection with the hundreds of other similar records. The same is true of the information asked for in other examinations, as in diphtheria, typhoid fever, etc. These records are the confidential property of the State Board of Health, and are used only in making deductions from sanitary work, the name of the patient never being revealed.

No......t..........

TUBERCULOSIS.

Doctor's name..................................................................

City or town.....................................................................

Patient's name.................................Age............Sex........

Occupation..................................Is patient able to work?..........

Number of specimen: 1st, 2d, 3d..............................................

Duration of disease................How many other cases in same household?...

Is sputum morning specimen?....................Is it scanty?...............

Clinical diagnosis..............................................................

Shall report be sent by mail, telegraph, or telephone?.......................

(Remarks may be written on reverse side of this card.)

---

Received..............................Result................................

Reported.......................by........................................

Following the examination, a report is made to the physician who sent the specimen. The blank used for the purpose contains the following explanatory note:



If the result of the examination is negative it is not to be assumed that the case is not one of pulmonary tuberculosis, for frequently in this disease tubercle bacilli are at times absent from the sputum and the disease can only be probably excluded if repeated examinations of the sputum fail to show the presence of bacilli. If the first examination in a case is negative, other specimens should be sent for examination.

The demonstration of the presence of tubercle bacilli in the sputum proves conclusively the existence of tuberculosis, but the absence of tubercle bacilli or the failure to find them microscopically does not exclude the existence of the disease.

# EXAMINATIONS IN SUSPECTED CASES OF DIPHTHERIA.

Examinations for the Klebs-Loeffler bacillus were made of 3,491 specimens for the purpose of diagnosis, and of 2,500 specimens for purposes of release, the remainder being for school and hospital investigations. Of the number, 761 were positive, 2,730 were negative, and in the school and hospital examinations 17 were positive and 331 negative.

Diphtheria outfits for the use of physicians are deposited in different parts of the state, the same as for tuberculosis. Accompanying the outfit is the following circular.

NEW HAMPSHIRE
STATE BOARD OF HEALTH.
LABORATORY OF HYGIENE.

This SPECIMEN will be examined for DIPHTHERIA BACILLI if ALL QUESTIONS on enclosed card are answered, otherwise not.

A diagnosis of diphtheria should not be surrendered until three negative cultures have been reported from the laboratory.

A case of diphtheria should not be released from quarantine until at least two negatives (three are better) have been secured.

Rub the swab thoroughly over exudate or membrane, not forgetting the nose as a frequent source of the bacilli; do this in a good light and at a time when you are sure no antiseptic has been used for at least two hours.

Diphtheria does not occur without the presence of the diphtheria bacilli; but there have been many cases of diphtheria in which, for one or another reason, no bacilli were found in the cultures by the examiner. In many of these cases later cultures revealed them.

If a culture taken from the throat of a patient, who appears, clinically, to have diphtheria, reveals the Klebs-Loeffler bacillus, there can be no question as to the diagnosis; *but should the culture prove negative, instead of positive, the physician should in every instance regard the result as valueless, and should not permit it to warp his judgment or treatment of the case from a clinical point of view.* The physician who relies upon a primary negative result for a diagnosis of his case may find himself in serious trouble, with, perhaps, a most malignant type of diphtheria on his hands a few days later.

The laboratory does not in any instance give a diagnosis of the case; does not see the patient; knows nothing of his symptoms. It simply reports "positive" or "negative" as the result of a most careful and scientific examination of the *material received*. The report is made *upon the swab*, and not upon the throat condition which prompted the sending.

This mailing case, approved by the U. S. Postoffice Department for sending pathological specimens by mail cannot be furnished physicians to be kept in stock at their offices on account of the great expense of such a distribution. These outfits will be kept at convenient stations for the use of the physician (of which he will be informed), or will be sent by mail upon application when needed for *immediate* use.

A record will be kept of every outfit, and the party receiving same will be held accountable for it.

Every specimen reaching Concord not later than nine o'clock in the evening (Sundays included) will go into the incubator at once so that a report can be made early the following morning.

Report will be sent by mail, as soon as possible, unless otherwise ordered.

Send specimen to Concord or Hanover, as may be most convenient.

The record card, which the physician must return with the specimen to be examined, is as follows:

DIPHTHERIA. No...............

Questions below must be answered in every case.

Doctor's name..................................City or Town..............
Patient's name.............................Age..........Sex............
Residence.........................Date of earliest symptoms...............
Date Culture taken?.............For Diagnosis?..........For Release?.........
Is there membrane or exudate?......................Where?.................
Was an antiseptic applied to throat within two hours?...............(If so the chance of diagnosis from swab is greatly diminished.)
Clinical diagnosis..................................................

Send specimen by mail to Concord or Hanover, as may be most convenient.

Shall report be sent by mail, telegraph or telephone?.............................

---

Received by................................Result........................
Reported...................................by...........................

This card, like that which accompanies other outfits, is for record and statistical purposes.

The following table gives the total number of examinations made, by towns, with results:

RECORD OF EXAMINATIONS MADE IN SUSPECTED CASES OF DIPHTHERIA DURING THE TWO YEARS ENDING AUGUST 31, 1910.



| City or Town. | Diagnosis. | Positive. | Negative. | Release. | Positive. | Negative. | Total. |
|---|---|---|---|---|---|---|---|
| Alton | 2 | 1 | 1 | 5 | 0 | 5 | 7 |
| Alstead | 1 | 0 | 1 | ...... | ...... | ...... | 1 |
| Andover | 13 | 5 | 8 | 6 | 1 | 5 | 19 |
| Antrim | 5 | 3 | 2 | 3 | 1 | 2 | 8 |
| Amherst | 4 | 1 | 3 | 14 | 4 | 10 | 18 |
| Auburn | 2 | 2 | ...... | ...... | ...... | ...... | 2 |
| Barnstead | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Bartlett | 6 | 1 | 5 | 3 | ...... | 3 | 9 |
| Belmont | 17 | 7 | 10 | 28 | 3 | 25 | 45 |
| Berlin | 8 | 2 | 6 | 6 | ...... | 6 | 14 |
| Boscawen | 8 | 2 | 6 | 1 | ...... | 1 | 9 |
| Bristol | 8 | 3 | 5 | 6 | ...... | 6 | 14 |
| Brookline | 4 | 1 | 3 | 8 | 3 | 5 | 12 |
| Bedford | 2 | ...... | 2 | ...... | ...... | ...... | 2 |
| Campton Village | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Canaan | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Candia | 5 | 1 | 4 | 19 | 3 | 16 | 24 |
| Center Harbor | 2 | ...... | 2 | ...... | ...... | ...... | 2 |
| Charlestown | 17 | 4 | 13 | 6 | 4 | 2 | 23 |
| Chester | 7 | 1 | 6 | 5 | 0 | 5 | 12 |
| Claremont | 21 | 2 | 19 | 3 | ...... | 3 | 24 |
| Concord | 1,455 | 219 | 1,236 | 898 | 310 | 588 | 2,353 |
| Colebrook | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Conway | 4 | 1 | 3 | ...... | ...... | ...... | 4 |
| Deerfield | 1 | ...... | 1 | 3 | ...... | 3 | 4 |
| Derry | 59 | 23 | 36 | 41 | 16 | 25 | 100 |
| Dover | 30 | 3 | 27 | 4 | 1 | 3 | 34 |
| Dublin | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Durham | 2 | 1 | 1 | ...... | ...... | ...... | 2 |
| Effingham | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Enfield | 5 | ...... | 5 | ...... | ...... | ...... | 5 |
| Epsom | 5 | 1 | 4 | 9 | 1 | 8 | 14 |
| Epping | 2 | ...... | 2 | 4 | ...... | 4 | 6 |
| Exeter | 7 | 2 | 5 | 17 | 7 | 10 | 24 |
| Farmington | 11 | 11 | ...... | 3 | ...... | 3 | 14 |

RECORD OF EXAMINATIONS MADE IN SUSPECTED CASES OF DIPHTHERIA DURING THE TWO YEARS ENDING AUGUST 31, 1910.—*Continued.*



| City or Town. | Diagnosis. | Positive. | Negative. | Release. | Positive. | Negative. | Total. |
|---|---|---|---|---|---|---|---|
| Francestown | 1 | ...... | 1 | 2 | ...... | 2 | 3 |
| Franconia | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Franklin | 45 | 12 | 33 | 159 | 33 | 126 | 204 |
| Gilmanton | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Goffstown | 3 | ...... | 3 | ...... | ...... | ...... | 3 |
| Groveton | 5 | 1 | 4 | 5 | 1 | 4 | 10 |
| Grasmere | 16 | 1 | 15 | 5 | 1 | 4 | 21 |
| Greenfield | 4 | 4 | ...... | ...... | ...... | ...... | 4 |
| Greenland | 23 | 7 | 16 | 26 | 4 | 22 | 49 |
| Hampstead | 13 | 4 | 9 | 21 | 6 | 15 | 34 |
| Hampton | 3 | ...... | 3 | 1 | ...... | 1 | 4 |
| Hanover | 36 | ...... | 36 | ...... | ...... | ...... | 36 |
| Haverhill | 7 | 1 | 6 | 1 | ...... | 1 | 8 |
| Hillsborough | 26 | ...... | 26 | 1 | ...... | 1 | 27 |
| Hinsdale | 2 | ...... | 2 | 1 | ...... | 1 | 3 |
| Hollis | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Hooksett | 3 | 1 | 2 | 3 | ...... | 3 | 6 |
| Hopkinton | 2 | 1 | 1 | 1 | ...... | 1 | 3 |
| Hudson | 2 | ...... | 2 | 1 | ...... | 1 | 3 |
| Jaffrey | 4 | 2 | 2 | 2 | ...... | 2 | 6 |
| Keene | 258 | 66 | 192 | 216 | 63 | 153 | 474 |
| Laconia | 85 | 25 | 60 | 96 | 28 | 68 | 181 |
| Lancaster | 6 | 2 | 4 | 1 | 0 | 1 | 7 |
| Lempster | 7 | 2 | 5 | 18 | ...... | 18 | 25 |
| Lebanon | 27 | ...... | 27 | 4 | 1 | 3 | 31 |
| Lincoln | 14 | 5 | 9 | 9 | 2 | 7 | 23 |
| Lisbon | 18 | 3 | 15 | 2 | ...... | 2 | 20 |
| Littleton | 68 | 26 | 42 | 102 | 27 | 75 | 170 |
| Londonderry | 3 | 1 | 2 | 3 | ...... | 3 | 6 |
| Loudon | 14 | 6 | 8 | 16 | 2 | 14 | 30 |
| Lyme | 9 | 1 | 8 | 4 | 1 | 3 | 13 |
| Manchester | 331 | 82 | 249 | 203 | 62 | 141 | 534 |
| Marlborough | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Madison | 2 | ...... | 2 | ...... | ...... | ...... | 2 |
| Meriden | 3 | ...... | 3 | ...... | ...... | ...... | 3 |

RECORD OF EXAMINATIONS MADE IN SUSPECTED CASES OF DIPHTHERIA DURING THE TWO YEARS ENDING AUGUST 31, 1910.—*Concluded.*



| City or Town. | Diagnosis. | Positive. | Negative. | Release. | Positive. | Negative. | Total |
|---|---|---|---|---|---|---|---|
| Milford | 58 | 15 | 43 | 71 | 13 | 58 | 129 |
| Monroe | 11 | 6 | 5 | 18 | 11 | 7 | 29 |
| Mont Vernon | 3 | 1 | 2 | 2 | 1 | 1 | 5 |
| Milton | 3 | 3 | ...... | 11 | 3 | 8 | 14 |
| Nashua | 165 | 43 | 122 | 96 | 24 | 72 | 261 |
| New Boston | 3 | 1 | 2 | 2 | ...... | 2 | 5 |
| New London | 10 | 1 | 9 | 3 | ...... | 3 | 13 |
| Newport | 26 | 10 | 16 | 19 | 10 | 9 | 45 |
| Orford | 7 | 2 | 5 | ...... | ...... | ...... | 7 |
| Peterborough | 29 | 13 | 16 | 31 | 14 | 17 | 60 |
| Pittsfield | 3 | ...... | 3 | ...... | ...... | ...... | 3 |
| Plaistow | 4 | 2 | 2 | ...... | ...... | ...... | 4 |
| Plymouth | 21 | 5 | 16 | 10 | ...... | 10 | 31 |
| Portsmouth | 162 | 47 | 114 | 137 | 39 | 98 | 298 |
| Rochester | 22 | 7 | 15 | 17 | 4 | 13 | 39 |
| Rye | 2 | ...... | 2 | 4 | 1 | 3 | 6 |
| Suncook | 54 | 17 | 37 | 18 | ...... | 18 | 72 |
| Sutton | 3 | 1 | 2 | 2 | ...... | 2 | 5 |
| Swanzey | 5 | 3 | 2 | ...... | ...... | ...... | 5 |
| Tilton | 11 | 3 | 8 | 24 | 10 | 14 | 35 |
| Troy | 11 | 1 | 10 | ...... | ...... | ...... | 11 |
| Wakefield | 4 | 1 | 3 | ...... | ...... | ...... | 4 |
| Walpole | 13 | 5 | 8 | 13 | 3 | 10 | 26 |
| Warner | 15 | 1 | 14 | 3 | ...... | 3 | 18 |
| Warren | 1 | ...... | 1 | ...... | ...... | ...... | 1 |
| Wentworth | 5 | ...... | 5 | ...... | ...... | ...... | 5 |
| Whitefield | 3 | 1 | 2 | ...... | ...... | ...... | 3 |
| Wilton | 11 | 4 | 7 | 7 | ...... | 7 | 18 |
| Winchester | 29 | 2 | 27 | ...... | ...... | ...... | 29 |
| Wolfeboro | 6 | 2 | 4 | ...... | ...... | ...... | 6 |
| Woodsville | 19 | 4 | 15 | 27 | 7 | 20 | 46 |
| | 3,491 | 761 | 2,730 | 2,500 | 725 | 1,775 | 5,991 |
| Concord School | 300 | 17 | 283 | ...... | ...... | ...... | 300 |
| New Hampshire State Hospital | 48 | ...... | 48 | ...... | ...... | ...... | 48 |
| | | | | | | | 6,339 |

# EXAMINATIONS IN SUSPECTED CASES OF TYPHOID FEVER.

Blood specimens from 766 suspected typhoid fever patients were made during the year, of which 221 were positive, and 545 negative. The towns from which the specimens were received, together with results in detail, are shown in the following table. The directions accompanying the typhoid outfits are as follows:

## Directions for Taking Blood Sample.

Cleanse the skin of the finger tip or the lobe of the ear of the patient. After drying, prick with a sterilized needle. A surgeon's needle is best for this purpose, and the flow of blood from the finger may be aided if a string is wrapped tightly around it a short distance from the tip, before the pricking. *Wait till a large drop of blood has appeared before using the pipette,* which will be found in the block. Draw the drop of blood into the capillary tube for about an inch or more, and then hold the tip of the tube in the flame of a lighted match until it appears red hot. This will fuse the glass and seal the tube. Do not heat the tube far up as this will destroy the blood.

Fill out the accompanying card and replace in the envelope; seal, and return to the laboratory by mail. (Postage two cents.)

All charges for transmission must be paid by the party sending the specimen; and also telegraph or telephone charges in reporting results. Report will be sent by mail, as soon as possible, unless otherwise ordered.

RECORD OF BACTERIOLOGICAL EXAMINATIONS IN SUSPECTED CASES OF TYPHOID FEVER DURING THE TWO YEARS ENDING AUGUST 31, 1910.



| City or Town. | Number cases. | Positive. | Negative. | Male. | Female. | Number sent. |
|---|---|---|---|---|---|---|
| Albany | 1 | ...... | 1 | 1 | ...... | 1 |
| Alton | 1 | ...... | 1 | 1 | 0 | 1 |
| Andover | 3 | 2 | 1 | 2 | 7 | 4 |
| Antrim | 3 | 3 | ...... | 2 | 1 | 3 |
| Ashland | 1 | ...... | 1 | 1 | ...... | 1 |
| Bartlett | 2 | 1 | 1 | 2 | ...... | 2 |
| Belmont | 1 | ...... | 1 | 1 | ...... | 1 |
| Berlin | 19 | 6 | 13 | 17 | 2 | 19 |
| Bristol | 3 | ...... | 3 | ...... | 3 | 3 |
| Brookline | 1 | ...... | 1 | ...... | 1 | 1 |
| Bradford | 1 | 1 | 0 | ...... | 1 | 1 |
| Campton | 1 | 1 | ...... | 1 | ...... | 1 |
| Centerville | 2 | 1 | 1 | ...... | 2 | 2 |
| Charlestown | 4 | 1 | 3 | 2 | 2 | 4 |
| Claremont | 53 | 13 | 40 | 28 | 25 | 57 |
| Concord | 162 | 46 | 116 | 105 | 57 | 168 |
| Conway | 2 | ...... | 2 | ...... | 2 | 2 |
| Deerfield | 1 | 1 | ...... | 1 | ...... | 1 |
| Derry | 9 | ...... | 9 | 6 | 3 | 9 |
| Dover | 19 | 2 | 17 | 11 | 8 | 21 |
| Epping | 8 | 5 | 3 | 3 | 5 | 8 |
| Exeter | 9 | 1 | 8 | 5 | 4 | 9 |
| Farmington | 21 | 6 | 15 | 7 | 14 | 21 |
| Franklin | 46 | 11 | 35 | 20 | 26 | 46 |
| Gilsum | 1 | ...... | 1 | 1 | ...... | 1 |
| Goffs Falls | 2 | 1 | 1 | 1 | 1 | 2 |
| Goffstown | 3 | ...... | 3 | ...... | 3 | 3 |
| Greenfield | 2 | ...... | 2 | 1 | 1 | 2 |
| Hampton | 6 | 1 | 5 | 6 | ...... | 6 |
| Hanover | 26 | 11 | 15 | 17 | 9 | 26 |
| Hartford, Vt. | 1 | 1 | ...... | ...... | 1 | 1 |
| Haverhill | 4 | 1 | 3 | 4 | ...... | 4 |
| Henniker | 2 | ...... | 2 | 2 | ...... | 2 |
| Hooksett | 2 | ...... | 2 | 2 | ...... | 2 |
| Hudson | 1 | ...... | 1 | 1 | ...... | 1 |

RECORD OF BACTERIOLOGICAL EXAMINATIONS IN SUSPECTED CASES OF TYPHOID FEVER DURING THE TWO YEARS ENDING AUGUST 31, 1910.—*Concluded.*



| City or Town. | Number cases. | Positive. | Negative. | Male. | Female. | Number sent. |
|---|---|---|---|---|---|---|
| Hillsborough | 9 | ...... | 9 | 6 | 3 | 9 |
| Keene | 33 | 11 | 22 | 22 | 11 | 33 |
| Lancaster | 1 | 1 | 0 | 1 | ...... | 1 |
| Laconia | 10 | 4 | 6 | 4 | 6 | 10 |
| Lebanon | 33 | 8 | 25 | 8 | 25 | 33 |
| Lempster | 2 | 1 | 1 | ...... | 2 | 2 |
| Lincoln | 8 | 3 | 5 | 5 | 3 | 8 |
| Littleton | 15 | 6 | 9 | 7 | 8 | 15 |
| Londonderry | 1 | ...... | 1 | 1 | ...... | 1 |
| Manchester | 54 | 11 | 43 | 35 | 19 | 54 |
| Meriden | 1 | ...... | 1 | ...... | 1 | 1 |
| Milton | 1 | ...... | 1 | 1 | ...... | 1 |
| Mont Vernon | 1 | ...... | 1 | 1 | ...... | 1 |
| Nashua | 25 | 4 | 21 | 13 | 12 | 25 |
| New London | 5 | 2 | 3 | 4 | 1 | 5 |
| Newport | 5 | 2 | 3 | 1 | 4 | 5 |
| Ossipee | 3 | ...... | 3 | 3 | ...... | 3 |
| Peterborough | 1 | 1 | ...... | 1 | ...... | 1 |
| Pittsfield | 1 | ...... | 1 | ...... | 1 | 1 |
| Plymouth | 39 | 18 | 21 | 31 | 8 | 39 |
| Portsmouth | 24 | 4 | 20 | 17 | 7 | 24 |
| Randolph | 1 | ...... | 1 | 1 | ...... | 1 |
| Rochester | 5 | 3 | 2 | 4 | ...... | 5 |
| Springfield | 1 | ...... | 1 | 1 | ...... | 1 |
| Stewartstown | 4 | 2 | 2 | 4 | 1 | 4 |
| Stratford | 3 | 1 | 2 | 3 | ...... | 3 |
| Suncook | 8 | 2 | 6 | 5 | 3 | 8 |
| Sutton | 1 | 1 | ...... | ...... | 1 | 1 |
| Troy | 3 | 1 | 2 | ...... | 3 | 3 |
| Walpole | 7 | 1 | 6 | 6 | 1 | 7 |
| Warner | 6 | 2 | 4 | 6 | ...... | 6 |
| Wilton | 25 | 15 | 11 | 16 | 10 | 25 |
| Wolfeboro | 2 | ...... | 2 | 1 | 1 | 2 |
| Woodsville | 4 | 1 | 3 | 3 | 1 | 4 |
| | 766 | 221 | 545 | 462 | 304 | 798 |

MISCELLANEOUS EXAMINATIONS.

| Examined for | Positive. | Negative. | Total. |
|---|---|---|---|
| Tubercular tissue | 4 | 8 | 12 |
| Feces tubercular | ..... | 8 | 8 |
| Streptococci | 2 | 8 | 10 |
| Malaria | 3 | 17 | 20 |
| Gonorrhœa | 73 | 123 | 196 |

# A BRIEF ON WAYS AND MEANS OF HAVING HEALTHY HOMES AND SUMMER RESORTS.

# FOREWORD.

The science and art of sanitation have made notable advances in the state and nation, since the New Hampshire Board of Health made its first report to the legislature in 1882. The leading cities and villages of the state have provided for themselves water-supplies and sewerage systems more or less adapted to their needs. In regard to the disposal of household wastes on a small scale, the annual reports and quarterly bulletins have abounded in suggestions, descriptions of various work done, timely information and instruction. Papers or bulletins on "Disposal of Household Wastes at Summer Resorts," etc., "The Septic Tank, Bacteria Bed and Economical Disposal for Small Communities," "A Sand Filter for Domestic Water Supply," "An Unhampered Cesspool" and others, have been printed in editions of considerable size and widely distributed. But some smaller communities and country districts are still backward. Many still believe in the old-fashioned cesspool; or, whether they believe in it or not, do not or will not see any better way; especially if it calls for any extra labor or expense. The ways of the grandfathers are good enough for them. The state inspector going in almost any direction from the capital finds wells in the barnyards, and other wells, springs, ponds and streams manifestly receiving pollution from household drainage. The summer visitor searching for things "colonial" has no difficulty in finding the colonial privy still flourishing and obtrusively "conserving" the ancient odors for posterity.

In the exercise of its authority, when requiring the abatement of unsanitary conditions, the board finds it desirable and even necessary to do more than prepare and promulgate rules and regulations. Local boards of health who have to enforce such regulations call for specific information and instructions as to the proper methods and appliances suited to their own problems. When reluctant owners are facing legal compulsion, they naturally inquire: "What can we do?" "What are the ways and means which will satisfy this new sanitary standard?" "What is the *least* that I must do, and what will it cost?" Some of these inquiries are for information on points not covered by the previous publications, the editions of which are now exhausted. Hence it seemed to be expedient to issue a larger pamphlet which shall not only reiterate the more important information and suggestions given heretofore, but present also some general plans, specifications and directions adapted especially to the needs of house-owners with small means and neighborhoods with scanty resources. Accordingly the civil engineer member of the board,—Prof. Robert Fletcher, member of the American Society of Civil Engineers and director of the Thayer School of Civil Engineering, Dartmouth College,—was requested to prepare such a paper.

But it must be understood that this is not intended to usurp the functions of a civil engineer or other competent advisor. Such plans and specifications will generally need some modification to be suited to a particular situation. The majority of people cannot understand even very plain drawings of this sort. Errors may arise from misinterpreting the plans, making the excavations too much or too scant, getting the grades wrong, using bad or unsuitable materials, careless or dishonest workmen giving imperfect construction, etc. If it be true that "He who tries to be his own lawyer has a fool for a client," it is even more true for a novice who tries to do a nice piece of construction for which he lacks the proper knowledge and skill. The present publication aims to give only preliminary advice and information, and to set forth the principles and some of the proper methods for dealing with household wastes when not in great quantity. At the same time, the plans are given in sufficient detail, so that intelligent persons in situations like those assumed, who follow them carefully, may find them immediately useful.

No consideration is given to sand filter-beds, contact beds, complete installations of septic tanks, percolating beds and sprinkling methods, because these are generally provided for operations on a large scale demanding considerable expense, and can be built only under expert advice and direction.

# DISPOSAL OF HOUSEHOLD REFUSE IN SMALL COMMUNITIES.

By ROBERT FLETCHER, Member American Society of Civil Engineers; Member of the State Board of Health.

The man of some past generation who first constructed a kitchen drain and a cesspool probably considered himself a "reformer" as against his neighbors who continued to throw their kitchen slops about the dooryard. At least he put the liquid waste "out of sight, out of mind,"—for a time. And yet he may not have been very ancient, for the late Col. George E. Waring wrote in 1876: "The art of sanitary drainage may almost be said to have been born—or reborn—but a quarter of a century ago." This backward glance doubtless refers to the time when, in the words of another:* "The old-fashioned backhouse had no rival, and, on the grounds of rich and poor alike, bore its silent witness to the radical equality of mankind." Certainly it is now much less than a century since "sanitary reformation" was widely agitated in Great Britain. It must be remembered that the general use of the water-carriage system of disposal was impossible before the days of modern water-works, giving more abundant supply to a far greater number of people than ever before known. In the earlier days, systems of dry disposal were much practised, such as the pail system, dry-earth closet and improved privy vault. In England, the latter were sometimes lined with brick or glazed earthenware. The pail system, as formerly managed in Birmingham, Rochdale and other English cities, required a large, well-organized force of scavengers with wagons for removing the tubs. These were big enough so that removals were made weekly, and some of the tubs were lined with absorbent material. In Rochdale, in 1876, the number of tubs had increased to more than 5,500. The cumbrous details and other disadvantages of such a system are obvious, and, in the larger cities, it was soon outgrown. But the need for some such method or methods, for single homesteads with no recourse to better means, is and must ever be well-nigh universal. It will be appropriate, therefore, in the sequel of this paper, to review briefly and give specifications for ways and means of sewage disposal without water-carriage.

## DISPOSAL OF WATER-BORNE SEWAGE.

### THE CESSPOOL AND SOIL POLLUTION.

Our ancestral friend with his first cesspool doubtless soon realized the need of further reformation. If he did not find the ground "sewage sick" after a few years, his descendants did. Yet there are thousands of good people who still think that the ground will continue to absorb and purify such liquid foulness and that Nature may be depended upon to save them from evil consequences. Many such people

*The late Dr. William T. Smith of the Dartmouth Medical College.

or members of their families are in ill health and sometimes die, because they will not believe that the causes lie close at hand and might easily be removed.

The charge against the cesspool has been thus stated: "The old-fashioned privy vault and cesspool cannot be too strongly condemned. Constructed for the avowed purpose of retaining the solid matters as long as possible upon the premises, they become centers of pollution and infection. The liquid portions, escaping, pollute the soil and neighboring wells; the noxious exhalations arising from their putrefying contents contaminate the air."*

He then cites the following facts: "At Charlbury, in consequence of the escape of the contents of a barrel of petroleum or benzoline, which had been buried in an orchard, a circuit of wells sixty feet below and 750 to 900 feet distant became so affected that the occupiers of fifteen houses, containing eighty-two people, were for ten days unable to use the water for drinking or cooking. Cattle refused to drink at the 'spring,' where they were accustomed to drink. Had this soakage been sewage instead of petroleum, who can doubt that the result might have been wholesale water-poisoning and an outbreak of typhoid fever."

In Munich, from 1854 to 1859, when porous cess pits were everywhere, and there were no regulations for keeping the soil clean, the mortality per million due to enteric fever was 24.2 yearly; from 1860 to 1865, when the bottoms and sides of porous pits were required to be cemented, the mortality decreased to 16.8; from 1866 to 1873, when there was a system of partial sewerage, to 13.3; and from 1876 to 1880, under complete sewerage, only 8.7. Pages of similar instances might be cited, but enough has been stated.

By official action of the State Board of Health of Virginia the following are declared nuisances dangerous to the public health and as such shall not be permitted to exist:

1. A dry closet in which the compartment containing the excrement is not water-tight or fly-proof, or in which the excrement is allowed to run on the ground or be exposed to flies, or in which the excrement is not removed or buried at least once a month.
2. A cesspool, vault or tank, containing sewage, and not water-tight or fly-proof.
3. A drain or sewer which empties, without purification, so that the contents can gain access to a well, spring or stream from which water is obtained for drinking purposes.

The main difficulty with the common cesspool is *stagnation*. But, in spite of man's neglect, Nature has always performed in them certain processes of "digestion" or reduction, by which the contained solids have been converted wholly or partly into liquid and gas. If records had been made, doubtless many instances could be given where the contents have been found to be almost wholly liquid after continued use. The experience of the writer to this effect is given beyond in connection with a method proposed for mitigating or removing the nuisance from old cesspools and giving respectability to their surroundings. At Lake Sunapee, N. H., a cesspool at the railroad station, which had been in use ten years, was opened a few months ago and practically no deposit found in it. This was 9 feet long, 3 feet wide and 7 feet deep and was covered with two to three feet depth of earth. Other like cases have come to the notice of members of the board.

In the vicinity of Chicago an entire suburban district has been equipped with what the engineer terms residential septic tanks, which are simply cesspools with stop boards or baffles across the top, but having outlets into agricultural drains. These were based upon the engineer's experience of twelve years with a cesspool which

*Samuel M. Gray, C. E., in report to the City of Providence, R. I.

accumulated but little sludge in all of that time.* A Canadian engineer has had similar experience and has used a similar method in his practice.†

The appurtenances for taking care of water-borne sewage on a small scale may be described under the following heading:

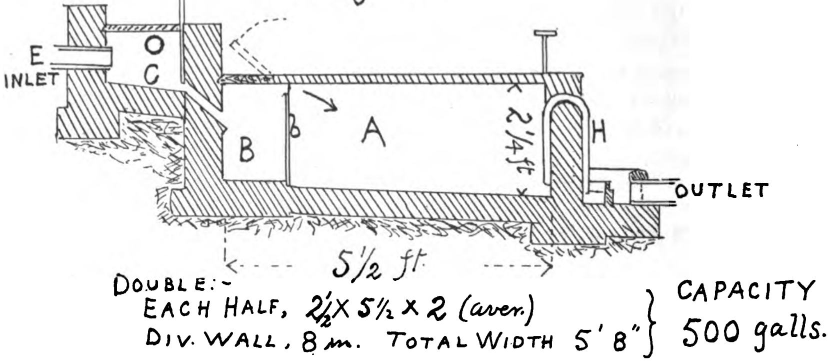


## THE MODIFIED CESSPOOL OR SEWAGE TANK WITH SUBSURFACE DISPOSAL.

As we give our attention to considering a better way, it may be well to notice first how the English took hold of the problem.

In 1874, a report was made in England on the working of Denton and Field's "Sewage Meter," in Eastwick, a hamlet of fifteen houses not far southwest of London. The population served was 145. As the water supply was scant, only five water closets (for the larger houses) were used. The cottages were served by "improved" privy vaults. A longtitudinal section of the tanks is shown in the sketch herewith. C is the grit chamber, into which the drain pipes, E, discharged from two directions or more. After settling in C, the sewage passed into B; thence over the partition, b, into the "meter" A. When the latter was full, it was emptied automatically by the siphon H into a basin from which it flowed through pipes to irrigate a garden. The capacity of the tank, which was made double so that half might always be in use, was 500 gallons, including all compartments. It filled and discharged in ordinary dry weather three times in two days.

Fig. 4




The irrigation feature proved very successful, but the climate there is much more favorable for that than would generally be found in the northern part of the United States.‡ The Eastwick tank is interesting historically, because it was officially declared to give entirely satisfactory results for a small community under the conditions stated; also because its arrangement and action were similar to those of more recent tanks.

It is evident that the operation of this tank was quite different from that of the cesspool. For the gorged cesspool simply overflows when fresh material enters; while the larger compartment of the tank was almost entirely emptied by the siphon, whenever it became full. This gave too little time for the process of digestion or

*Paper by Burton T. Ashley, reported in *Engineering News*, January 31, 1907, page 119.
†H. F. Shade of Vancouver, *Engineering News*, February 20, 1908.
‡The foregoing description is condensed from Waring's "Sanitary Drainage of Houses and Towns," The Riverside Press, 1876.

reduction which is accomplished in the cesspool, but gave much better distribution on the land.

The proper cesspool or sewage tank must be *designed* or *contrived* according to certain general considerations which may now be stated:

*Size.* The Eastwick tank *metered* or measured out 1,500 gallons in two days, showing that the 145 people used only about five gallons each per day. In a country district with quite a moderate water supply, this might serve as a basis. But in small towns or villages in this country, where the supply is freely used, the ordinary family not addicted to waste, the "washing" being done at home, will use from twenty-five to thirty gallons per person per day. The writer has found this by repeated observations by meters, even when a "flat rate" was charged, so that there was no incentive to economize. In summer resorts, when a fairly abundant supply is available, perhaps fifteen to twenty gallons per person daily for all uses on the place is more nearly correct, according to observations at some mountain hotels in New Hampshire. It is safe to assume twenty-five gallons per person per day as an *extreme* allowance, where the proprietors have to provide the supply. This takes account of the large use in the laundry. Tests have shown that the operaton of such tanks is satisfactory, when a quantity equal to its full capacity is discharged in from twenty-four to thirty-six hours; and that it is not detrimental to allow a quantity of three to four times its capacity to flow through in one day. This considerable variation in the rate of flow does not cause deposits of sludge to occur too rapidly. Moreover, in summer resorts, where the number served has wide extremes between summer and winter, if the tank is built double, one half may work efficiently for the least number and the two together be sufficient for the greatest.

*Note the important principle* that rainwater must be excluded. House sewage is quite dilute enough, especially with the inclusion of the water from the laundry.

In view of these facts, a single family of not more than ten or twelve persons would not really need a tank of more than 350 gallons' capacity at the utmost. One of half this size would be ample, but it is not worth while to build a tank smaller than 3 feet wide, 4 feet long and 4 feet in depth of fluid contents. On this basis we may suggest the following:

TABLE OF SIZES FOR SINGLE AND DOUBLE TANKS.

| Width. | | | Depth. | | Contents. | | | Quantities. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Single. | Double. | Length. | Wall. | Liquid. | Cubic Feet. | Gallons. | Persons Served. | Earth excavation, cubic yards. | Masonry, cubic feet. | Figure. |
| 3 | | 4 | 5 | 4 | 48 | 360 | 8 to 16 | 13 | 234 | 5 |
| 3½ | | 5 | 5¼ | 4½ | 79 | 590 | 12 " 30 | | | |
| 4 | | 7 | 5¾ | 5 | 140 | 1,050 | 40 " 120 | 25 | 420 | 6 |
| 4 | | 10 | 5¾ | 5 | 200 | 1,450 | 70 " 240 | | | |
| | 8 | 10 | 5¾ | 5 | 400 | 2,900 | 70 " 500 | | | |
| 4 | | 12 | 5¾ | 5 | 240 | 1,800 | 100 " 350 | | | |
| | 8 | 12 | 5¾ | 5 | 480 | 3,600 | 100 " 700 | 50 | 680 | 7 |
| 4½ | | 18 | 5¾ | 5 | 405 | 3,038 | 125 " 500 | Less if concrete is used. | | |
| | 9 | 18 | 5¾ | 5 | 810 | 6,076 | 125 " 1,000 | | | |
| 5 | | 21 | 6¼ | 5½ | 577 | 4,330 | 200 " 700 | | | |
| | 10 | 21 | 6¼ | 5½ | 1,155 | 8,660 | 200 " 1,400 | | | |

As these figures make the smaller single tanks disproportionately short, the ends may be rounded as shown in the sketches, which will make the capacity a little larger. Generally it is not advisable to have less than five feet depth of liquid in the tank, and Figs. 5 and 8½ might be modified accordingly. Some authorities provide from one half to one square foot of *liquid surface* for each person served. By that rule the second numbers in eighth column are too large, after the first two. But the large numbers are *only allowable for a short time*, anyway.

*Material.* Where field stone abounds, rubble walls built of selected smaller stones laid water-tight with mortar of Portland cement (1 part) and clean sand 2½ (parts), and plastered inside to make a smooth finish, are economical. If brick are easily procured, brick masonry may be preferable. If broken stone or good gravel (which must be screened to exclude all stones larger than 2½ inches in diameter) are conveniently at hand, concrete is an ideal material, because it can be poured within wood forms fitted to give any shape and thickness desired; but it must be made and placed by an experienced workman. If the ground is firm enough to stand plumb in the trench, the concrete can be placed directly against it, so that only the inside plank forms would be needed. Concrete walls may be made thinner and stronger if reinforced with wire fencing or expanded metal, but, in small construction this is hardly worth while unless done by one who knows how. The proportions for suitable concrete for this work are 1 part cement, 2 of *clean* sand and 4 of screened stone or gravel; but, to know the proper amount of water and how to work it in the mould so as to secure smooth surfaces, one must have experience.

The main cover which supports the earth over the tank may be of reinforced concrete slabs or of large flat stone as most convenient. Concrete slabs convenient to handle may be made in shallow, tight boxes of rough boards 4 inches deep, long enough to cover the width of the tank (4 to 6 feet) and only 24 to 30 inches wide so as not to be too unwieldy. The concrete should be of the proportions just stated, and the reinforcement may be *old barbed wire* or small rods 3 inches apart or old wire mesh placed within one inch of the under side of the slab. These should be allowed to set two weeks before removing the boxing, and then placed with great care. With less labor, they may be built in place over the tank on a rough but tight floor, well propped from below, level with the top of the walls, and with 2 x 4 pieces on the walls for forming the edges.

*Arrangement.* It is common practice to have the sewage first enter a vestibule known as the grit chamber or settling basin. This may be omitted, *if* the house drains and all fixtures are so well designed and guarded that no sand or garbage or rags can gain entrance. Under such conditions, it may well be omitted from single tanks; but, for double tanks, it serves as a basin from which to direct the flow to whichever half is in use. Accumulations may be more easily detected in and taken from the smaller basin; but, if the coarse stuff is not in large amount, it may be less troublesome to let it go directly into the large tank and remove it all at once. The need of this will not be frequent, if the process proceeds properly. The end of the inflow pipe should be submerged in either case, so that gases of decomposition may not pass up through the house drains and other fixtures.

The drawings show that this system is better adapted to sloping ground. Although the outflow and inflow may be at the same level, the effluent should have some fall so as to absorb air in the outlet chamber. It is far better also not to allow it to trickle away with the same irregularity that the inflow has, but to collect it in a siphon basin from which, when full, the entire contents will be emptied at one flush. This secures much better distribution and action in the drainage trench beyond.

*Distance and Depth.* The distance from the house will depend partly on the slope of the ground surface. Usually the tank will not be offensive, or (since it is intended to be entirely below the surface) even noticeable, if placed within thirty feet of the house or nearer; but more than fifty feet, or as much farther as is convenient, would probably be more satisfactory. Evidently the inlet must be lower than the point where the pipe comes through the basement wall of the house. The disadvantage of very level ground is that the tank must be so deep that it cannot be emptied by a blow-off pipe, but must be pumped out, or may be mostly emptied by a siphon, if that is found to be necessary; also that the depth would increase with the distance. Sloping ground will usually allow wide choice of location, far or near.



The quantities of excavation are figured on the assumption of walls 16 inches thick at the base, 8 inches at top and 9 to 12 inches above the liquid surface; with

SEWAGE TANK FOR A FAMILY

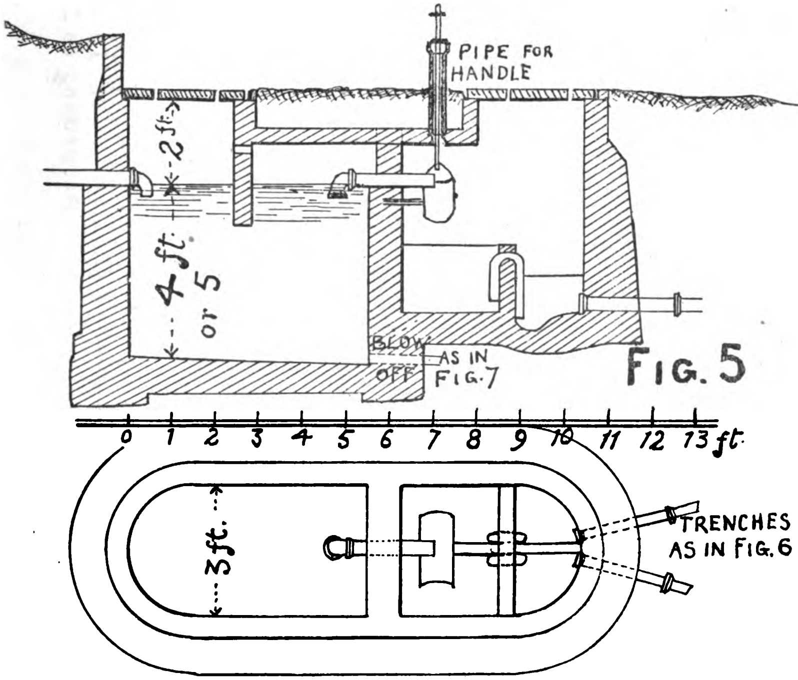
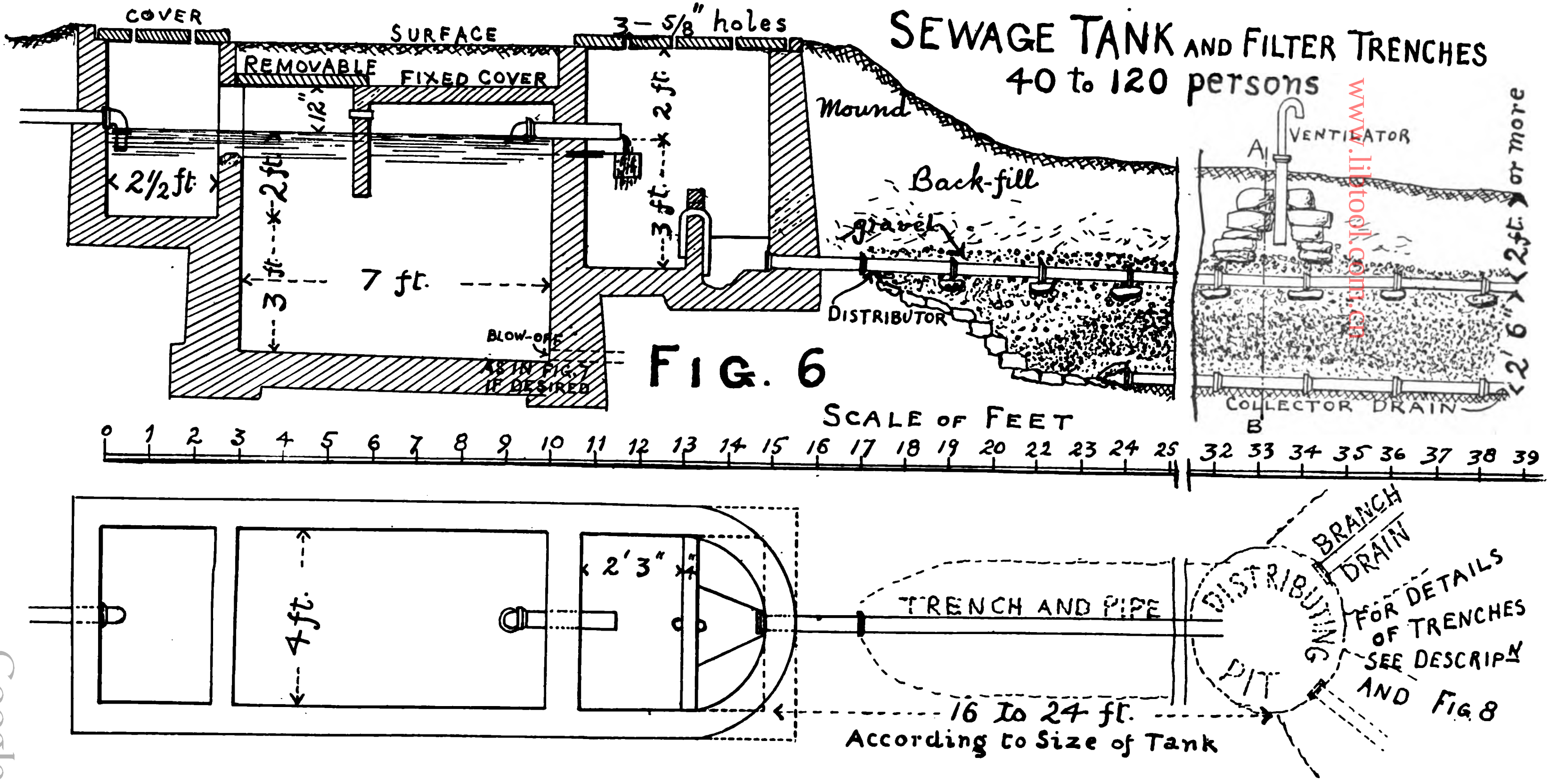



FIG. 5

the top of the wall near the original surface of the ground. Tank bottom 8 to 12 inches thick according to size. The dimensions may be a little more or less, according to the kind of masonry. It is assumed that the depth of covering will be 12 or more inches. The curb walls are carried up to support the removable covers over the inlet and outlet ends. These curbs and covers may be made of plank, but that material would soon decay in such a place.

The sketches represent three sizes of tanks. Fig. 5 shows one for an ordinary household. All essential dimensions are given; others may be inferred from the scale of the drawing. No settling basin is shown, but, if the builder prefers to have one (supposing he does not exclude rubbish from the house fixtures), it would be attached

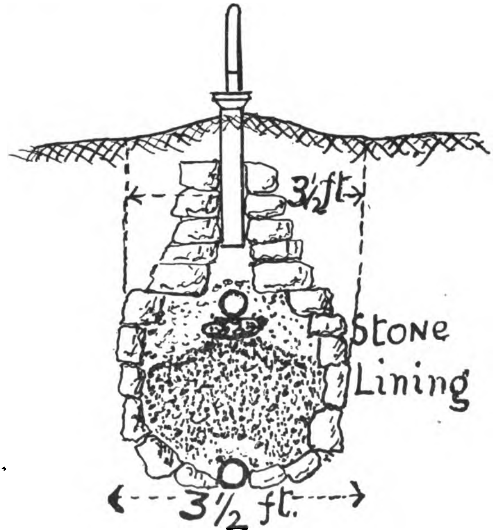


SEWAGE TANK AND FILTER TRENCHES
40 to 120 persons
COVER
SURFACE
REMOVABLE
FIXED COVER
3 – 5/8" holes
2½ ft.
12"
2 ft.
3 ft.
7 ft.
2 ft.
3 ft.
BLOW-OFF
AS IN FIG. 7 IF DESIRED
Mound
Back-fill
gravel
DISTRIBUTOR
VENTILATOR
A
B
COLLECTOR DRAIN
2 ft.
2' 6"
2 ft. or more
SCALE OF FEET
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 22 23 24 25 32 33 34 35 36 37 38 39
4 ft.
2' 3"
TRENCH AND PIPE
DISTRIBUTING PIT
BRANCH DRAIN
FOR DETAILS OF TRENCHES SEE DESCRIPN AND FIG. 8
16 To 24 ft.
According to Size of Tank


FIG. 6

as in Fig. 6. A twelve-inch wall ought to suffice at the *rounded* ends, but it is safer to have the straight walls 16 inches thick at base; all may taper to 8 inches or less at top. If the earth is not firm, when the tank is empty there may be a great push to crowd the walls inwards. The stop-wall or strut-wall across the top, in this as in other cases serves as a brace. It may be supported on iron bars or old pipe coated with cement mortar; but reinforced concrete is better and more durable.

Fig. 6 represents a larger tank with settling basin, main tank and outlet well complete. This is suggested for a group of houses or for a small summer hotel. The trench is shown single for a distance varying from 16 to 20 feet or more, and terminating in a gravel-filled pit from which two filter trenches may be carried as far as is necessary to get an inoffensive effluent. In most cases it is better to have twin trenches




CROSS SECTION OF GRAVEL-TRENCH ON A—B

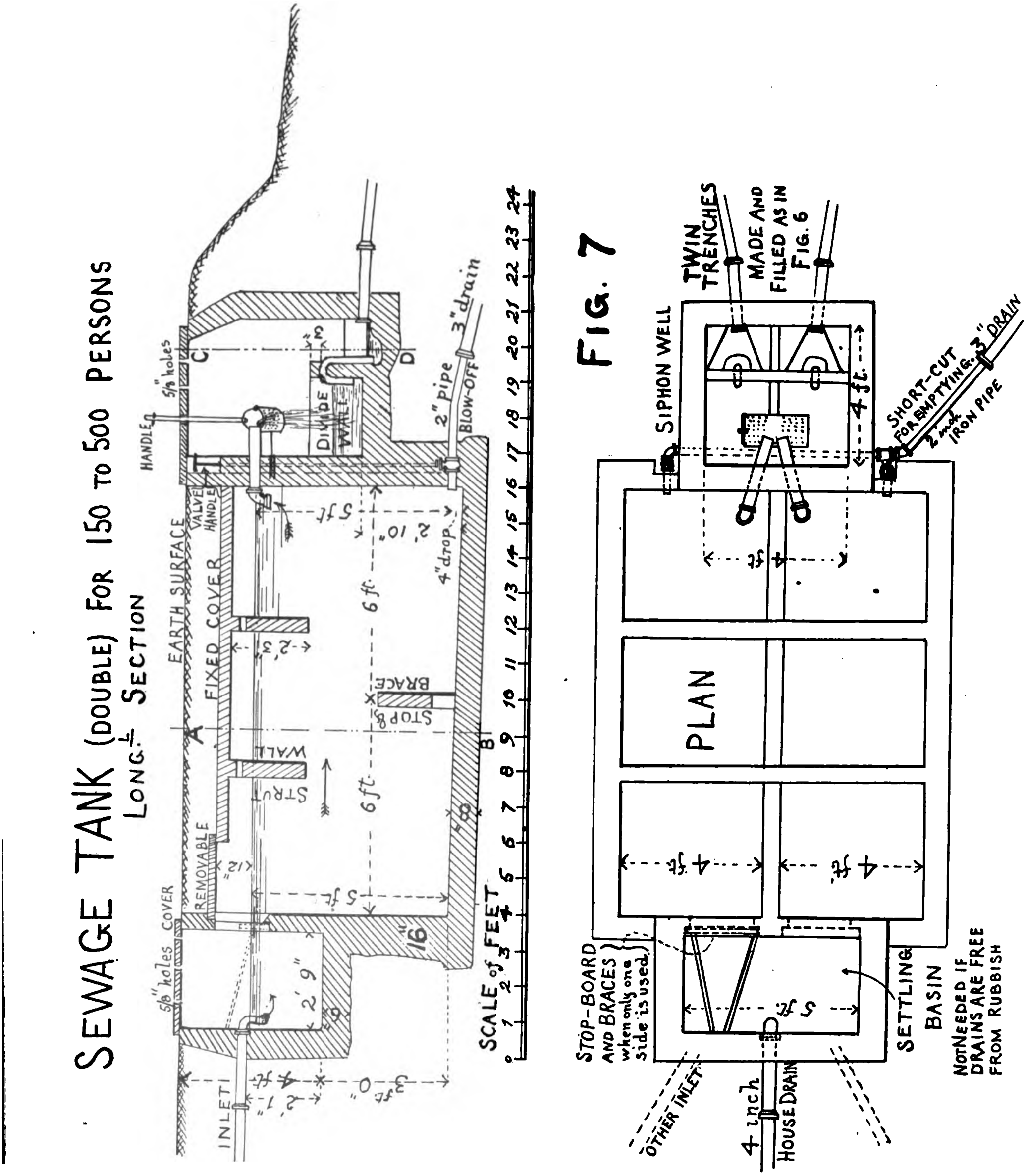
FIG. 6½

start from the siphon well as shown in Fig. 7; thus one can be in use, while the other has a period of rest.

Fig. 7 shows a larger tank adapted to the needs of a small village or a large summer hotel. Either half may be used separately or both together according to the demand. If the whole is used for the minimum number of people, the storage in the tank may be too long and the effluent objectionable. Note arrangement of two-inch pipes and gate-valves in Figs. 7 and 7½ for possible emptying of the tanks or either one.

*Be it observed* that the general intent in all of these cases is to secure such transformation of the sewage and its effluent that the outcome will not be offensive or dangerous. If the ground has considerable slope, the liquid may partly appear upon the surface. But a stone-filled pit at the end may largely absorb it, *if a sufficient number of radiating trenches and pits is provided.* Under favorable conditions, the effluent may never be apparent. Spruce, balsam or other trees set far enough away (40 to 50 feet) so that the roots will not creep into the trenches will much relieve any soaking of the ground; but grass is among the greatest absorbers and evaporators of ground water. Moreover, concerning all the parts and appurtenances, the aim





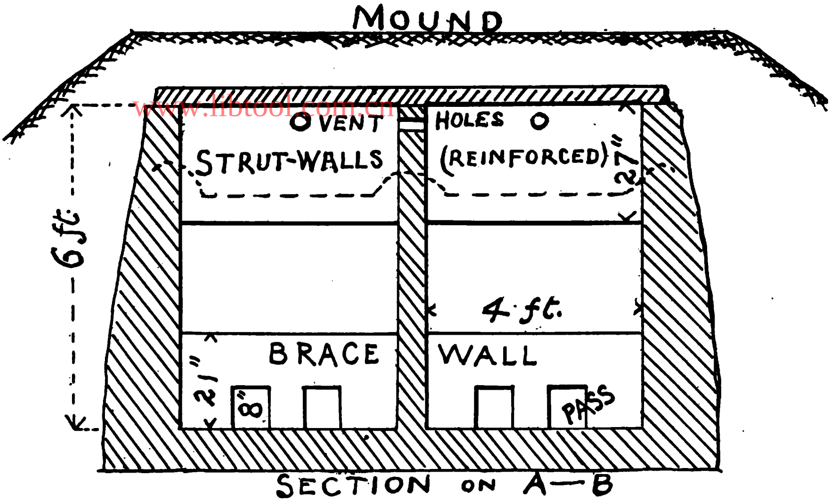
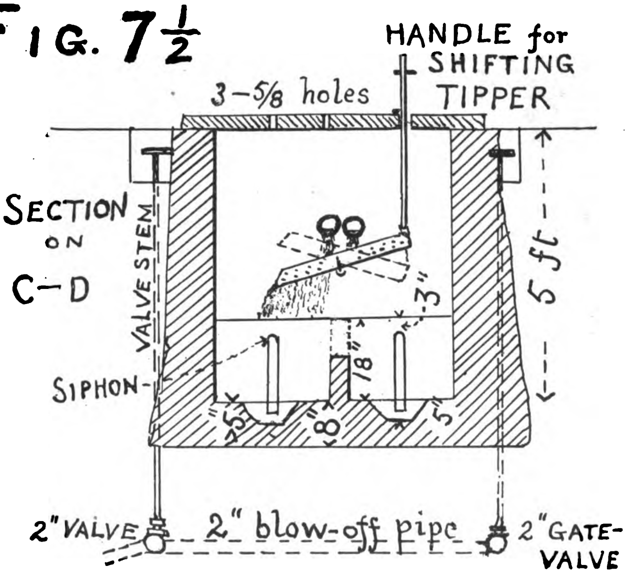





FIG. 7½




is to have the construction and operation as simple as possible, with the least amount of "machinery"; nothing being prescribed but what is usually at hand and not difficult or expensive to obtain, and with the expectation that it will operate with only a little care and attention.

*In the operation of the Tank* if sludge accumulates unduly and too rapidly, there are probably faulty conditions. There may not be depth enough to allow the process of "digestion" to proceed properly; the inflow may be too dilute or irregular, as by admitting rain water, or other excessive flow; or the movement through may be so slow as to be almost stagnation, if the tank be too large for its duty. Observation and trial will show what correction is needed.

## DESCRIPTION OF PRINCIPAL DETAILS.

*The Outlet.* As the sketches show, the effluent passes from the tank through a 3-inch glazed pipe having a quarter bend attached to its inner end. This is set tightly in the end wall at the mid-*width*, tipping slightly forward. Six inches below this a piece of ¾-inch pipe about a foot long is set as a socket to carry a hinge rod to which is attached a tipper trough made of galvanized iron 12 x 24 inches. Except for space about eight inches square at the middle, where it is attached to the rod, this trough is perforated by 1-8 inch holes. A divide wall separates the space below into two equal siphon basins. By a handle passing through the cover, the trough may be inclined either way so as to direct the stream into either basin. When the basin is full, it is emptied by the siphon and the contents delivered to the 3-inch drain pipe which distributes them through the material of the trench as described below. The outlet basin should be narrowed towards the drain pipe, as in Figs. 6 and 7, so that the water will rise for a time higher than the bell of the pipe. The

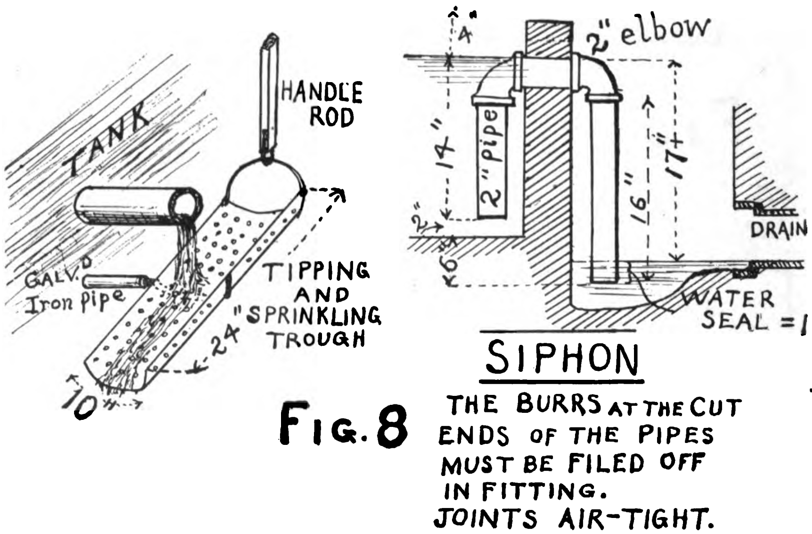



FIG. 8

success of the method depends much upon this distribution which should be as far-reaching as possible, and which requires the effective flushing at intervals, with rests between, which the siphon accomplishes. The details of these parts appear in the sketches. As to holes in the covers, as indicated, one ¾-inch hole should suffice; but the bent vent-pipe shown by the sketch is much to be preferred.

*The Trenches.* Particular attention must be given to preparing the trench. Three and a half feet will probably be a suitable width, and the depth will depend upon that of the outlet of the siphon well. This outlet pipe or distributor is to be laid so as to spread its contents, lengthwise and sidewise over a filling of gravel beneath. Begin about one foot in front of the outlet well, and, in the next five feet, drop the bottom to a depth of 2 feet 6 inches below the outlet. The bottom of the trench must be carefully graded, usually on a slope of twenty-five inches fall in 100 feet. To do this, procure a ten-feet straight edge, and make one end two and a half inches higher than the other by fastening a wedge or block thereto; with a common level

SMALL TANK AND TRENCHES, WITHOUT SIPHON, GROUND NEARLY LEVEL

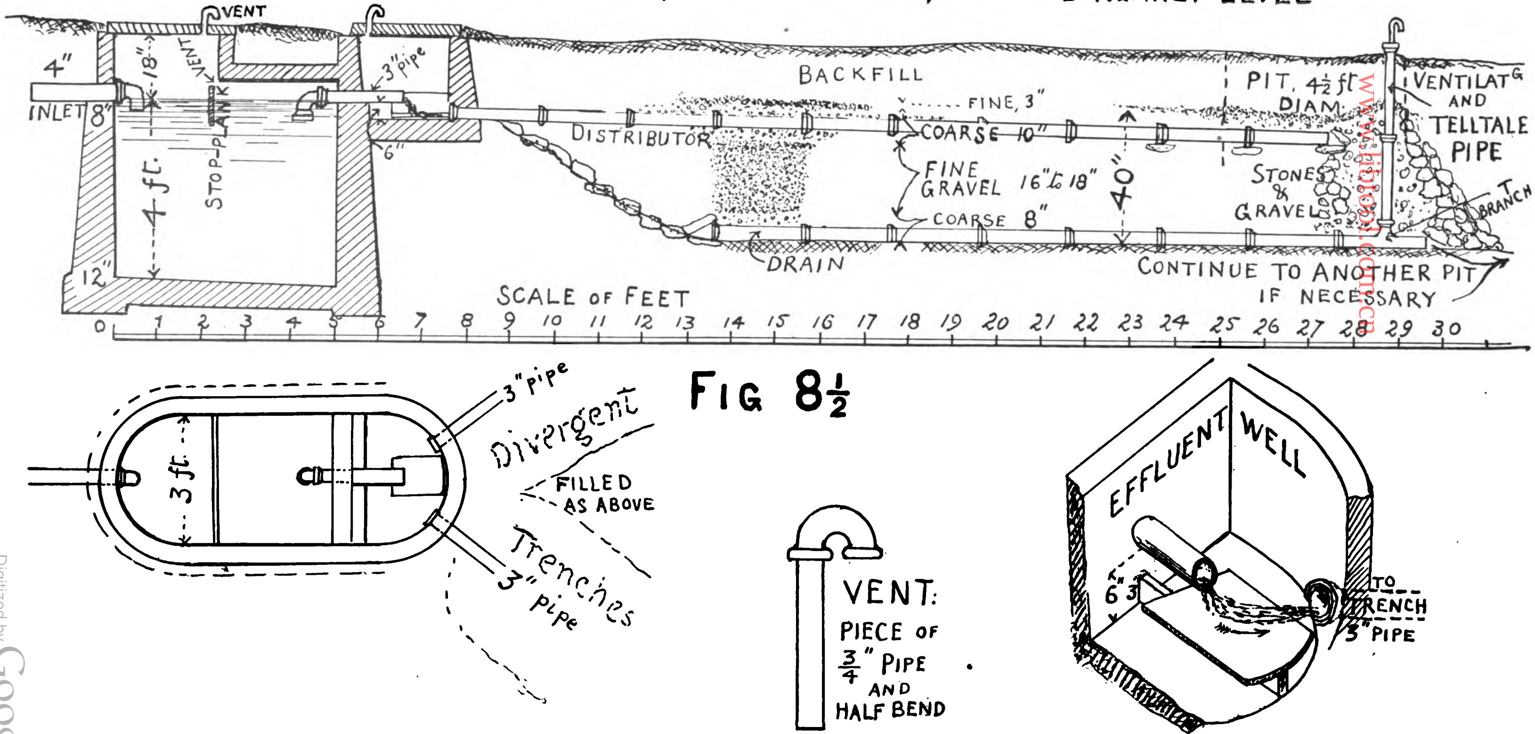
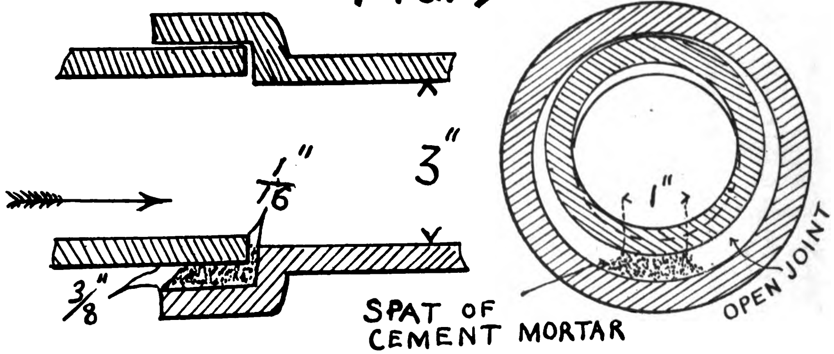



FIG 8½

on top, this slope board will give grade. The trench bottom must then drop according to the grade given by the slope-board. In this bottom, which should dish toward the middle, lay 3-inch glazed drain pipe. Depressions must be made for the bells so that the pipe will rest its entire length on the graded bottom. Use a little cement in the bottom of each joint to "center" the pipes to an even grade. *The greater part around the joint must be left open and the pieces separated a little so as not to have a snug fit.* See Fig. 9, but note that the *lower* pipe must have *even* joints.

*The gravel,* or whatever serves as such, next claims attention. Firstly, all fine sand or dirt must be removed from it. Then two grades must be prepared by screening or otherwise; of the first the particles should be from the size of apple seeds or coarse sand up to the size of peas; the second grade may be called pebbles, being from the size of peas up to that of eggs, with nothing of more than 1½ inches in diameter. If nothing better is available, good clinkers or cinders might be prepared so as to furnish the needed sizes; also broken brick, broken clay pipes, crockery, etc., which have plenty of surface on the pieces. *As the gravel is placed in the trench,*

FIG. 9




STEPPED JOINT FOR DISTRIBUTOR PIPE
(For Collector Pipe, Laid Even)

*some lining should be put on the bottom and sides to prevent the earth from creeping in and clogging the filling.* This lining may be flat field-stone laid on edge, old brick, or larger stones rejected from the gravel, placed by hand as the filling proceeds.

Beside and above the drain pipe, place the coarse stuff or pebbles at least 6 inches thick. Above this, fill the trench about 18 inches deep with the finer stuff, making the middle 4 inches higher than the sides. On this place flat stones at 2-feet intervals to support the distributing pipe, and then even up the trench with the pebbles. All this material *must be compacted enough* so that it will not settle. The stones must be set so that the upper pipe line when resting on them will be on the same grade as that below, and about 2 feet 6 inches higher. After the pipe is on graded line with the lengths separated about 1-16-inch at each joint, lift each spigot end in the bell until it strikes the bell at the highest point, and fix it there by a spat of cement mortar about an inch wide pressed in beneath the spigot end at lowest point of the bell. The remainder of the joint is left open as shown by Fig. 9. Then fill around the pipe compactly with a layer of coarse stuff (pebbles), about 6 inches thick;

above this and against the sides of the trench about four inches depth of the finer stuff. Above this, back-fill the trench and thoroughly tamp the earth and heap it over the trench so as to exclude rain water and hinder the clogging of the gravel.



*Termination.* This arrangement of the distributing pipe is intended to carry the first part of the flush wave out toward the ends of the trenches and to allow the latter part of the flush to trickle down through the open joints near the upper end. The body of fine material is intended to serve as a filter and the lower pipe to collect and carry away the effluent. Evidently the length of trench must depend upon the grade and the amount and rate of delivery from the siphon basin. Probably the basin shown in the sketches is too small for the largest tank. A length of 20 feet of trench may suffice for the smaller services and one of 60 feet or more for the larger services. At these limits an enlargement may be made in shape of a pit 4½ to 5 feet in diameter. This should be lined with any convenient stone and filled with small stones and pebbles, having above it a ventilating pipe, as shown in the sketch. The back filling over this must be first a layer of fine stuff and then earth packed hard and heaped up. The *distributing pipe may terminate* in this pit. The lower drain pipes

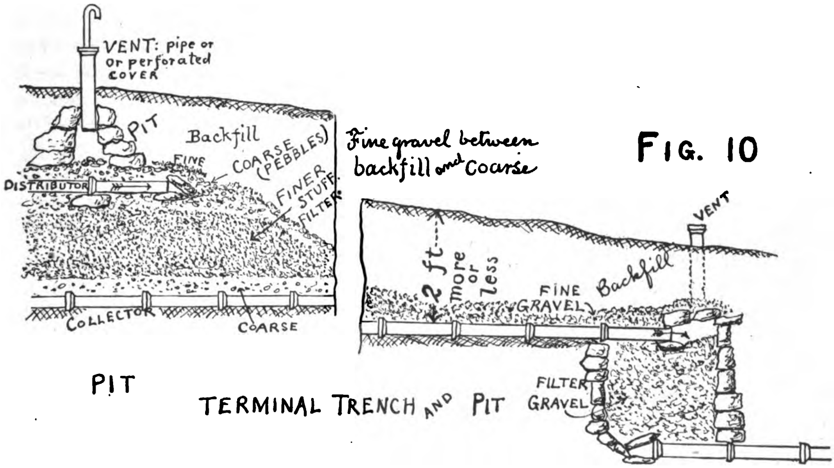



FIG. 10

PIT

TERMINAL TRENCH AND PIT

may be divided and continued at the bottom of two or three short trenches diverging from the pit and filled with stone tapered down to about 8 inches deep above the pipe. The pipes may terminate in small stone piles in shallow pits just below the natural surface of the ground. The number and length of the diverging trenches must depend upon the amount of effluent to be distributed. The arrangement is shown in Fig. 10, and diverging trenches indicated in Figs. 5, 7 and 8½. If the liquid flows through and away too freely a portion of the trench near the end may be rearranged by putting in a larger body of the finer gravel.

Be it again noted that these are general suggestions and directions for adapting certain means to the end of inoffensive sewage disposal. They may and probably will require changes in dimensions and variations in arrangement to suit particular cases. When there is any doubt, further advice and information should be sought.

If this method is applied to very porous ground (which is not supposed in what precedes) great care must be taken not to allow the liquid to go beyond observation or control until there is assurance that it is inoffensive. In gravelly soil, the filtering material is already present to an unlimited extent, but it must usually be assorted and placed so as to make a proper filter bed. If it is needful to purify the effluent within a short distance of the tank, a competent engineer should be consulted to prescribe the proper treatment. But the general principle may here be stated that the tank effluent should be *confined* to two or more radiating trenches used alternately. In these, the depth of filtering sand and fine gravel must be four or five feet, with distributor pipes and collecting drain arranged as before. But the effluent should be delivered where its condition may be observed. If inoffensive, it may be disposed of in any convenient way. Necessarily the trenches must have such lining as will surely confine the liquid and compel it to filter downward through the four or five feet of the filter body; and then such trench must have a suitable period of rest and aëration.

A simplified form of the smallest family tank is shown by Fig. 8½, drawn to indicate adaptation to nearly level ground. Here the siphon basins are omitted and a shallow efflux chamber about two feet deep is placed so that the flow may be alternately diverted into either of the two trenches. The accompanying sketch shows the very simple arrangement, to wit: The outlet pipe from the tank being about six inches above the bottom of the basin, the latter is divided by a narrow partition, 3 to 4 inches high; over this a properly shaped board or piece of roofing slate is tiled so as to throw the tank effluent from one side to the other as often as desired. The smaller and shallower effluent well permits less depth of trenches beyond, which is desirable in level ground, but this result could be gained for the deeper siphon well by raising the tank and putting a mound of earth over the top, provided the level of the inlet pipe would allow.

But the omission of the siphon basis is not advised. The additional cost is small; the siphon is a simple bent pipe, practically certain in action, *if* care is taken to have it set tightly in the wall *and the joints at the bends air-tight;* and the great advantage of a flushing discharge is gained. The variable trickle and occasional spurts from house drains tend to soak the near part of the trench chiefly, while the farther parts are seldom reached.

The case alluded to, where small tanks, or cesspools with stop-boards,were simply connected with agricultural drains—also a case in the writer's experience to be described further on—may suggest to some readers that the labor and expense for special materials put into the drainage trenches just considered are more than necessary; that a simpler style of trench would be sufficient. But in those cases there were favorable conditions and, at best, such expedients are liable to have only temporary value. When one is doing a work of this kind it is the part of wisdom to be thorough; to take no chances, but to have a care to make the conditions *entirely right.* The procedure which is recommended is based upon well-tried principles and practice, making possible the free movement and further alteration of the liquid beyond the tank.

For those situations where neither gravel, broken stone nor coal clinkers are to be had at low cost, other materials must be sought. In a brick-making region plenty of brick fragments may be available; in rare cases on the seaboard broken oyster and clam shells may be most convenient. Fragments of pottery, old tile pipe, etc., are good. In a region where stones abound a proper selection and disposition of suitable sizes in the trench may serve well, the smaller grades being obtained possibly by breaking. Where clay abounds, and nothing else is at hand, it may be properly burned in lumps so as to produce a clinker or "burnt ballast," such as is used in England; and this is very suitable. Coke would be excellent, but usually too expensive unless used only as the thin layer directly under the distributor pipes. What is wanted in the trenches is plenty of void spaces (suitable gravel gives 35% to 40%) and the greatest possible *surface* on the pieces, on which the liquid may be diffused. The trouble with the so-called "blind drain," made by filling a ditch with large and small stones indiscriminately, is that it is only effective when new. The voids are filled after a while by soil washed in from above and from the sides; moreover the void spaces between and useful surface of the stones is much less than with smaller and assorted materials. A trench intelligently and carefully prepared according to the principles set forth herein should have certainty of action and should not become clogged.



## A CONTROLLED CESSPOOL.

There are thousands and perhaps hundreds of thousands of householders who are committed to the cesspool and who think it unavoidable, as they must care for their wastes on a narrow area. Have they any remedy? A case in the experience of the writer* was treated somewhat after the method just described. The house was in the suburbs of a small city of one of the Middle States, on a rather steep slope, and located about fifty feet back from and fifteen feet higher than the highway, below which are other houses in tiers on a still sharper slope, descending about three hundred vertical feet to a large body of water. As the house was fitted with the usual fixtures of approved sanitary plumbing, a cesspool was provided to receive the sewage from the household, the personnel of which varied from two to six or seven. The resources of the surrounding community are not equal to providing an adequate system of sewerage, while the conditions described demand special care from the higher residents against making any nuisance for those lower down. Fortunately the soil is a slightly permeable *clay hardpan.*

According to the usual practice of this locality, the cesspool is located in front of the house, just at the foot of the piazza terrace, so that the top is nearly on a level with the cellar floor within. In construction it is jug-shaped, as shown in the sketch (Fig. 1); paved and lined with stone, laid dry; the dome-like top terminating in a throat or manhole built up with brick and mortar; and tightly covered by a slab of Hudson River bluestone, even with the turf of the lawn. *No rain water was admitted.*

A visiting relative declared that the conditions which he found, after this cistern had been in use about twenty-one months, constituted a flagrant sanitary misdemeanor. It was full; and exuding from beneath the cover was a black or dark green, slimy deposit, which spread a yard or two through the grass which only partly concealed it,—always offensive to the sight and often to the smell. The owner met the remonstrances with the usual question and answer: "What can I do about it? We don't know any better way."

Obviously it was a case of choked cesspool needing relief; accordingly the usual appliances and help were procured from the city with the expectation that a large body of liquid must be *pumped* out and then a deposit of sludge *dug* out. But, as the pumping proceeded, the operators were surprised to find that the contents were all liquid,—light, yellowish brown in color and not overpoweringly offensive to smell. There was not a shovelful of deposit or sludge left in the bottom, although a few blackish flakes or flocculent matter came out through the pump. The bottom and sides of the cistern were at once sprinkled with about half a bushel of powdered air-slaked lime, and the writer descended into it immediately with not so much sense of offense as is experienced around the Moon Island plant of the Boston main drainage works.

*Abstract of a paper in *New Hampshire Sanitary Bulletin* for October, 1908: "An Unhampered Cesspool."

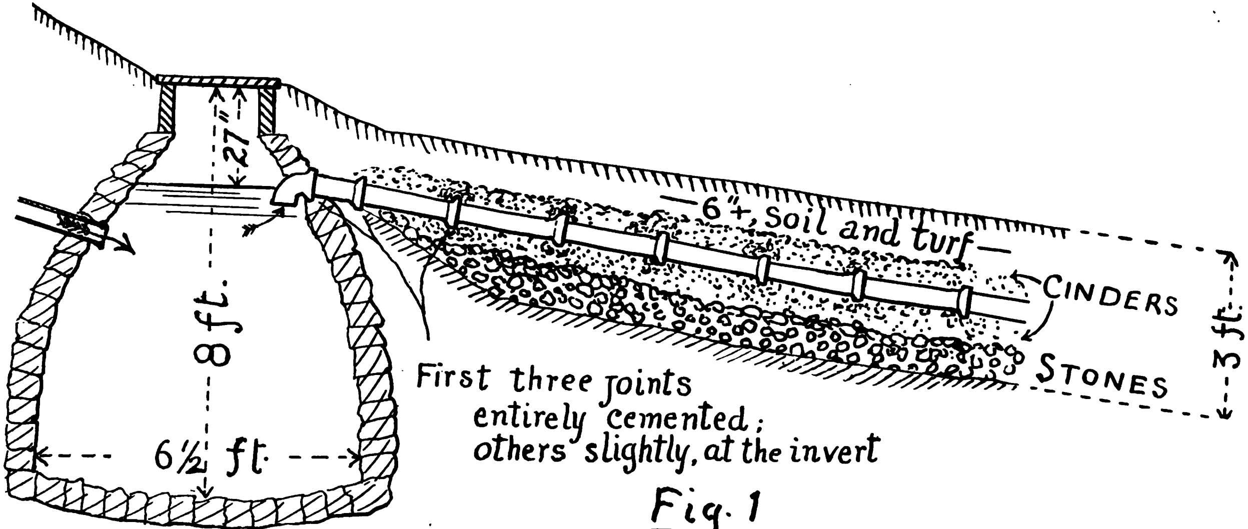



Fig. 1

# CESS-POOL AND OUTLET

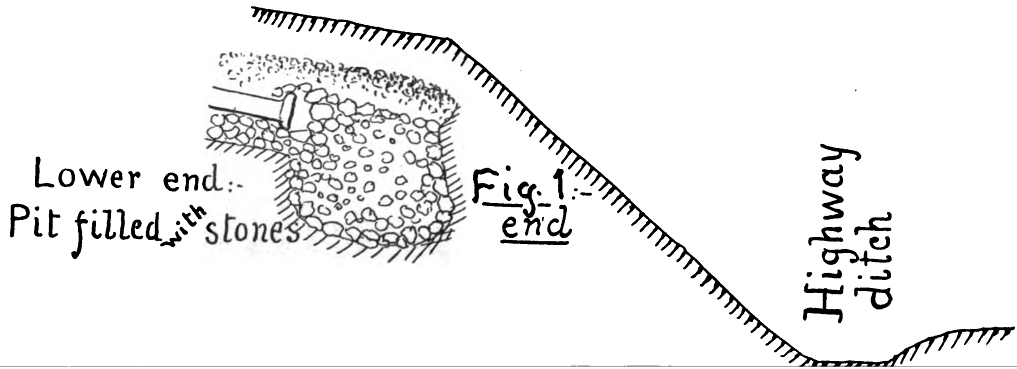



Fig. 1 - end

Here a process of nature had been proceeding, as it always has proceeded under like conditions, and always must proceed. But the operation had been hindered, and it was evident that the cesspool needed an outlet. Hence a hole was made through the stonework about two feet below the cover, and a combination of old-fashioned "blind drain" and pipe drain provided, as shown in the accompanying sketch. A trench was dug radiating from the cesspool outward and downward, about three feet deep, and filled about ten inches in depth with small cobblestones which could be had for the hauling. Above this was laid about three inches of coarse cinders from the railroad yard in the city. On this was laid a line of 4-inch glazed pipe,—the joints through the cistern wall and the first three joints outside being wholly cemented, and the inverts slightly for several lengths more. Around the pipe lengths some of the coarser cinders were placed, and the finer cinders at the sides of the trench and above the coarse stuff, until the cinder covering was six inches or more thick above the pipe. The fine cinders were intended to *hinder the clogging of the drain* by infiltration of the soil above and at the sides. Enough original soil was then well tamped in to fill the trench, and the sod carefully replaced, so that in a few days the surface of the lawn appeared as usual. It is almost needless to explain that this arrangement of material was for the purpose of extending the region of percolation and filtration. The trench was about 40 feet long, and the diameter of pipe in the lower half was reduced to three inches. The terminal pit shown in the lower sketch of Fig. 1 was an adaptation to the situation and intended to facilitate the filtration of the liquid to the surface of the lower terrace.

During more than three years of subsequent use there has been no offense from the cesspool, the very existence of which would not be suspected if not for the stone cover, and the only indications of the existence of the pipe outlet and porous drain, are the thicker growth of grass at the lower edge of the lawn and a luxuriant growth on the terrace slope near the pit; also, in the roadside ditch, a perceptible but inconspicuous seepage which is so far purified as not to betray its origin to the sense of smell,—even to a person working close to the ground with a grass sickle.

Let it be noted that it was practically a tight cesspool (soil not absorbent), and the only soil pollution was from the overflow on the surface. There was *stagnation*, but Nature had transformed all of the solids into liquid and gas. The rather crude porous trench provided was intended to give the partly purified effluent freedom to move along slowly and under conditions wherein Nature is known to remove offense (partly or wholly) from foul liquid. The discharges were put out of sight and at the same time not altogether beyond observation and control. As it was, there was not sufficient means of aëration of the drainage provided. The more effective arrangement as previously described might have been used on a reduced scale.

In gravelly or otherwise porous ground, the flow from the tight (cemented) cesspool must be managed so as not to do mischief by percolating too rapidly. The materials in the trenches must be disposed so as to secure slow filtration, and pipe collectors must be placed at the bottom so that the state of the final effluent may be observed. The proper treatment has already been indicated.

As to other conditions: The grade of the trenches should be made slight, preferably not more than 2½ inches fall in each ten feet, so that the drainage may not be too rapid. Evidently a soil saturated with ground water offers an impossible situation. If the householder is hampered by a narrow lot and small area, the advantage of two or more radiating trenches used alternately is obvious.

A small chamber made of concrete or cemented brick-work may be built just outside the curb or throat of the cesspool, so that the effluent may be successively diverted into one of the two or three pipe drains, the others being stopped by a wooden plug (or valve). (See accompanying sketch for details.) The plugs each have a 2 inch by 2 inch wooden handle and may be stayed in place by a properly fitted board or disc formed into the segment of a circle. When a drain needs rest, it may be closed by a plug taken from one of the others opened for service. Such a chamber would slightly promote initial aëration.



Or it may be more convenient and less expensive to insert through the masonry

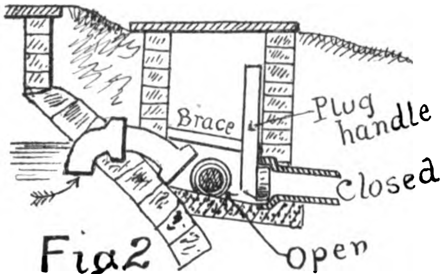
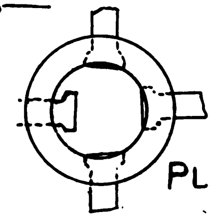



Fig 2



PLAN

of the cistern, around the throat, two or more T branches of ordinary glazed pipe, the branch serving for outlet into the drain. To close the unused drain or drains, have a wooden stopper loosely fitting the main stem of the pipe, and let down so as to cover the outlet. The detail of this is shown in Fig. 3.

If the question is raised as to the freezing of such drains in Northern localities, we may admit that frost may encroach upon them in the periods of inaction through

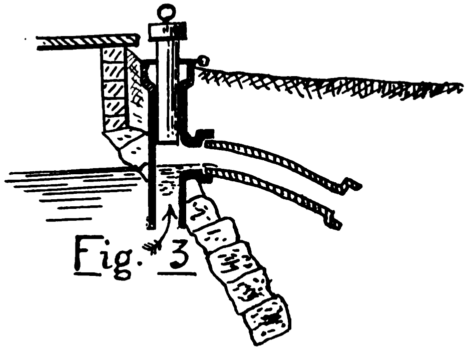


Fig. 3

long winter nights, especially if the ground is not protected by snow or leaves during weeks of severe cold. A thick turf over the trenches is a favorable condition, and, if the drains do not clog, experience proves that it is a rare case where a drain two or three feet deep, carrying domestic sewage—which has a normal temperature of 50° F. or more—actually freezes to the point of stoppage, *unless the outlet is allowed to freeze.* It is easy to put a slight covering of leaves and brush at points of exposure.

## SIMPLER CONTRIVANCES ADAPTED TO SPECIAL SITUATIONS.

The bulletin of the California State Board of Health for March, 1910, gives a design for a tank which is a plain square box made of concrete, buried in the earth, covered by plank and earth, having a small vent-pipe through the cover. A stop plank extends across the bottom near the inlet, and a baffle across the top near the outlet. The effluent passes into a system of buried pipes arranged for subsurface irrigation. For a climate and location where all water is generally needed the plan is well adapted, but the plank cover should be replaced by more durable material.

The Public Health and Marine Hospital Service of the United States, in reprint No. 54 from the Public Health Reports, describes an arrangement which consists of a seat placed over an old kerosene oil barrel two thirds full of water. A pipe with a T branch through one side at water level delivers the effluent into a smaller barrel or tub. Both the top and lower ends of the T pipe in the "liquifier" are screened, and both water surfaces are covered with a film of oil to guard against mosquitoes. Under intelligent care, and attention to the emptying of the effluent tank as required, this might work well. The apparatus is inexpensive, may be placed in any suitable outhouse; it is nearly free from odor and the fermentive changes gradually liquefy the contents. An "automatic closing" lid to the seat and cover over the effluent tank exclude flies. An "anti-splasher" is placed in the main tank.

A New Zealand contrivance comprising a special form of closet-pan holding four gallons, emptied once or twice a day into a pipe leading to a "mascerating pit," 8 feet long by 4 feet by 4 feet, lined with a plaster of concrete or tar, is described in *Engineering News*, Vol. 58, page 467.

These "inexpensive" devices are only mentioned because of possible adaptation to a summer camp. They should not be used about a residence for permanent fixtures; for they will almost certainly require considerable care and attention and with repairs may prove costly in the long run.

# DRY DISPOSAL.

Where there is no water-supply sufficient to operate water-closets, some form of dry earth treatment is usually the simplest and least expensive. Tested by experience, the following form of this may be termed

*The Endurable Privy.*—When properly used by the household this realizes a literal conformity to the sanitary regulation of Moses in Deut. 23: 12, 13.

Prepare the vault by paving the bottom with small stones, dishing to the middle or one corner whence a cheap drain pipe, *laid with cemented joints*, will conduct the fluids to a suitable point underground or to the garden (porous soil near trees). The effluent from this is usually quite small, but it serves for an occasional washing out. Cover the paving with a layer of Portland cement mortar, about half an inch thick. Any man of practical sense can use a shovel and trowel and a few pounds of sand and cement, with skill enough to build such an arrangement in a few hours. (See Fig. 11.) Build a box of 1½ to 2-inch plank, of proper size, say 20 to 24 inches wide and deep, and as long as desired; bore in the bottom and sides plenty of ¾-inch holes; mount this on board ways, slightly inclined towards the vault door; rest the box upon rollers (old pipe or broomsticks), so that it will readily roll when gently pulled. Provide a box of sifted *coal* ashes or earth, quite dry, and scatter about one quart over each dejection. With only ordinary use the liquid will be largely absorbed,—

and the odors will be prevented or greatly mitigated; but even with some abuse, and only fairly frequent use of the dust, the closet will be comparatively inoffensive and there will be no soil contamination. By actual experience such a box made of hemlock plank was serviceable after a dozen years or more. The labor of removing and emptying such a box is not difficult or very disagreeable. A few rollers, two or three lengths of boards or planks, a pit dug in a proper place and a little patience in the shoveling will suffice for the task. One man can handle such a box, adapted to a family of four or five people, and requiring to be emptied two or three times a year. To insure the certain use of the dust a box cover, like that shown in Fig. 12 may be provided. The dust must be rather fine and *dry*. Of course the simplest provision for the closet is a box of dust with an old quart dish for a sprinkler.

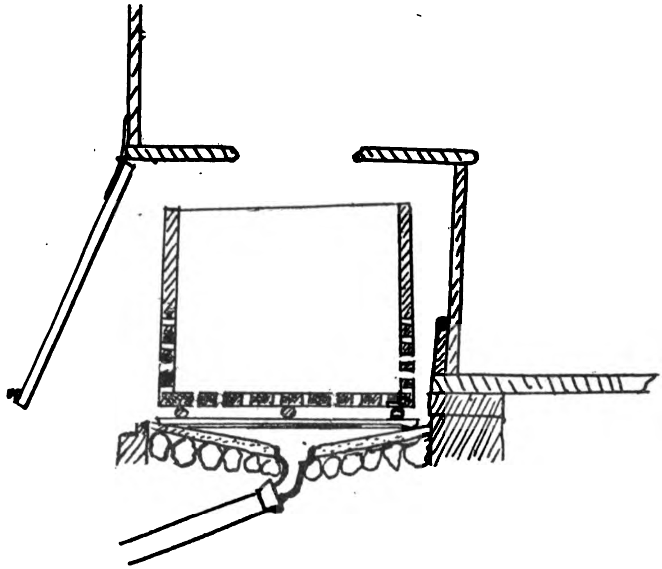


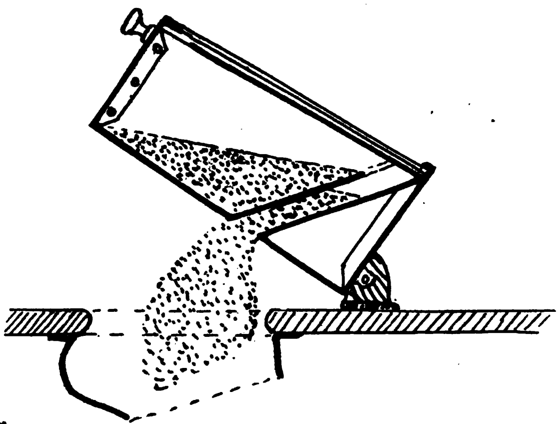
FIG. 11—Details of construction of vault and box for earth-closet.

An upstairs closet if located near a chimney or partition may have the hopper or cone under the seat terminate in a vertical line of 10-inch glazed earthenware pipe set over a water-tight brick vault kept tightly closed. If the dust is freely used, the contents of such vault will appear only damp or slightly moist and will give no offense. This supposes that kitchen slops are excluded and ordinary care given to it. The writer formerly used both arrangements many years with success. Before the general introduction of water-works, the dry-earth system was widely used, especially in England, where it was invented by the Rev. Henry Moule who made a study of the absorbent disinfecting properties of dry earth or dust. It is just as worthy today of extensive use under the conditions to which it is adapted. It has been successfully used more than 40 years in army barracks, where the vault boxes were made long and shallow, and so placed as to be dragged out by horses for emptying as required.

Such a system is especially adapted to summer cottages, camps, larger encampments and small hotels or lodging houses, where water fixtures are too costly or inexpedient because of the transient use of the premises; also under conditions where water-pipes cannot be protected from freezing. By a little forethought *dry* earth (not clear sand) can always be collected and stored under cover, to be distributed to closets as needed. The system may be and has been specified for steamboats required to avoid pollution of the waters navigated.



N. B.—THE FUNDAMENTAL CONDITION OF SUCCESS in operating this or any other system herein described is CONSTANT ATTENTION and CARETAKING. Thus far we have considered the simplest devices, both on the score of expense and because ordinary people balk at anything that looks like *machinery* or a *contrivance*, especially if it requires a little extra care or thought. The evil conditions we have considered are due chiefly to neglect. No system will run itself; human agency must constantly intervene, else *neglect* will spell FAILURE. The ordinary latrine of the camp soon becomes an abomination if not covered daily; and human beings who, in the woods, conduct



(Weyl's. Handbuch der Hygiene, II, p. 315)

FIG. 12.—Self acting dust closet. The lid is replaced by a hinged reservoir containing the dust. Whenever this is let down a certain quantity of dust is discharged automatically and thrown upon the night soil.

themselves after the careless and unblushing habits of the dog, rather than adopt the more cleanly ways of the cat, should not boast of the civilization of the twentieth century.

*The Dry-Earth Closet*, as technically known, requires the apparatus already alluded to, and the *system* is so important and useful as to merit more description.* The dry conservancy system is extensively in use today even in certain large cities on the continent of Europe, where sewers have not yet been introduced. This consists in the main of the frequent removal of excreta, in the country by some man servant or member of the family; in villages and towns according to some coöperative plan, as before stated.

*Some of the following pages are adapted or quoted from Bulletin No. 43, United States Department of Agriculture, "Sewage Disposal on the Farm," prepared by Prof. Theobald Smith, M. D., Harvard University.

The earth to be used should be a rather fine loam, sifted to remove coarse particles, thoroughly dried by spreading out in the sun or under a shed, and then stored in barrels. The drier the earth the better it is. The finer the particles of earth, the greater the capacity for absorbing fluids. It is for this reason that sand is not satisfactory. Coal ashes are quite suitable, as they are, after proper sifting, of the requisite fineness and are thoroughly dry. The mixture of earth or ashes and night soil should be removed at certain times, depending on the location of the closet, the season of the year, and other conditions.

In cold climates, indoor closets are especially desirable to obviate the exposure which cannot be avoided when closets are out of doors. For invalids there should be a carefully managed earth-closet kept in a well-aired room set apart for this purpose. In warm climates, earth-closets should be frequently cleaned. To prevent

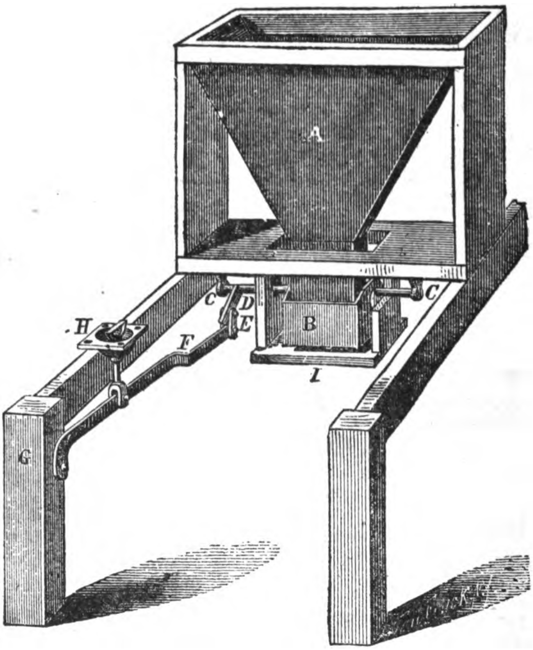



Fig. 13.—The old form of earth closet with frame and pail removed to show the mechanism. The handle on the left when raised throws into the pail a certain quantity of dry earth or ashes from the reservoir or hopper in the rear.

the attraction of flies and insects and the too rapid decomposition of the contents, a little unslacked lime added with the earth to the excrement will be of value. The discharges of persons suffering from typhoid fever and bowel troubles should be mixed with thin slaked lime* (milk of lime). One half to one hour after the mixing, such discharges may be put upon the soil, always at some distance from a well or spring, a stream, or a field under cultivation.

In Europe the use of earth and ashes has been superseded by peat dust. The upper layer of peat is dried in the air and ground in a suitable machine. The coarser

*Lime, to be used for disinfection, should not be air-slaked, but kept in tightly-covered receptacles to prevent this from taking place.

particles are removed by sifting and used for bedding in stables. The fine portion which has a very high absorbing power for fluids and is also capable of preventing odors, is used in dry closets. In Germany there are at present (1896) about 30 factories engaged in the preparation of peat moss for the purposes mentioned. Its great advantages over dry earth should bring it into use in our country.

We may profitably quote the conclusions of the late Colonel Waring, sanitary engineer, on the value of the dry-earth system:

"Precisely what the earth-closet and its accessories, as now contrived, accomplish is the following:

"1. A comfortable closet on any floor of the house, supplied with earth, and cleansed of its deposits without the intervention or knowledge of any member of the household.

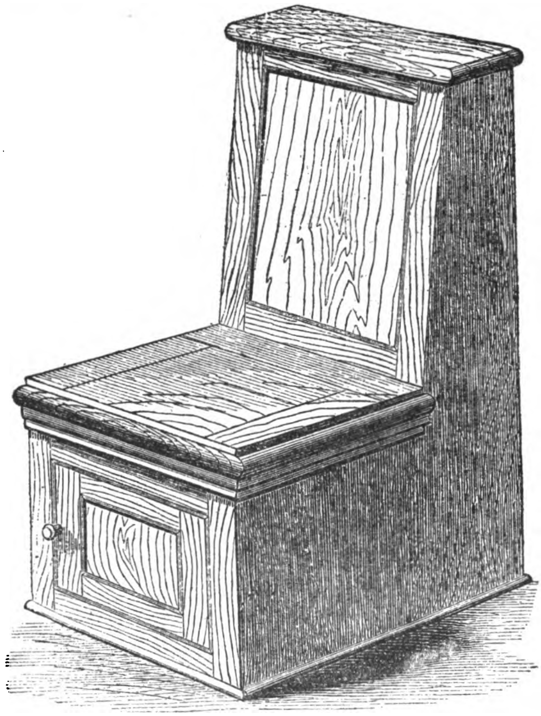


FIG. 14.—Appearance of Fig. 13 with casing in place.

"2. A portable commode in any dressing-room, bedroom or closet, the care of which is no more disagreeable than is that of an anthracite stove.

"3. Appliances for the use of immovable invalids which entirely remove the distressing accompaniments of their care.

"4. The complete and effectual removal of all the liquid wastes of sleeping-rooms and kitchen.

"5. The removal of the most fertile source of typhoid fever and dysentery, and the prevention of cholera infection.

"6. The complete suppression of the odors which, despite the comfort and elegance of modern living, still hang about our cesspools and privy vaults, and attend the removal of their contents."

## KITCHEN AND CHAMBER SLOPS.

The removal of kitchen and chamber slops is a matter which also requires proper attention, as this liquid frequently gives rise to unhealthful conditions, annoying alike to sight and smell when carelessly disposed of. The simplest way to utilize kitchen slops is to pour them upon plants about the house in summer, in winter upon the soil, each time in another spot, so as not to supersaturate the surface layers of soil in any one place. A means of less trouble, recommended by Waring, is to partly fill with soil a barrel with a leaky bottom and cover this with a layer of stable manure to prevent the puddling of the soil. The slops filter through the soil and leave the barrel below as a clear fluid. The barrel is emptied two or three times a year and the contents used for fertilizer.

Subsurface irrigation has been extensively practised and is successful under favorable conditions. The trenches already described, if made shallower and smaller, and placed not too near growing plants would serve well where the ground is suitable. But any systematic arrangement of that sort requires competent supervision of the construction.

House slops may be disposed of by surface irrigation or by subsoil pipes (agricultural title). The originator of this method, Mr. Moule, may here be profitably quoted as to its simplicity and success:

"Where there is a garden the house slops and sink water may, in most cases, be made of great value and removed from the house without the least annoyance. The only requirement is that there shall be a gradual incline from the house to the garden. Let all the slops fall into a trapped sink, the drain from which to the garden shall be of glazed socket pipes, well jointed, and emptying itself into a small tank, 18 inches deep, about a foot wide, and of such length as may be necessary. The surplus rain water from the roof may also enter this. Out of this tank lay 3-inch common drain pipes, 8 feet apart and 12 inches below the surface. Lay mortar at the top and bottom of the joints, leaving the sides open. If these pipes are extended to a considerable length, small tanks, about 1 foot square and 18 inches deep, must be sunk at about every 20 or 40 feet to allow for subsidence. These can be emptied as often as required, and the deposit may be either mixed with dry earth or be dug in at once as manure. The liquid oozes into the cultivated soil, and the result is something fabulous. . . .

"On a wall 55 feet in length, and 16 feet high, a vine grows. A 3-inch pipe runs parallel with this at a distance of 6 feet from it for the entire length. The slops flow through this pipe as above described. On this vine year after year had been grown 400 well-ripened bunches of grapes, some of the bunches weighing three fourths of a pound. During a period of four years, for a certain purpose, the supply was cut off. To the surprise of the gardener scarcely any grapes during those years appeared; but after the supply was restored, and the consequence was an abundant crop, the wood grew fully 16 feet, of good size and well-ripened."

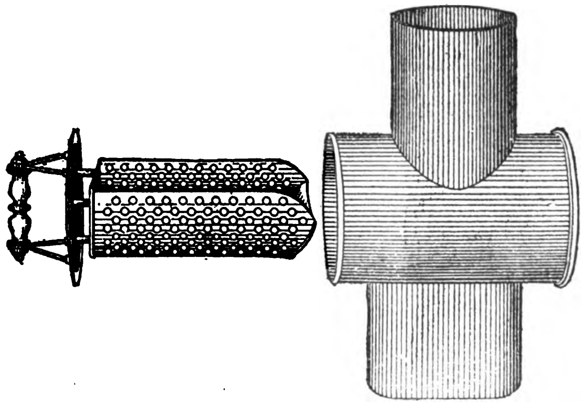
In place of an indoor sink, an upright tube or hopper may be constructed out of doors in communication with the subsurface pipes into which the waste fluids are poured.

## WASTE AND GARBAGE.

The attractiveness of a rural home depends largely upon the promptness with which all kinds of waste material are disposed of. The abundance of space around the house is a great temptation for the members of the household to use it as a place for storing rubbish and useless, worn-out things. Sifted ashes are easily utilized in earth-closets and upon walks and roads, to make them compact and firm. Other articles of no use, such as broken crockery, bottles, tin cans, etc., can be thrown into depressions and gullies and covered over with earth, or else buried in trenches where subsoil drainage is desirable. The removal of rubbish is a very fruitful theme and might be dealt with at length. Its importance, as related to health and disease, is a subordinate one, and the reformer must appeal to the love of order, propriety, and beauty in and around the home in order to make an impression.

[Of late years, we have learned that this is not a secondary matter. The decaying remains in tin cans attract flies; the pools of water which they may hold are breeding places for mosquitoes; and these insects are active carriers of diseases.—Ed.]

Garbage is of much less annoyance in the country than in the city, where its collection and destruction is a great expense, and is frequently very unsatisfactorily done. In the country, the household garbage is fed to the swine and poultry, and is in this way profitably used. There are, however, homes where garbage must be taken care of in other ways. It may be buried in the garden or else burned in the kitchen range. Recently a device has been patented which enables the house-



Garbage cremator. The garbage is placed in the perforated frame. The latter is pushed into the smoke pipe, where the garbage becomes slowly carbonized.

keeper to place the garbage in a section of the smoke-pipe of the range, where it dries out rapidly, burns and leaves only a little charcoal behind, which may be used for fuel next day. This device has been well recommended by sanitarians.

## PROTECTION OF DRINKING WATER.

The next subject to claim our attention is the protection of the sources of drinking water. In the country, water is, as a rule, obtained from wells and springs. The important bearing upon well water of soil purity demands a few explanatory remarks concerning the origin of well water. Wells are excavations made into the ground to a variable depth until water is reached. This water is denominated ground or subsoil water. Its origin may be better understood if, for the moment, we conceive the surface of the earth as more or less irregular and entirely impervious to water. The rain would collect on this surface and form lakes, ponds and streams, according to the configuration of the surface. If, now, we conceive this surface covered with sand or other porous earth to a greater or lesser height, and the top of this be considered the earth's actual surface, the water will remain in the same position, but it will be buried within and fill the pores of the overlying soil as subterranean lakes, ponds and streams. In digging a well we remove this porous layer of earth until we reach these subterranean streams or reservoirs of ground water. It thus appears plain why ground water may flow as any surface stream and pick up on its way various substances which have percolated into the ground.

When the bed of soil, overlying the impervious layers, is very deep, wells will have to be dug down to a considerable depth to reach the surface of the ground water. Where this layer of pervious earth is of slight thickness, wells will be shallow, and the ground water may appear on the bottom of gullies, trenches and wherever the porous layer has been dug or washed away.

The movement of the ground water depends on the inclination of slope or the impervious strata, and has been observed to be quite rapid in some instances. By adding common salt to the water in a well its detection in other wells at a short distance has been found a guide in the determination of the rapidity and direction of the underground current.

When the ground water, resting on the uppermost impervious layers, is near the surface, and therefore not safe or fit to use as drinking water, it may be possible, by digging below this layer, to find another porous bed containing water. This source will, in general, be much purer, since it is less exposed to pollution from above, and since the water has to travel longer distances underground. Such a deep supply must, however, be protected from the superficial supply by a tube or water-tight wall, extending to the surface of the deep supply, otherwise the water from the upper layers will simply drain into the well.

## WAYS OF CONTAMINATION.

Wells are exposed to contamination in two ways. The surface water from rain, house slops and barnyard drainage may find its way into the well at or near the surface of the ground. Or the ground water stream supplying the well with water may, in its subterranean movements, encounter cesspools or seepings from cesspools, and carry with it soluble and suspended particles, some of which may enter the well. The danger of typhoid fever bacteria entering the water has already been mentioned. Since the actual condition of the deeper layers of the soil between cesspool and well cannot be known, it becomes imperative to prevent all pollution of the ground-water current supplying wells by either abolishing the cesspools or else placing them at a considerable distance from all sources of water.

Besides typhoid fever bacteria, those organisms which cause digestive disturbances and severer troubles, such as diarrhœa, dysentery and possibly other unknown diseases, may be carried into well water. During cholera epidemics, polluted wells might form centers of infection. Eggs of animal parasites may be washed in from the surface. Again, the barnyard manure, representing the mixed excrement of various animals, may, under certain conditions, be bearers of disease germs, and such excrement should, under no conditions, be looked upon as entirely harmless to human beings.*

Besides the protection of the ground water near the well from pollution, emanating from cesspools, etc., the surface of the ground about the well should be kept free from manure, slops and other waste water; hence the well should not be dug under or close by the house,† nor should it be located in the barnyard, where the ground

*It is probable that the filth which gets into cow's milk and which appears to be mainly excrement of cows is largely responsible for the severe summer diseases of infants fed on cow's milk.

†The water may be carried into the kitchen by running the pipe from the well, horizontally, under ground.

is usually saturated with manure. It should be surrounded by turf, and not by richly manured, cultivated or irrigated soil. The ground immediately around it should slope gently away from it and be paved if possible. The waste water from the well should not be allowed to soak into the ground, but should be collected in water-tight receptacles or else conducted at least twenty-five feet away in open or closed channels which are water-tight.



## CONSTRUCTION OF WELLS.

The well itself should be so constructed that impurities cannot get into it from above or from the sides. If water can soak into it after passing through a few feet of soil only, it cannot be regarded as secure from pollution. To prevent this, the well may be provided with a water-tight wall, built of hard-burned brick and cement, down to the water level. The outside surface of this wall should be covered with a thin layer of cement. Or tile may be used to line the well and the joints made water-tight with cement down to the water level. Driven wells, *i. e.*, wells constructed of iron tubing driven into the ground, are, perhaps, the safest where the quantity of water needed is not large and where other conditions are favorable.

These different devices are all designed to keep the water near surface of the soil from percolating into the well. To keep impurities from entering the well directly from the top, considerable care is necessary. Such impurities are likely to prove the most dangerous because there is no earth filter to hold them back and destroy them before they can reach the water. Adequate protection above may be provided in several ways. The sides of the tiled wells should project above the surface and be securely covered with a water-tight lid. The ordinary well should also have its sides project above the surface and a water-tight cover of heavy planks provided which should not be disturbed excepting for repairing or cleansing the well. Under no circumstances should objects be let down into the well to cool. A still better method of protecting the water from above is to have the lining wall of the well end three feet below the surface of the ground and to be topped there with a vaulted roof closed in the center with a removable iron or stone plate. This should be covered with earth and paving sloping away in all directions.

Too much care cannot be bestowed upon the household well. It should be guarded jealously and all means applied to put the water above any suspicion of being impure. This is especially true in dairies where well water is used in cleaning milk cans, and where steam and boiling water have not yet found their way for this end. Polluted wells in such houses not only endanger the health of the inmates but that of a more or less numerous body of city customers.

Prof. Theobald Smith closes the paper from which we have made the foregoing abstracts with the following two paragraphs:—

"The principles to be kept in the foreground are the disposal of sewage in the superficial layers of the soil in not too great quantity, the disinfection of the stools of the sick with lime before such disposition is made, the digging of wells in places kept permanently in grass and at some distance from barnyards and, above all, their thorough protection from contamination from the surface and from the soil immediately below the surface.

"In every community there are public-spirited citizens who could do much good by taking hold of the simplest and safest methods of disposing of sewage and refuse, putting them into practice, and showing the rest of the community just what good can be accomplished and what harm avoided by a little continuous attention to sanitary matters. In this way many may be led to undertake improvements who, with no definite knowledge of the expense involved and with misgivings as to the final success of the undertaking, would otherwise hesitate to make a beginning."



## OTHER ASPECTS OF PRACTICAL SANITATION.

*Cost and size of pipe sewers* on the "Separate System," that is, for house service only. Concerning such work many people have exaggerated ideas, and a few facts are here stated to correct such misapprehension on the part of the general public:

1. *The cost of pipe sewers* for household waste only is surprisingly small, if there is only ordinary ditch work and a *competent foreman* supervises the work *for the owners*. [See paper on "Construction of Village Sewers," by the writer, Vol. 17, p. 214, Report State Board of Health.]

*Instances:*—In Hanover 1,519 feet of 8-inch pipe, 612 feet of 6-inch pipe and 226 feet of 5-inch house connections cost $571, or 24½ cents per linear foot, complete; again, 806 feet of 8-inch pipe, and 653 feet of 6-inch pipe cost $341, or 23¼ cents per foot. Again, a main line of 2,437 feet of 8-inch pipe and 969 feet of 10-inch pipe, with seven manholes, 5 to 11½ feet deep, cost $1,289, or 38 cents per foot, all labor included. Within a few weeks a small sewer about 840 feet long was put in and connected with a manhole, in 25½ working hours at a cost of $181, or about 21½ cents per foot, all told. This was for the college under direction of a student of the Thayer School of Civil Engineering.

2. *Surface water must be excluded;* only household wastes admitted. Hence *joints* must be made *water-tight* with cement mortar; else *tree roots* will enter and *choke* the pipes and the ground will be polluted.

3. *Small sizes* of pipe are ample. An 8-inch main will suffice for a large village. Such a pipe, sloping one foot in 100 feet for two miles, would serve 5,000 people, at 50 gallons each per day, and then run only half full. But *absolute uniformity of grade* is essential; the sewage must never slack up or stop in its flow. House connections should be 4-inch pipe or 5-inch; all trapped or covered by strainers to positively exclude garbage.

4. *Danger of freezing* very slight; temperature of sewage at the house seldom less than 50 degrees F.; in the coldest winter weather a large volume of sewage has repeatedly thawed down through two feet depth of frozen ground and disappeared. Nevertheless, ordinary outlets should have some protection or cover from the effects of cold winds or long-continued exposure. Hence, also, the drains, heretofore described for subsoil irrigation, if not in a naturally sheltered situation, should be protected by leaves or straw spread over the ground above.

5. *Flies and Garbage.* The sanitary condition of an entire neighborhood is much affected by the prevalence of flies. Everybody ought to realize that the swarms may be greatly diminished by removing and destroying, so far as possible, all material which attracts them, and in which they breed. Hence all waste vegetable matter (garbage) and refuse animal matter of every description should be promptly burned or *effectually* buried. Unfortunately such material is usually abundant about stables, and countless numbers emanate from them; but the unavoidable evil might be very much lessened by care to keep the stables cleaner and the material under cover as much as possible, since flies avoid darkness. A charring device for a stove-pipe has

been described already; but housekeepers could destroy small quantities without offensive odors by placing it along a narrow space only, on the front part of a fire in the stove or range, so that the evaporation of moisture and the charring may proceed slowly. In winter time the ledge just inside the door of a furnace is a convenient place for charring effectively considerable quantities of garbage.



## LEGAL AND PERSONAL ASPECTS OF THE PROBLEM.

A considerable part, if not the majority, of the people in cities and towns enjoy the public utilities provided by municipal government or corporations,—water-supply and sanitary conveniences,—with little thought of the benefits received, and with little or no knowledge concerning their construction and operation. Hundreds abuse and injure them through ignorance or stupidity, and many others in sheer malice. We have seen how, in more rural districts, evil conditions are due to ignorance, laziness or selfish indifference to the need of improvement. In order to protect the well-informed and right-minded public from the part which is otherwise minded, the state has stepped in with salutary laws, and has given large authority to its board of health to compel correction of abuses and unsanitary conditions. It is sufficient to state here that these laws, and the regulations made in accordance with them, relate to:

1. The prevention and removal of all nuisances, upon proper complaint.
2. The protection of waters used for domestic purposes.
3. Adulterations and sale of unwholesome foods and poisons.
4. Inspection and sale of milk, butter and cheese.
6. Prevention of introduction of epidemic diseases into the state, quarantine, and the control of communicable diseases.

The general public is becoming yearly more enlightened as to the vital importance of right sanitary conditions. The fair fame of the state for the attractiveness and healthfulness of its summer resorts is more than ever dependent upon the *undoubted* care manifested to secure pure water, untainted air, milk and butter beyond suspicion, and surroundings which have "no *out* about them." Neither farmers, managers of hotels or managers of encampments can long retain desirable patrons unless they study and *work* and *spend* money to have their places *clean* in all of these particulars. "A word to the wise is sufficient." Intelligent action, based upon the preceding information and suggestions, will preclude that exercise of the authority of the state board or local boards of health which becomes imperative when the rights of the public to pure surroundings are infringed.

# APPENDIX.

## QUANTITIES OF MATERIALS FOR TANKS.



| | Fig. 8 1-2 cu. yds. | Fig. 5 yds. | Fig. 6 yds. | Fig. 7 yds. |
|---|---|---|---|---|
| (a) Concrete not reinforced.......... | 3 | 6 | 10 | 24 |
| (b) Concrete reinforced............. | 2 | 4 | 7 | 16 |
| (c) Rubble, cement mortar.......... | 4 | 8 | 14 | 32 |
| (d) Brickwork, cement mortar........ | 3 | 6 | 10 | 24 |
| Gravel or broken stone for (a).... | 2 1-2 | 5 | 8 3-8 | 20 |
| Same for (b).................. | 1 2-3 | 3 1-3 | 5 1-2 | 13 1-2 |
| Sand for (a).................... | 1 1-4 | 2 1-2 | 4 1 4 | 10 |
| Same for (b)................. | 7-8 | 1 2-3 | 3 | 7 |
| Cement for concrete (a)......... | 5 bbls. | 9 bbls. | 16 bbls. | 40 bbls. |
| Same for (b).................. | 3 1-2 " | 6 1-2 " | 17 " | 27 " |
| Mortar for (c) or (d), 2 1-2 parts sand, 1 part cement....... | 1 1-2 yds.<br>5 bbls. | 3 yds.<br>9 bbls. | 5 yds.<br>17 bbls. | 11 yds.<br>37 bbls. |
| Brick (d) thousands............. | 2 1-4 M. | 4 1-4 M. | 7 M. | 17 M. |

Approximate cost on the following basis:

Portland cement, $2.50 per bbl. of 3 7-8 cu. ft.
Plain concrete in place, $7.50 per cu. yd.
Reinforced concrete, $8.50 per cu. yd.
Rubble masonry, $5.50 per cu. yd.
Mason, $5.00 per day, helper, $1.75.
Brickwork in place—$20.00 per thousand, $14.00 per cu. yd.

Then for tank only, not including excavation or accessories:

| | | | | |
|---|---|---|---|---|
| (a) ............For 6 and 7.......... | $22.50 | $45.00 | $65.00 | $160.00 |
| (b) ..............unit price is less... | 7.00 | 34.00 | 50.00 | 120.00 |
| (c) ..............because of........ | 22.00 | 44.00 | 70.00 | 150.00 |
| (d) ..............larger quantity.... | 42.00 | 84.00 | 125.00 | 300.00 |
| Accessories: | | | | |
| 2 vent pipes...................... | .50 | .50 | .50 | .50 |
| Siphons, 1 or 2 .................... | 1.25 | 2.50 | 2.50 | 2.50 |
| Glazed pipe, 60 per cent. of list price: | | | | |
| 4-inch piece and elbow........... | .54 | .54 | .54 | .54 |
| 3-inch piece and elbow ........... | .42 | .42 | .42 | .84 |
| Tipper and handle.............. | | 1.50 | 1.50 | 1.50 |
| Blow-off—2-inch gate valve, pipe, and setting.................. | 6.50 | 6.50 | 7.50 | 13.50 |
| Total for fittings.................. | $9.25 | $12.00 | $13.00 | $19.25 |

Under favorable conditions cost may be less, especially if the owner does much of the work himself. For concrete construction nothing is directly included for lumber for forms. If lumber is bought new for this and not used again, the cost may be a little more; but old lumber is good enough; it need not be planed, and joints or cracks may be made tight enough to retain the water of the concrete by using thick paper, or pointing with a little mortar.

## MATERIALS FOR THE TRENCHES.

A length of 4 yards or 12 lineal feet is assumed as about the least advisable for the smallest tank. Other lengths in proportion.

*Gravel:* Finer grade 1-8 in. to 3-8 in., 2 cu. yds.
Coarser grade 1-2 in. to 1 1-2 in., 1 1-2 cu. yds.
Lining-stone about 100 sq. ft., 6 in. thick, 2 cu. yds.
3-inch glazed pipe, distributors and collectors, 12 pieces.
Vent and telltale for pit (if made), 3 pieces.
T branch for pit, 1 piece

If screened gravel cost $1.25 per cu. yd., and selected flat stone about the same, and pipe 8 cents per ft,—60 per cent. off from list price,—the *materials* for this length of trench will cost about $8.50.

## PUBLICATIONS.

Besides the references already given, for which the writer hereby acknowledges his indebtedness, the following works are recommended to any who desire to gain more extended knowledge of questions relating to sewage disposal. They should be procured for every town library:

"How to Drain a House," by Col. George E. Waring, D. Van Nostrand Company, New York, 1895, 12 mo., 225 pp., $1.25.

"The Separate System of Sewerage," by Staley and Pierson, same publisher, 1904, 8 vo., 326 pp., $3.00.

"Sewage Disposal," by L. P. Kinnicutt, professor of chemistry, Worcester Polytechnic Institute, Prof. C. E. A. Winslow in charge of Sewage Experiment Station of Massachusetts Institute of Technology, and R. Winthrop Pratt, chief engineer of Ohio State Board of Health, Wiley & Sons, New York, 1910, 8 vo., pp. XII and 436, and 104 figures and illustrations.

This new work by three leading experts, surveys the whole field, both as to theory and the latest research and practice in construction. It deals, however, chiefly with methods and works conducted on a large scale.

# FINANCIAL STATEMENT.

## EXPENSES OF THE STATE BOARD OF HEALTH.

*For the Year Ending August 31, 1909.*

| | |
|---|---|
| Salary of Secretary (14 months) | $2,916.67 |
| Salary of Clerk (14 months) | 583.33 |
| Expenses of Board | 199.73 |
| Printing Blanks | 62.03 |
| Printing Report | 982.78 |
| Incidentals | 90.00 |
| Total | $4,834.54 |

*Expenses for the Year Ending August 31, 1910.*

| | |
|---|---|
| Salary of Secretary | $2,500.00 |
| Salary of Clerk | 500.00 |
| Incidentals | 446.87 |
| Printing Blanks | 18.85 |
| Total | $3,465.72 |

## STATE LABORATORY OF HYGIENE.

*Expenses for the Year Ending August 31, 1909.*

| | |
|---|---|
| Expenses, including Salaries | $4,976.63 |
| Printing Blanks | 231.07 |
| Incidentals | 100.00 |
| Total | $5,307.70 |

*Expenses for the Year Ending August 31, 1910.*

| | |
|---|---|
| Salaries of Chemists (2) | $2,671.62 |
| Salaries of Bacteriologists (2) | 1,801.00 |
| Incidentals | 1,060.32 |
| Printing | 383.25 |
| Total | $5,916.19 |

| | | |
|---|---|---|
| Receipts from Liquor License Commission, 1909 | | $727.10 |
| Paid out Salary Assistant Chemists | $707.50 | |
| Incidentals | 19.60 | |
| Total | $727.10 | |
| Receipts from Liquor License Commission 1910 | | $780.00 |
| Paid out Salary Assistant Chemist (2 months) | $120.00 | |
| Incidentals | 390.67 | |
| Total | $510.67 | |
| Balance on hand | 269.33 | |
| Total | $780.00 | |



## SANITARY INSPECTION SERVICE.

*Expenses for the Year Ending August 31, 1910.*

| | |
|---|---|
| Services and Expenses of Inspectors | $1,144.60 |
| Laboratory Apparatus and Furniture | 1,187.49 |
| Incidental Expenses | 167.51 |
| Total | $2,499.60 |

## STATEMENT OF THE OPERATION OF THE EMBALMER'S LAW.

### Receipts.

| | |
|---|---|
| Balance on hand as per last Report | $215.69 |
| Received for Licenses, 1909 | 110.00 |
| Received for Licenses, 1910 | 70.00 |
| Total | $395.69 |

### Expenses.

| | |
|---|---|
| Paid for postage, printing, etc., 1909 | $66.80 |
| Paid for postage, printing and filing case, 1910 | 144.55 |
| Total Expenditures | $211.35 |
| Balance on hand | 184.34 |
| Total | $395.69 |

### Epidemic Fund Expenditures.

| | |
|---|---|
| For the Fiscal Year 1909 | $25.00 |
| For the Fiscal Year 1910 | 109.00 |

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