

failure of medical treatment—in cases the history and symptoms of which rendered a tubercular or syphilitic tumor improbable, preferably in cases in which there was some indication of the side affected. It would only be in the cases of cyst, cystic glioma, and glio-sarcoma (cystic sarcoma?), that there would be any probability of success. But as trephining and puncture with a fine hypodermatic exploring needle (under strict antiseptic precautions) would not be a very formidable procedure, and as the cases are otherwise hopeless, it does not seem very objectionable. In the majority of cases the growth would be solid; but with strict antisepsis probably no grave results would follow. In a minority of cases, however, *the lesion would be cystic* (one of the forms above mentioned); if such were found to be the case, drainage, as in Oppenheim and Koehler's patient, might be followed by good results. The prospects of success, of course, are slender; but, as otherwise the cases are hopeless, the above appears to be a point worthy of attention, when one remembers that lesions of a cystic nature have been found in the cerebellum in a considerable number of cases. The rare cases in the cyst wall of which there happened to be only a small fragment of tumor growth, or no new-growth whatever, would be most hopeful.

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### THE TREATMENT OF ACUTE DYSENTERY BY ANTISEPTIC RECTAL AND COLON IRRIGATION.<sup>1</sup>

By W. W. JOHNSTON, M.D.,

PROFESSOR OF THEORY AND PRACTICE OF MEDICINE, MEDICAL DEPARTMENT OF THE COLUMBIAN UNIVERSITY; CONSULTING PHYSICIAN TO CHILDREN'S, GARFIELD, AND EMERGENCY HOSPITALS, WASHINGTON, D. C.

THE history of the rectal treatment of dysentery is a very interesting one, but I must resist the temptation to enter upon it. It dates back to the Egyptians, Greeks, and Romans, and had alternations of a century of favor followed by centuries of disfavor and abuse. The ancients employed it for the removal of "acid humors," which, they thought, by their retention intensified the inflammation, and to this same idea have we come again with the help of fifty years of microscopic and chemical study. Coming down to recent years there is one period in the history of this treatment to which I must refer.

IRRIGATION WITH COLD AND WARM WATER.—It is a matter of some interest to us, that a physician of the neighboring and historic town of Bladensburg was the first to recommend cold-water injection in dysentery. In the *Edinburgh Journal of Medicine*, in 1826, Dr. Joseph Kent, of Bladensburg, wrote that since 1823, he had employed ice-water injections for dysentery at half-hour intervals, "speedily

<sup>1</sup> Read before the Association of American Physicians at Washington, May, 1892.

alleviating every distressing symptom." In 1848 Assistant-Surgeon Withecomb, in a Calcutta medical journal,<sup>1</sup> reported two cases successfully treated by high injections with a long tube. But it is to the published opinions of Drs. O'Beirne and Hare, that special attention should be paid. O'Beirne, in an article on "New Views of the Process of Defecation" (Am. ed., Washington, 1834, p. 35), held that in dysentery, "the chief curative indication should be to pass up the gum-elastic tube and introduce it into the sigmoid flexure, in order to give exit to the accumulated and pent-up contents of the cæcum and colon." In an appendix he writes: "Dysentery having reappeared in this city (Washington), I have had opportunities of trying my novel mode of treating the disease." One to four pints of warm water with castor or olive oil were thrown in: hardened feces, mucus, and flatus were passed, with relief of the symptoms.

Hare<sup>2</sup> used these words, full of meaning to us now: "The substance of the whole argument is this—the long tube changes a huge internal abscess into an external one, and enables us to wash out and cleanse from it its putrid contents. It also enables us to foment and soothe by local applications the sloughing and ulceration these contents have caused on its surface. . . . Dysentery in its primary nature . . . is a mild and harmless disease, and . . . therefore if we remove quickly these acrid secretions we shall disarm dysentery of its terrors." He advises the physician not to cease repeating the injection until he is satisfied that the colon is evacuated and cleansed; it is as necessary to wash out the colon when its contents are liquid as when they are solid. "By passing an elastic tube beyond the sigmoid," he says, "I have found in more than three hundred cases of the severest form of dysentery not the slightest difficulty in washing out the colon from cæcum to anus. . . . In treating three hundred and forty-six cases in Calcutta, I had but 4½ per cent. of deaths."

It is a matter of some little pride to us that two of the three or four who first demonstrated the value of this mode of treatment should have been so near to us—the one our near neighbor, employing ice-water injections, and the other a surgeon of the army residing in Washington, advocating and using irrigations with large quantities of warm water thrown into the sigmoid flexure, with a view of cleansing and washing out the bowel.<sup>3</sup>

<sup>1</sup> India Reg. Med. Sci., Calcutta, 1848.

<sup>2</sup> Edinb. Med. and Surg. Journ., vol. lxxxii., 1849, p. 40.

<sup>3</sup> Cold-water injections or irrigation have also been advised by Baker (1825), Dulles (1877), Messemmer (1878), Dagand (1879), Laporte (1879), and Simon (1886).

Warm or hot water has been advised and used by Irving (1849), King (1872), Reid (1876), Kingsley (1887), Graham (1887), and Fordyce (1886). By some of these writers water irrigation was used as a preliminary step to the injection of drugs in solution.

**ANTISEPTIC IRRIGATION.**—As far back as 1774, we have records of efforts to modify the putrescence and gangrenous destruction of tissue by antiseptic injections.<sup>1</sup> Peruvian bark, chamomile flowers, calumba, charcoal, chloride of lime, hyposulphite of soda, creasote, and other substances have been employed for the purpose by various physicians from that date until the introduction of the more successful antiseptics of the present day. In 1879 Cantani,<sup>2</sup> after treating of rectal alimeatation, speaks of disinfesting the colon in dysentery and other diseases by such drugs as earbolic acid, salicylate of soda, borate of soda, etc., and predicts a great future for this kind of treatment.

Two causes have coöperated to draw renewed attention to rectal and colon antiseptics; one is the growing belief in the specific and contagious nature, with the recent discovery of the amœba, of dysentery; the other is the dissatisfaction with other methods and the effort to find in this disease a direct, rational, and successful treatment.

I will not refer to all that has been written on this subject, but for three or four years past the journals have contained some favorable reports of this method. It will be noted, however, that few of them refer to *irrigation*; injection is the usual plan.

The latest communication is one that I have had translated since this paper was written. It is by Dr. Korytia,<sup>3</sup> a Russian. He refers to Dr. Strhogloov<sup>4</sup> as having published, five years before, the results of his treatment of washing out the bowel with a 5 per cent. solution of earbolic acid. Sixteen cases are reported with excellent results. Dr. Kamper in the same year reported the same method used in eighteen cases. Korytia employed warm water or warm earbolized water. One tube only was used and the fluid (six pounds) was allowed to remain in the intestine five to ten minutes, even fifteen to twenty minutes. One to three washings were generally sufficient; sometimes four to six were given, never more than one daily. Nine of the cases were severe (diphtheritic); six were milder (catarrhal). The improvements noted after the injections were: the number of the stools diminished; the frequent desire lessened; appetite, sleep, and the nervous state were all improved. The feces became thicker, lost their foul smell, and the mucus, blood, and particles of waste tissue disappeared; the fever subsided. In the mild forms the results were happiest. In them tepid water had as good an effect as the earbolized warm water. The history of each case is given in detail, showing that the improvement followed immediately upon the washing of the rectum, and that relapses due to its suspension were arrested at once by a return to the treatment.

<sup>1</sup> Pringle: *Obs. on the Diseases of the Army*, 7th ed., London, 1774, p. 275.

<sup>2</sup> *Presse Méd. Belge, Brux.*, 1879, xxxi. 275.

<sup>3</sup> *Vratch*, 1890, xi. 957.

<sup>4</sup> *Russkaja Meditsina*, 1884.

In one fatal case after irrigation, the stools were from twenty to five daily; tormina and tenesmus lessened, but the patient grew weaker and died; gangrenous lesions in the bowel were found. In many of the cases internal medication was tried, proved ineffectual, and recourse was then had to the washing. The duration of the ease after beginning the treatment was three, and in the most severe cases, seven days.

The strong arguments for the superior advantages of antiseptic irrigation are found in the complete and successful manner in which it answers to the pathological conditions of dysentery: an intense inflammation, seated in the rectum, sigmoid flexure, and colon, and always more intense here, even when the disease extends higher up, characterized by gangrenous destruction of tissues and ulceration with decomposition, and accompanied and most probably due to bacterial multiplication. If these conditions existed *outside* the body there would be but one course followed; the removal of the cause, if possible, then cleanliness and thorough antiseptics. Within the intestinal canal the typical treatment would be the removal of the cause or contributing cause, and cleanliness by thorough flushing of the bowel and antiseptics. There can be, there *must* be but this one principle of treatment, and if the mechanical difficulties involved are removable, it must be the *successful* treatment.

There is one feature in dysentery to which I wish to draw separate attention. It is this: The rectum and colon form a distensible cavity and are closed below by the sphincter. In dysentery this cavity, especially its sacular and most dilated lower portion, becomes the most distended, the most filled by the contents, which are composed of transuded serum, blood, decomposing shreds of tissue, and the results of digestion, the whole being in an active state of disintegration and filled with multiplying bacteria. The sphincter as a result of neighboring inflammation and oedema, acquires great irritability, dilates frequently, but with irregular and spasmodic movement, and contracts quickly and violently, closing the orifice before the rectum is completely emptied. Thus the rectum becomes like an acutely inflamed bladder. A certain quantity of its contents is expelled; a residuum is always left; in some cases the amount is small, in others—bad cases with much fluid—it is large. The rectum is never emptied, but always contains some fluid in a state of active decomposition. In this condition, as in a distended bladder full of decomposing urine, the first indication is to empty the rectum, and the second to wash out the cavity and to keep it empty and clean.

If this statement which I make is true, it has a most important bearing on the nature of dysenteric symptoms and on the kind of treatment which they require. I have found no reference to the fact in any work on medicine or in any medical contribution on the subject, although, in the enormous mass of literature on dysentery, the failure to find such a reference might well be excused. That it is a fact, I have demonstrated

in several cases to my own complete satisfaction, and although it may not be an essential feature in all cases, yet in a large number and those the most severe, it is a constant condition.

The patient whom we see straining at intervals of a few minutes in his violent efforts to empty the rectum, does not empty it, the very intensity of the muscular contraction defeating this object. The sphincter shares in the irritability of all the rectal muscles, and closing spasmodically shuts off the escape of the contents before the act is accomplished. The result is also in part brought about by the patient lying down while straining, and the more feeble from prolonged illness he is, the more likely is the rectum to be incompletely voided. Moreover, the routine treatment in dysentery helps to aggravate this retention; opium suppositories paralyze expulsive muscles but do not relax the sphincter; the number of actions is lessened and they are smaller, but the dangers are increased in proportion to the apparent success of the treatment, and the more severe the case and the more energetic the treatment, the greater is the danger. In graver forms we have the more abundant, dirty white purulent and fetid stools, and the reddish-brown fluid with floating shreds of diphtheritic dysentery. The abundance of fluid favors its retention and accumulation, and every opportunity is given for the absorption of poisonous materials and systemic infection. Under such circumstances can any course seem more unreasonable than the ordinary treatment adopted, and can any course be reasonable except one which applies general and accepted principles to the peculiar physical conditions of dysentery? *Keep the colon and rectum empty and clean*; that is the law and the whole gospel.

The following are two illustrative cases:

CASE I.—Miss S. was taken ill on the night of May 28th, with an attack of severe abdominal pain and so-called diarrhœa. Purgative was given at intervals then, and on the 29th, 30th, and 31st, the actions becoming more frequent, smaller, and showing blood. I was sent for in the night of the 31st. She was suffering intense pain, and was much exhausted by frequent rising to stool; I gave a hypodermic injection of morphia and stimulants internally, and suppositories of morphia were ordered.

*June 1st.* Some nausea and vomiting. Two actions, reddish in color and offensive, of thickish fluid about two ounces each time. Stimulants, liquid food, and poultices to the abdomen ordered, and a saline purge as soon as she could take it. By the afternoon she had taken two purgative doses, and had had four stools, the last more fecal in appearance with a small scybala, but containing some blood.

*2d.* Had a moderately good night; two suppositories used. Three small stools, brownish fluid containing some blood. Champagne, milk, and whiskey during the night. During the day she had three stools of reddish-brown fluid with tenesmus; pain in the rectum and abdominal pain. At night she was worse and more nauseated. The actions were

more frequent, consisting of a small amount of fluid, like uncooked beef-tea, passed with tenesmus and causing vomiting.

3d. The stools occurred every hour, and were of the same character, fluid, offensive, and reddish. The desire to empty the rectum and the burning pain in the anus were constant. She had every indication of being weaker and more ill than before. A soft-rubber tube was passed into the rectum and about two ounces of fluid of the same character as had been passed before, flowed out through the tube. A smaller soft-rubber tube was passed by the side of the escape tube, and the rectum was irrigated with a continued stream of warm water with dissolved borie acid, until the water ran perfectly clear. A suppository of a quarter of a grain of morphine was then introduced.

During the day from this time on there was no action. At 3 p.m. the tube was again passed and about one ounce and a half of fluid of the same character escaped. Irrigation as before, and suppository introduced. At 10.30 p.m. there had been no stool and the patient was much stronger in pulse and manner; had had no nausea, and had taken a good deal of nourishment, chicken broth and milk and brandy. Tube then introduced and escape of fluid as before; irrigation and suppository. During the night she was comfortable, and there was no action until 7 a.m. Two suppositories were used.

4th. There were two irrigations practised during the day with the same result as yesterday. The rectum was first emptied of a small amount of fluid, more brownish than before, then washed out, and a suppository introduced. There was nothing else passed from the rectum all day. The night was comfortable.

5th. A dose of oil was given as there had been no action; this produced six actions during the day, four contained some solid matter and the last two were thin and brownish; there was no blood. No irrigation to-day in consequence of the frequent actions.

6th, and for three days after, the rectum was washed once daily; there was no pain or diarrhoea, and her general condition continued to improve daily.

The two points in this case I would draw attention to are:

First. The fact that the rectum was not emptied voluntarily, although the stools were frequent on June 2d and 3d; and, second, that the complete evacuation of the rectum and the antiseptic irrigation at once relieved the distressing symptoms, both local and reflex; thenceforth the patient had no escape of fluid from the rectum except through the tube—that is, no action of her own assent or volition; the morphia, of course, contributed to relieve the irritability of the rectum and sphincter.

CASE II.—Mrs. Y., an elderly woman, of about sixty-five years of age, who had had a dysenteric attack in 1889, was taken with symptoms of extensive colitis in July, 1890. The chief symptoms were fever; feeble pulse; coated, dry tongue; no abdominal pain; frequent fluid evacuations, two to four ounces each time, of a dark-brown, very offensive fluid, containing small mucus and shreds of mucus and a very little blood. She tried to resist the frequent desire, but every half-hour to an hour the anus would open and discharge and then spasmodically close

with pain and burning. I tried for three days to relieve her by giving opiate suppositories combined with liquid food. But she made no change for the better, and finally I succeeded in inducing her to let me try a thorough washing of the rectum. I brought her to the edge of the bed in the position for a dorsal uterine examination, and introduced a small hivalve vaginal speculum into the rectum. This was done gradually, without causing much pain. Several ounces of the same ill-smelling fluid escaped from the rectum when the sphincter was relaxed. The rectum was then thoroughly washed out with a five per cent. solution of carholic acid. All other treatment was suspended. There was an immediate relief to the tenesmus and to the constant and uncomfortable desire to evacuate the rectum. The bowels were not moved until the following day, the discharge being of the same character but less in quantity and less offensive. From this time the rectum was cleansed twice daily for four days; the voluntary stools ceased, the fluid washed out contained mucus shreds, and without a purgative normal fecal matter was passed after the third day's irrigation.

In this case the situation was continued rectal and coloa inflammation with beginning ulceration and retention of the decomposing fluid in a distended rectum, consequently increasing danger of infection. The treatment was followed by immediate good.

I will add no words of argument to these facts, which so clearly show the uselessness, the waste of time in mouth-treatment by drugs, and the rational application of a simple and obvious principle to the relief of a local disease.

**METHODS OF IRRIGATION AND ANTISEPSIS OF THE COLON AND RECTUM.**—In the earlier methods of rectal and colon treatment, water was thrown into the bowel, retained for a certain time and then expelled. Some of the most excellent results are reported from this plan and within recent date. But this cannot but be an imperfect way of cleansing the bowel, although it answers well enough for bringing an antiseptic fluid in contact with the wall of the bowel and with germ-breeding mucus. The objection to it is, the necessity of distending the inflamed coats of the bowel up to a point where injury may be done, if any considerable quantity of water is injected; its advantage is that by this distention the antiseptic fluid washes the inner wall more thoroughly than without it. The method is better fitted, therefore, for subacute cases or those tending to become chronic, than for the acute inflammation with necrosis of the mucous coat. Properly speaking, this method is not irrigation at all, and the only procedure deserving of this title is that in which there is a *free and immediate escape* of the water thrown in; and even without argument, it is apparent that in this way only can the bowel be thoroughly emptied and made aseptic.

The mechanical difficulties are very much greater in the efforts to irrigate the colon than in the case of the rectum. To wash the *rectum*, a double, in-and-out, hard-rubber tube, passed into the rectum five to

eight inches, through which flows a current of water from a fountain syringe, answers the purpose well. The only objection is the pain which attends the introduction of a hard, inflexible instrument through the irritable anus. Two soft-rubber tubes passed side by side, the larger one for the escape current, are more comfortable for the patient and better in every way; No. 17 English (29 French) is a good size for the smaller tube, the escape tube can be two sizes larger. A large-sized soft catheter will do very well for the entering current. The double-current soft-rubber tubes are not so successful; their soft and thin walls are pressed upon by the sphincter and escape of fluid is obstructed. Then again there is an advantage in having two separate tubes, as either can be pushed up or down as it is desired to wash different parts of the rectal wall; they are, therefore, to be preferred to any double-current tube. The disagreeable sensation of distending the anus passes away in a few moments and the patient gets so much relief from the operation that he ceases to object; preliminary cocaine application may be used if the suffering is great.

All that is needed, then, for this operation are a fountain or Davidson syringe, attached to a small rubber tube or large silk catheter, an escape tube of large size of soft rubber, made long enough by the attachment of a long piece of tubing, so that the fluid escapes into a vessel on the floor. The hand holds and guides the tubes and changes their position from time to time.

The *colon* cannot be distended with water or irrigated with the same facility. That water can be made to pass through the sigmoid flexure there can be no doubt; but the passage of a tube through the flexure into the colon is a difficult task. If this is tried on the cadaver with the abdominal wall removed, one can see how difficult it is; the end of the instrument must describe a complete sharp curve on itself, as if it were about to tie itself into a knot. Even with the hand pressing on the passing instrument and guiding it, it is not easy to accomplish. It is clear from the experiments which I have made, that a partially flexible tube, like the old-fashioned stomach tube, should never be used, and that a small tube does not pass as readily as one which more nearly fills the bowel. Distending the rectum with water as the tube advances, does not favor the passage as much as leaving the bowel empty. The tube finds its way better along the mucus-covered mucous coat. I speak now only of experiments on the cadaver, when the eye is watching the process; the contrary is the general opinion of physicians from efforts on the living patient. But the turning of the instrument on itself in a cavity filled with water, when the end strikes against the wall is very likely to happen and can easily be mistaken for the onward progress of the instrument. In the rectum the finger introduced discovers the error of direction, but higher up it is not possible to do so.



The conclusion of many trials must convince anyone that the attempt to make the instrument enter the descending colon as often fails as succeeds. The difficulties show that all colon irrigation must be done by one tube. I have tried the double-current stomach irrigator and have had constant failure—the closure of the lumen from twists of the tube or from outside pressure prevents the exit of the injected fluid; so that the only way in which this can be accomplished is to force half a pint or one pint of fluid into the colon and then allow it to escape at once through the same tube; in this way the colon and sigmoid can be thoroughly washed out.

What are the indications for the choice of coloa or rectal irrigation? In all cases of so-called catarrhal dysentery where the stools are small, contain blood and mucus and in all cases, mild or severe, where the general or local symptoms are relieved by washing the rectum, no attempt need be made to do more than this. For even when the disease extends into the sigmoid flexure and colon, the curative influence is transmitted along the bowel wall upward, as gargling the throat benefits laryngeal inflammation. If the patient continues to have fever, delirium, great restlessness, or other symptoms of general infection, or if stools are large, thin, with a gangrenous odor, containing blood, mucus, and tissue-like shreds, then the attempt should be made to make the tube pass in the sigmoid for higher injection. If the patient is on his left side, with hips raised, a gentle current may pass from a raised fountain syringe into the colon, even if the point of the tube has not passed beyond the first curve of the "flexure." I need not add that there is a danger of perforating an ulcer, even without much force being used, so that the operation should be done with the greatest gentleness. In the great majority of cases of dysentery as we see it, rectal irrigation may, I hope, by continuing experience be proved to be all that we need to gain the desired end.

The quantity of water used depends upon the circumstances of each case; as a rule it should pass in and out of the bowel until it runs clear, and both in the case of the colon and rectum the amount thrown in should be equalled or almost equalled by the amount which escapes; if the egress is not free the operation must be stopped until the trouble is remedied. There need be no limit to the quantity of water.

The frequency of irrigation is to be regulated by the number of stools, state of decomposition in the bowel, and other conditions; a good rule is to try to prevent the patient from having any stools at all; let his bowel be emptied only at your command through the inserted tube; at first once in three hours, later three times daily, as the outflowing fluid contains less blood and has less odor. *Keep the rectum empty and clean*, is the one rule.

At first wash the bowel once in three hours; later three times daily,

and so on with diminishing frequency as there are less odor, less blood, and finally less mucus. When mucus is no longer seen in the form of thin flakes the patient may be said to be well; but for a few days one daily irrigation serves a good purpose. Relapses should at once be met by a return to local treatment.

As an *irrigating fluid* water may be used plain, hot or cold, or may contain in solution any of the numerous antiseptics. Extreme cold or very hot water may be injected, but both must have a more or less irritating effect, and their action, in the nature of things, is intermittent. If a continued current of cold or hot water could be kept on the inflamed surface, the case would be different. The surgeon would not apply great heat or cold for five minutes to an inflamed ulcer of the skin and then leave the ulcer alone for three or more hours. It may be practicable to keep water flowing in and out of the rectum for many hours, but few patients could bear such continued distention of the sphincter.

Almost every *antiseptic* has received warm recommendation. Fifty-three cases of acute dysentery were treated at the Military Hospital at Oran with a 1 : 5000 bichloride solution. After the first day the stools were fewer in number, and in three or four days the mucus disappeared; tenesmus and pain were soon lessened.<sup>1</sup>

Lemoine<sup>2</sup> treated fifty-four cases of dysentery with solutions of corrosive sublimate, 1 : 5000. Six ounces were injected into the rectum twice daily; later a solution of the strength of 1 : 3000 was injected twice daily. The fluid was not retained longer than ten minutes. Improvement followed immediately, and acute cases were cured in from one to three days. No systemic poisoning followed in any case.

Notwithstanding all this favorable testimony, the dangers of ulceration in the colon being set up by the remedy, and the grave doubts lately raised as to the value of corrosive sublimate as a germicide in just such conditions as exist in dysentery, deter one from using it at all. Under no circumstances should it be employed without an immediate outlet for the solution.

Tannin destroys bacterial life and renders ptomaines innocuous; it is recommended by Cantani for typhoid fever, and it may have as good an effect in dysentery for the same reason.

Salicylic acid, thymol, aseptol, sulpho-carbolate of zinc, alum, hydrochloric acid, carbolic acid, borie acid, the sulphites and byposulphites have all been used and advised, but no sufficient number of cases have been treated by any one of these as to lead to its preference over all other remedies of the same class.

<sup>1</sup> Centralblatt f. klinische Medicin, No. 11, 1891.

<sup>2</sup> Bull. général de Thérapeutique, Paris, 1890.

Boric acid and carbolic acid are the only antiseptics I have used frequently; the results have led me to think that the former, or both together, give all we want, and as I believe that a great part of the benefit comes from the cleansing and complete emptying of the rectum, the least irritating and least dangerous germicide ought to be preferred.

## A BACTERIOLOGICAL STUDY OF DRINKING-WATER.<sup>1</sup>

BY VICTOR C. VAUGHAN, PH.D., M.D.,  
OF ANN ARBOR, MICHIGAN.

SINCE the opening of the Hygienic Laboratory of Michigan University, October 1, 1888, a large portion of my time, devoted to laboratory work, has been given to the bacteriological study of drinking water. While I have no great discovery to announce to you, I have thought that a brief record of the results obtained after three and one-half years of work might not be wholly devoid of interest. Health officers are given the privilege of sending samples of food and drink to the laboratory for examination, where the work is done for a small fee, which is supposed to cover the cost of material. I have been anxious from the first that this work should be of practical benefit to the people for whom it has been done, and should also constitute a contribution to science.

Having had, before beginning this work, some years of experience in the chemical analysis of drinking-water, and having been convinced of the inadequacy of the evidence furnished by the same, I have entrusted that part of the work, in most instances, to trained assistants, and I am sure that whatever its value may be, the work has been well done. Drs. F. W. Brewer and A. Ives have made most of the chemical analyses, which will be reported in part later in this paper. A small number of the chemical examinations, and all of the bacteriological work, has been done by myself, and I alone am responsible for any errors which may be detected in the same.

We keep at the laboratory a number of sterilized bottles with glass stoppers, and of two and one-half litres capacity. These bottles are sterilized by steam, then set in wooden crates so arranged that the bundle of the crate holds the stopper in place, and makes it impossible to open the bottle without removing the handle, which is fastened by means of screws. The use of sealing wax is forbidden, and in cases where the over-zealous collector has resorted to this method "to make things more secure," the samples have been discarded and fresh bottles

<sup>1</sup> Read before the Association of American Physicians at Washington, May, 1892.