



OLD DARTMOUTH HISTORICAL SKETCHES

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THE DEVELOPEMENT OF
THE NEW BEDFORD WATER WORKS SYSTEM
(EDMUND WOOD)

ARNOLD'S GARDEN, WITH THOUGHTS UPON THE
ACHIEVEMENTS OF THE ROTCHES
(Z. W. PEASE in New Bedford Mercury)

THE DEVELOPEMENT OF THE NEW BEDFORD WATER WORKS SYSTEM

SPECIAL MEETING OCTOBER 25, 1919

There was an outing yesterday for the members of the Old Dartmouth Historical society at Quitticas pond, a visit to see the New Bedford water works system. The party returned to the city later in the afternoon, going to the rooms of the society. During the meeting Edmund Wood read an extremely interesting paper on "The Development of the New Bedford Water Works System," a paper that carries along the story of the water works system as it was told in a paper a few years ago by Robert C. P. Coggeshall. In the paper read by the latter at that time, Mr. Coggeshall rehearsed the story up to the time of the establishment of the present extended system, and the story of the present extension begun in 1893 was continued by Mr. Wood. The story is one of great interest, for on it is based the industrial progress of New Bedford, and Mr. Wood's paper points out how much the present generation owes and how much all the people in New Bedford in the future owe to the wise judgments made at that time.

Mr. Wood's paper follows:

At a meeting of the Old Dartmouth Historical society held some four years ago—April 19, 1915—one of our members, Robert C. P. Coggeshall, read a valuable paper on "The Development of the New Bedford Water Supplies." In it he took up the early discussions and studies of plans to furnish the inhabitants of this city with water. After describing some of the first primitive schemes for supplying some sort of community service, he sketched entertainingly the struggles of our fathers to overcome the strong conservatism of the elders and establish a municipal water system.

He outlined the plan which after much opposition was adopted and carried through with a courage and faith in our city and its future which we must admire even now. It was during and directly after the Civil war, which had shaken to the foundations the nation's life, and made severe drafts on the resources of our people.

In this paper, Mr. Coggeshall states that the water works were completed, and water delivered through the distributing pipes on Nov. 25, 1869.

Just one month from today will occur the fiftieth anniversary of this event—an event big with influence on this city's future. No one will ever be able to state to what degree that day's accomplishment was responsible for the proud position among manufacturing cities New Bedford occupies today.

The prosperous days of whaling had come to an end. We had money, for New Bedford was rich. Already we had begun investing our capital in the railroads which were building up the great undeveloped west. Our youth had begun to go away for employment, for we had few industries here to give them any opportunity. We then bid fair to remain an interesting city of arrested growth, living on a wonderfully rich and romantic history. We should have rivalled Salem and Newburyport. Our custom house might have produced a Nathaniel Hawthorne as a development of the romantic and legendary atmosphere of our life. Surely this local Historical society would have been started many years earlier than it was, and would have been the city's chief glory, for it would have been the vehicle for expressing the local pride—and that was in keeping alive the glorious past.

Few Had a Vision.

Our older and influential citizens were conservative and feared any venturesome attempts to enter into competition with places which had become established and successful manufacturing centers. But how fortunate was it for our city that we had a few citizens who had a clear vision, who had confidence that the vision could by strong effort be converted into a substantial reality. It is interesting and instructive now to read those old records of the lively disputes which divided this whole community. A few far-sighted citizens saw that we must branch out into a new industry, that we must turn to manufacturing, that for this purpose a good supply of water was an absolute necessity, that this city was surprisingly wanting in natural pond reservoirs within the city limits—and consequently some scheme should be at once devised to bring a

supply of water into the city. The advocates of this course were denounced as venturesome botheads and dangerous radicals. But the result should teach us a lesson. "Waterworks Craze"—as Mr. Coggeshall reminds us he was called by his opponents—is still active among us,—and who will now believe that he was ever at any time in his life a reckless and extravagant advocate of a foolish and impractical experiment.

And how grateful we should be that they won the day—and we should now record our appreciation of the men with vision, of faith in our people, of determination to create a new New Bedford, and destroy the moth and rub off the rust which had already begun to corrupt, and had caused a halt in the growth of our population and slowed down the heart beats of the community.

Extension Since 1893.

Mr. Coggeshall has described the plan which was finally adopted and which served well our city for thirty years. He has brought down the story to the year 1893, when, following several annual warnings from the water board it was determined to take up the question of a new or a further water supply. In that year the writer of this paper was elected a member of the water board and served for seven years. During the last year of his service—1899—the new system was completed and the new water turned on in the pipes. The other two elected members of the water board also served through practically the whole term of designing and construction—David B. Kempton and Thomas E. Tripp. The writer, as the only surviving member, has been asked to write out for the Old Dartmouth Historical society this second story of the New Bedford water supply.

The first real steps toward designing the improved water system was taken during the mayoralty of Jethro C. Brock in 1893. Many of the contracts were let in 1894 while Stephen A. Brownell was mayor, and the work of construction was continued through the years 1895 and 1896 with David L. Parker, and through the years 1897, 1898 and 1899 under Charles S. Ashley.

The mayor and president of the common council are ex-officio members of the water board, so that these officials participate in the work. The following presidents of the common council each served one year: Samuel C. Hart, John A. Barrows, Oliver Prescott, Arthur L. Blackmer, George P. Bailey, Stephen A. Brownell and John L. G. Mason.

Robert C. P. Coggeshall, the efficient superintendent of the New Bedford water works for thirty-seven consecutive years, also acted as the clerk of the board during all these years of new construction, and brought to the determination of many puzzling questions his ripe experience in the technical details of a municipal water system.

It was on May 5th, 1893 that the water board sent to the city government the first communication. This was a request for authority to proceed at once with the work of securing all necessary options to purchase and procure property, surveys, and plans for the purpose of providing for an increase in the water supply.

This authority was granted, and in the discussions which followed, the opinion was soon reached that the question in all its bearing should have a careful investigation by engineers of long experience in hydraulic problems, and whose conclusions should commend themselves to all.

As the result of many inquiries, Messrs. George E. Rice and George E. Evans, hydraulic engineers, were selected by the water board to make an exhaustive examination of the possible ways by which an additional water supply could be secured, and to make all surveys necessary. These engineers at once began an exhaustive study of the problem as it had developed. They went over the existing system and noted its defects and the new demands of a rapidly growing city.

Outgrowing the Old System.

Our original water works were built for a maximum capacity of five million gallons. The storing reservoir was constructed near the head waters of the Acushnet river by building a dam across the valley. The bottom of this reservoir was covered with peat, leaves, and all the remains of vegetable growth. And thus it was which was responsible for that beautiful light amber color for which our water was noted.

From this reservoir the water was led down to the city by an egg-shaped brick conduit built with a descent of only seven inches to the mile. At the end of this conduit in the north part of the city was located a small receiving reservoir and the pumping station. The water was pumped up to the distributing reservoir at Mt. Pleasant with an elevation of one hundred and fifty-four feet above tide water in New Bedford harbor.

From this distributing reservoir the water was led by gravity in pipes throughout the city.

These distribution pipes were largely of thin sheet iron, cement lined, but they had been gradually replaced by cast iron until but one mile of the old pipe remained.

This original system was partly worn out, and in many respects outgrown.

Decide to Build Anew.

About two-fifths of the territorial area of the city, owing to its elevation, could never be supplied by the original works. The growth of the city was constantly running up into these higher elevations of land which would require the construction of a high service system. It was also found that the conduit had given out in a great many ways. It had to be taxed beyond what a gravity conduit of one course of brick ought to be taxed, being allowed to run full, and the roots had forced their way through the brick work, and there were numerous cracks in the arch. The growth of the city had gone out over the line of this conduit, and streets had been laid out across it, and the arches had not been fortified. For some time it had been a source of great anxiety. The size of the distributing reservoir was not up to modern requirements. Its capacity was only 15,000,000 gallons, while our average daily consumption was about 6,000,000, and our maximum consumption about 7,300,000 gallons.

In a dry year, with a low level of water in the storing reservoir, it would be impossible to get our daily summer consumption down through the conduit, and as this reservoir only had about one day's supply in reserve, the whole situation was far from safe. The question at once arose, had we the heroism to begin anew rather than inaugurate a policy of making patches upon the old system. Many cities have faced this problem. Perhaps we were no wiser than other cities, for we were fortunate that we gave out in many respects at one time. For this reason the temptation was not so strong for us to be unduly influenced by the great investment already made and begin to patch, and alter and extend. It was owing perhaps to this good fortune that so much of our system was outgrown, that we were wise enough to decide to cut loose from it and begin over.

The plans submitted by Messrs. Rice and Evans to the water board provided for the taking of a new supply of water from the Middleborough ponds, to take the waters of Little and Great Quittacus, connect these waters by a deep aqueduct, locate a new pumping station upon the south-

ern shore of Little Quittacus pond, and force the water up a four foot force-main, eight miles long, to the highest point found in the immediate vicinity of New Bedford. This point is not in the city, but in our neighboring town of Dartmouth. It is about 200 feet above tide water, and, by raising the reservoir, gives us an elevation of 216 feet for our water supply. There were a good many points brought up to show the superiority of this plan. It would forever take care of our high service system; the highest land within New Bedford's limits being less than 150 feet above tide water, it would give us a high enough service for the whole area of the city. This reservoir was to be constructed large enough to hold a large reserve of water, and keep a big supply constantly on tap. We decided to construct it with a capacity of 65,000,000 gallons, built in two parts with a dividing wall between. This reservoir was then to be connected with the city's present distributing system, by a pipe four miles long; this distribution pipe to be of cast iron and thirty-six inches in diameter.

Plan Seemed Expensive.

This plan was submitted, as I say, by our engineers, and the question came upon its adoption. Of course, there was much discussion upon it. It seemed pretty expensive. The estimates of the cost of this work made very carefully and itemized by the engineers, involved an expenditure of about \$1,200,000, and it seemed to throw away to some extent valuable property which the city already had. In this discussion, different alternative plans were carefully considered. It was hard for us to give up the gravity system, bringing the water down by a gravity conduit. Investigation showed, however, that this would not much decrease the expense. To get so large a volume of water down to the city with so slight a descent would require an enormous brick conduit coming down the valley, built in the wettest part of the whole country, to follow the grade of the land.

After all, the plan was adopted by the water board, and we went to the city council for authority to build it. The city council adopted the plan, and went to the legislature for its authority, and secured for New Bedford the waters of Great and Little Quittacus ponds. Great Quittacus pond has quite a large watershed, Little Quittacus, a small one. The very finest water, according to the reports which the state board of health gave us, is Little Quittacus, the next the

Assawompset pond, then comes Great Quittacus pond. But it was thought that if Great Quittacus water was brought through Little Quittacus it would give us a very perfect water. Great Quittacus is a very deep pond; we found soundings in some places of sixty feet and a good sandy bottom.

The legislature passed the act giving authority to the city of New Bedford to take these waters, to condemn lands and build the works; to go into another township for the construction of our reservoir, in the very middle of a town road, to divert the road around it, and to do other extraordinary things, and the city council then appropriated the money. Then they did something which added a great deal to the convenience of this work, they voted to turn over the whole matter of the carrying out of the act, to transfer all the powers granted to the city council of New Bedford by the act, to the water board, and they appropriated a lump sum of \$1,200,000 to be raised as fast as needed, to be expended by them, and the only check put upon all this was that they were to render an account every three months to the city council, of the progress they had made in the work. This very much increased the responsibility of the water board. They were not able to say that they were hampered in any way in their decisions of what was best by the council entering in and deciding differently. They had every advantage in carrying out the plan of the engineers, of working with a small executive body with frequent meetings and intimate discussion.

Carried Out Original Plan.

The board continued Rice and Evans as the engineers of the construction, and they elaborated this system which has been described and furnished all the engineering service and the plans, and had practical charge of the work. The original scheme was changed, of course, in some details, but I am very glad to state here what is a tremendous satisfaction to business men, that the carrying out of these plans was most satisfactory; that we had to make very few changes, and the contracts were completed according to the original plans and specifications. We did not have the embarrassing questions of extra work and changes, and the endless disputes into which they lead.

This plan can be further described. The reservoir was a little different from some others which have been built. The excavated earth was found to be exceptionally good, but we were very careful, very conservative, may be, in providing for an absolutely tight

reservoir. The embankments were built very slowly by very gradual layers of earth, only five inches thick, and under a very rigid inspection, sprinkled, and rolled with steam road rollers, and then another five-inch layer, and so on until the proper height was reached, then excavated, after it had thoroughly settled, for the retaining wall, and then the embankment carried up above. This made an extremely sound, tight embankment. But we went to a further expense,—covering the whole surface of the reservoir with concrete, six inches deep on the horizontal portions and nine inches thick on the embankment. The water was taken into the reservoir on the middle of the east side and taken out on the middle of the west side, looking out for anchor ice, which has sometimes bothered us in New Bedford. We have a by-pass which runs round the reservoir through which we can pump. We have it arranged so we can take water out of either half. We built a very strong dividing wall, which is heavy enough to allow one part of the reservoir to be used at a time. This will facilitate the important cleaning of the bottom occasionally. The dividing wall is built of such a height, that, when the reservoir is full, the water will flow over the top of it and appear as one large sheet of water.

Built a Railroad, Too.

The force main which runs about eight miles from the pumping station at the ponds up to the distributing reservoir on High Hill in Dartmouth is crossed about halfway by the New York, New Haven & Hartford railroad. The engineers made at the outset what seemed like a very startling proposition that the plan should include the building of a railroad from this point of intersection to the pumping station. The first reason for it was of course to provide for always getting the coal to the pumping station at the lowest price possible. We figured up the cost and the interest on it, and the saving in the price of coal over any other method of getting coal out there, and it seemed as if we could hardly save the interest on the cost of the railroad. But another point came into the calculation which affected our decision. This force main goes through a very bad section of country. It crosses the very large and hitherto almost impassible Bolton Cedar swamp. You can here drive a pile fifteen feet at almost one stroke of the hammer. It was a pretty bad place to get through and put a pipe line. It was found by estimates made, that quite a portion of the cost of

building a railroad could be charged off to construction account. That is, that a line of pipe built through such a territory could be constructed for a very much smaller cost with a railroad paralleling it. Then, of course, all the material for the pumping station, the engines and the superstructures, would also be carried by this railroad, if built. At length it was decided to build a regular standard gauge railroad from Braley's station on the New York, New Haven & Hartford railroad to the pumping station at Little Quittacus pond. This railroad was one of the first things built, and was then used to help the construction of the force main, which runs along beside it. There were no land damages on this railroad, as a strip five rods wide through that whole country was taken for the pipe line. The idea, too, was to carry this railroad right into the pumping station. At the end it passes on an elevated trestle into the coal shed. The coal, after being delivered on top of the trestle by the railroad, passes down hill all the way to the grate bars. This coal shed was built large enough to take in a full cargo of coal, so that a cargo landed in New Bedford can be run up and be placed in this shed without much trimming and handling. In this way we have the coal at the point of consumption at a very moderate price.

Special Equipment Built.

One important point on which a water board can apply its best energies, if it is seeking for ultimate economy through a series of years, is in the design and construction of the boilers, engines, and pumps; and yet here it is that so many cities have failed and been balked in their desire by the conflicting claims of so many pump builders, their failure to deliver the promised duty, or the irritating and disastrous breakdowns, after a few years of steady, unbroken service, due to some defective part.

The water board inclined strongly to a specially designed engine. Perhaps they were influenced somewhat by the fact that a few years before a bridge had been built in New Bedford and it was in the form of bidding that every contractor should submit with his bid the plan he proposed to build. There was an attempt made to compare them and the contract was awarded and the bridge was built, but it would take a very courageous county commissioner in New Bedford to ever build another bridge after that system of bidding. We decided to have the boilers, engines and pumps specially designed for the

place and the service to be performed, and then to have the bids all made upon one basis for comparison. Mr. E. D. Leavitt, consulting engineer of the Calumet & Hecla Mining company and of the Bethlehem Steel company had already designed some pumps which had upon trial runs developed a higher duty than had before been obtained. He was employed by the board to design and prepare plans for the boiler and two engines and pumps, each of 10,000,000 gallons capacity every twenty-four hours. After competition bidding these were built and are unique. Their records have been phenomenal. It is now twenty years since they were installed—they have never sustained a break of any kind, renewals have been trivial, and today they stand as perfect as far as can be ascertained as the day they were built.

One of the most difficult questions which came up for the board to decide was whether to use cast iron or riveted sheet steel pipe for the forty-eight inch force main. Previous to this time cast iron had been universally used. It was very expensive and the weight to handle through the swamps was enormous. Steel construction had been used in some very large hydraulic operations in the mines out west, but water works engineers are most conservative and we learned of only two lines of steel that had been laid in municipal water undertakings. The steel pipe is very much thinner than cast iron, and the great danger was that corrosive would at once weaken and soon destroy the strength of the steel pipe.

Decide On Steel Pipes.

Many anxious hours were spent by the board in consideration and discussion of this one subject. The cost of even the cheaper style of pipe was more than a third of a million dollars, and the responsibility of deciding to adopt an innovation, with the risk of having to do it over again after a few years, was difficult for the board to assume. We had careful estimates prepared of the cost of both kinds of pipe. Even the old timers who were strongly backed up by the manufacturers of cast iron pipe, admitted that we might get twenty years of use out of steel pipe before being obliged to renew it. We figured finally that by having the steel pipes dipped in an asphaltum mixture and by using great care to touch up all places where this coating was knocked off both inside and out, that we were sure of twenty-five years of use. The difference in the cost of the two kinds of pipe was found to be about \$138,000. We fig-

ured that this amount saved by using the steel pipe if put at interest for 25 years would nearly pay for the cost of a new force main, so we decided to use steel. Remembering those hours of worry and indecision, it is an immense satisfaction now to read the report of the superintendent—that after twenty years of constant use, and examination of the force main inside shows that not only has there been no corrosion of the pipe, but the asphaltum coating is intact, and the pipe is as strong and serviceable as when it was laid. The superintendent dares to place no definite limit now on the life of that pipe. But you may be sure that with that awful sense of responsibility constantly before us, we had several good inspectors on that line while it was being laid and every place where the coating was chipped off, both inside and outside, was carefully painted by hand-brushes. One spot only left bare would rapidly corrode, and it would not take long to rust out the 5-10 inch thickness of the steel sheet.

It seems difficult now to realize after these twenty years of experience with steel riveted pipe, the strength of the prejudice which resisted its adoption. During the construction of the work I was invited to read a paper before the New England Water Works association, and more interest was manifested in our adoption of this innovation than in any other part of our plans. I can remember now the many questions which were put after the reading of the paper, and the incredulous attitude of many of the older engineers, and their wonder at the temerity of the New Bedford water board.

Secure Water Rights.

At the time that this city went before the legislature for authority to take the waters of the Middleboro ponds, Taunton had already been granted the right to take water from Assawampsett pond, but with a peculiar provision. A reserve of water was to be maintained by raising the dam and the retaining shores of the ponds, so that the water taken should only be from these created reserves, and the normal flow of water through the Nemasket river would be undiminished. The first bill presented by us to the legislature was written with a similar provision. But the state board of health in reviewing our petition took the position that this was not practical and sufficient. Consequently a new petition was prepared and submitted, asking for all the water in Little and Great Quittacus, that a dam should be constructed between Great Quittacus and Pocksha pond, which is really a part of Assawamp-

sett, that this dam should be so constructed that the surplus water from Quittacus might flow north into Pocksha,—but under no circumstance could any Pocksha or Assawampsett water ever flow back into Quittacus. This is the scheme which was finally approved by the legislature. At that time there were some water power privileges existing on the Nemasket river, and although they had ceased to be of much value, it was feared that law suit would be instituted by the owners of these power rights, because of the diminished flow of the river.

By the terms of our legislative act it was made plain that the proportion of our liability for any damage would be in the same proportion that the flow from Little and Great Quittacus bore to the flow from the whole system of ponds. To prepare ourselves for any adverse litigation a series of very interesting observations were made, and a set of records prepared which were most thorough and interesting. A smooth and accurately measured flume was constructed at the outlet of the water of all the ponds into the Nemasket river. In this accurate measurements were taken at regular intervals of the volume of the flow of water by means of a current meter. A similar plan and observations were made at the outlet of the Quittacus ponds. Numerous rain gauges were put into the hands of competent people in several different localities scattered over the whole water shed.

Secured Accurate Records.

These records cover the observations for many months and for all conditions of water in the ponds.

The possession of these accurate records later stood us in good stead. There were two concerns on the Nemasket river that owned ancient water power rights in the stream, and although they were not very thriving concerns, it was well understood that they valued these water rights at a high figure. These are dangerous questions to put before a jury in a suit at law. The flow of the water is generally much overestimated, and old residents can be found to testify to a traditional mighty power. Mill experts even would guess at the volume of water. As these regular periodical measurements were being taken, the owners of these water rights came out to observe and asked about their accuracy and the purpose of such elaborate tests. Gradually the price put upon the damage caused by us through diminishing the flow of water, grew more reasonable, and in the end they were settled for very moderate sums—one for \$4500 and one for \$6800.

Twenty years ago at the time when this new water system was being constructed, no city had thought it necessary to buy the land around its source of supply to ensure the purity of the water against any contamination. It had always been thought that the state board of health could sufficiently protect the communities. But several irritating instances had occurred to demonstrate that the power of this board was in many ways limited. They could not proceed against any man until it could be clearly proved that the water supply had been contaminated. A man could erect a large piggery near the shores of a city water supply where it was evident that impurities must reach the pond. But until the piggery had been completed and had run for a sufficient length of time to afford ample evidence that injury had really been done to the water, no action could be taken to suppress the nuisance. It was just beginning to be suggested that eventually cities would be compelled to own their water shed.

This new idea suggested itself to our water board and was seriously considered, but there were many difficulties in the way, the chief one being the added cost.

Our new supply is in a picturesque country, and cottages had begun to spring up around some of these ponds, and the value of the land would soon be on the increase. We thought with the present value of land there, that we could well afford to buy it, provided we did not have to pay an inflated price for it. We had heard often enough of the way in which all cities have to pay for land when it becomes known that a municipality is the purchaser, and we tried to conceive of some plan by which we could acquire this territory for the regular going market rate. This was quite a problem to solve, and we tried it in various ways. One difficulty was the fact that we had no money for this purpose. All our money was appropriated to carry out the plan which was submitted to the city council with the itemized estimate, and that only allowed of an expenditure for lands necessary for construction along the pipe line and for the pumping station, etc. It was at last suggested that as we were so confident that this would meet with the favor of the citizens and they would back us up in it, we might do it on our own personal responsibility, and we considered seriously the plan of going to the banks and negotiating a private note to raise \$50,000 or \$60,000 and to begin the work.

Secure Adjacent Land.

This plan seemed to have much to commend it, and we came very near following it, but at last we came to the conclusion that it was a pretty risky thing to do. It would be almost impossible to do a thing like that and to persuade the ordinary critical citizen that this land conveyed to private individuals for the purposes of New Bedford, and afterwards reconveyed to New Bedford, that some portion of it, some residuum of value did not adhere to the fingers of the men who handled it. This was quite a convincing thought, and we gave it up. We accomplished the same purpose in another way. If we went to the city council and asked for the money for this purpose, the intention of the city would be immediately advertised to every owner of land in the neighborhood. But if we could keep the expenditure quiet for three months, acting through unsuspected agents, we could secure possession of a large part of the land at fair prices. The mayor of the city is ex-officio member of the water board, the treasurer is ex-officio the water registrar, and when we all became convinced that was the proper thing to do, we went ahead and did it. We bought the land secretly through agents and we quietly passed the bills and the mayor approved the special audit and city treasurer paid it. It was a source of gratification to us that such procedure was so unanimously approved, that the action of the water board in going ahead and buying the land in such a way was commended, after we had reported to the city council and confessed what we had done. It is rather an unusual course and I do not know that it can be recommended.

The city had never bought the land about its old reservoir, nor had Taunton who had lately been granted some of the water from Assawampsett pond. So the owners of the shore had no suspicion that it was a part of the water works plan to take the land.

One piece of good fortune aided us very materially. There was a gentleman who had lived on the shores of Great Quittacus pond, who had conceived the idea of controlling this pond himself. He had begun to acquire the lands, and had become the owner of quite a portion of this shore by actual purchase. He had pursued this object as his hobby, and with great earnestness until he had secured options on quite a number of other lots along the shore. Mr. Turner's views were most commendable. He strove for the fullest protection of the shores from an aesthetic point of view. He had a very modest cottage on the north end of the pond, and all

his options had in them the provision that no wood should be cut, and no little buildings should be put up within sight of the shore. You can conceive that this sort of an idea was in exact sympathy with the object of the New Bedford water board, which was to get possession of all the land before the trees were cut off, and to preserve it as it was. This gentleman had made good progress in acquiring the shores of this pond when he unfortunately died.

Land Values Go Up.

We then paid a call on his attorney and agent, Mr. Henry A. Wyman, a well known Boston lawyer, now the honorable attorney general of the state. We made a very fair deal with him for the estate's lands. The city of New Bedford told him very frankly what they wanted of this land, and were met as frankly. But the estate only owned a comparatively small portion of this shore right, but they possessed valuable options on others, which might have lapsed, the estate not caring to go on with this idea. We made an arrangement by which this gentleman acted as our agent in going around and closing up these options for us at the old original prices which had been arranged, before any city loomed up in sight as a factor in estimating values. These lands were, therefore, purchased by him before there was anything made public. Then other lands were bought in a similar way, and when the fact was disclosed that it was the city which was buying all this land, we had acquired three-fourths of all the shore on both ponds. We then thought that this action had gone far toward fixing what was the normal standard value of such land in that locality, and that there was not much danger in letting it out and dealing with the balance of the owners in an open way. But it was a grimly humorous fact when it became noised abroad that the powerful and infinitely rich city of New Bedford was really the party who had been anonymously and mysteriously buying lands about the pond, how immediately the value of all the remaining land went up. Some of the farms, whose owners had really offered them for sale only a year or so before, in order that they might go out west unincumbered, and build up a new farm out there more fertile than this, immediately jumped in value. The owner felt that he was bound closer than ever to this land of his ancestors, and that nothing could sever the strong heart bonds he felt for these lands except a good, liberal payment of money. It was the policy of the board to pay what would have been

the full market value, if the purchaser had been a private individual, and a little more.

Land Cost \$100,000.

The area of land purchased around Great and Little Quittacus ponds amounts to over 1500 acres and the cost was about \$100,000.

The action of the authorities in proceeding at that time to the purchase of all this land, at a comparatively small price has been approved by our citizens. And yet its value to the city has not begun to be realized. Had it not been purchased at just that time the value of the land would have very largely increased and moreover many cottages would have soon been constructed on the immediate borders of the ponds. That has happened to lands around Assawampsett pond since the city of Taunton began to use it for their water supply. Fall River after using the waters of North Watuppa pond for over thirty years suddenly realized the difficulty and the danger. They began soon after this to purchase some of the shores, at what seems to us large prices. To accomplish what we have done and adequately protect the purity of their water has and will cost them many times what it cost the city of New Bedford. Here we have only eight miles north of our city 1500 acres of land beautifully situated which must eventually become a great park with wooded drives laid out through it, and affording delightful vistas of lake and shore. Many generations may yet rise up and be grateful to us for the vision of the future and the wise provision for its needs and its happiness.

The work of carrying out the plans for the further water supply was finished and the new water sent through our distributing mains at six o'clock on the morning of July 10th, 1899—a little more than six years after the appointment of the engineers and the beginning of the necessary surveys. It was finished none too soon. The city had been growing rapidly and many times we were perilously near a serious water famine. We were certainly fortunate that during those last few years our old gravity conduit, taxed much beyond its originally designed capacity, did not break down with most disastrous consequences to the whole community. Everything started off smoothly and has worked smoothly ever since. Our citizens were scarcely aware of any change, except that the water was better and clearer, and we had a much greater pressure which allowed us to serve the higher sections of the city, and was of incalculable value for added fire protection. And the supply seemed ample for many years to come.

Soon after the use of the new water had begun the water board established the rule that all services should have a meter placed upon them. This had an immediate effect of shutting off an enormous waste, and extended for many more years the period for which this new supply should be adequate for all our needs.

In 1908 the city council increased the water rates. For many years every annual report of the water board had besought them to do this. The water supply should be self-supporting. And there is no effective way of stopping the careless or wilful waste of water, unless that waste costs the taker. The expense of these large additions to the water works plant seemed large and it was all borrowed. But bonds have to be paid eventually, and they have a habit of becoming due and payable with remarkable regularity.

It is believed that the present rates charged for the use of water are sufficient for the first time in the history of the water department to pay what the original legislative act said the water rates should care for, namely—first, management and repairs; second, the interest on the water debt; and third, a sufficient sum towards a sinking fund that should provide for the ultimate extinguishment of the debt.

Kept Within Cost Estimate.

The original estimates of the cost of this whole scheme for enlarging the water supply made by our engineers before beginning the work was \$1,200,000. And this is the sum that the water board asked the city council to appropriate, and is the sum that they voted. Four per cent bonds for that amount were issued from time to time as needed. The money market was favorable, and the bonds were sold to the highest bidder for a premium which amounted to \$111,361.50. This premium received was also placed to the credit of this account.

It was this sum which was used to pay for the land purchased about

the ponds, and for which no amount had been included in our original estimate.

Perhaps the most interesting, as well as the most remarkable, fact connected with the story of the further water supply is yet to be stated—the total undertaking was paid for and the amount appropriated was not exceeded. The work was wholly done by contract; there were many different contracts, but there was almost no extra work.

The estimates of the cost were carefully made and itemized and included many expenditures which are difficult to determine in advance like land damages.

Hardly less interesting is another fact, that although we had the power of eminent domain, to condemn and arbitrarily take lands needed for the work, yet we agreed harmoniously with 181 separate owners of the different parcels taken; the city was sued by only one aggrieved individual, and that case never got to court because he withdrew and accepted the amount originally offered by the board.

It is a great satisfaction for the writer to sit down now with Mr. Coggeshall, who as clerk of the board during these years shared in all its deliberations, and note how few defects have developed, how few things were forgotten, and to see how many needs of the city were successfully anticipated. The credit for this must be largely given to our broad, sagacious, and level headed engineers, and to them the reputation of this work among the water experts of other cities is their worthy enduring monument.

It should be a source of gratification to the citizens of New Bedford that the plans so laboriously worked out have proved practical, efficient, and adequate; that they are standing successfully the test of time, the test of actual use, and to realize that the extension of the water system, although constructed by a municipality, represents as nearly as possible the full cash purchasing value of the money which it cost.