Sectt. I (1)-I—10,006—7-10-70.

(1) Number of pages 16

(2) Date of repair 25-3-1876

(3) Initials of the Referencer

TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

Revenue DEPARTMENT

G.O. No. / B.P. No.	2461	Press / Mis.
Dated 23.10.1876		197—.

Not to be folded or roughly handled

Municipal—Water Supply.

No. 4. *Read the following letter from the Acting President of the Municipal Commissions, Madura, to the Chief Secretary to Government, dated Madura, 12th August* 1876, *No.* 1905 :—

I have the honor to submit the report on the Madura Town water supply, called for in G.O., dated 4th March 1876, No. 230, Public Department.

2. As the enclosed *precis* of correspondence on the subject will show, this question has now been under discussion for more than a quarter of a century, and, I regret to say, seems no nearer settlement now than in 1850.

3. During the interval endless discussions and references have taken place, and three projects for supplying the town with water have been brought forward in more or less detail.

4. The first is that of Captain Horsley, then Civil Engineer, the first mention of which that I can find was in 1849. His design was to improve an existing channel which is taken off from the river about 4¼ miles above Madura, and to carry a portion of the water thereof along an embankment to the outskirts of the town; thence to take it by a masonry aqueduct across two wide streets; and finally by means of a water tower and a syphon to discharge it into a small reservoir to be constructed in the centre of the town. Thence it was intended to discharge the water so as to flush and clean the drains, the condition of which appears to have been as great a public nuisance then as now. The amount of the estimate was Rupees 23,605-9-9.

5. The defect of this plan is obvious, viz., that it would only act while the Vaigai river was in fresh, that is for a few weeks only during the year, and in no case during the dry weather when it is naturally more difficult to keep the drains clean than in the months during which the efforts of the drain cleaners are assisted by copious showers of rain. This defect attracted notice at the time, and the Board of Revenue, with whom the superintendence of public works then lay, inquired whether it would not be a better plan to raise water from the river by mechanical means for the purpose of flushing the drains. The then Collector (Mr. Parker) replied that he and the Civil Engineer thought that water could not be raised by picottahs all the year round. No doubt they were right; and as at that period no one thought of steam engines up-country there were no other mechanical means to which they could have resorted.

6. In default, therefore, of a better, Captain Horsley's plan was sanctioned. This was in September 1851. Difficulties then arose about the land required for the embankment, compensation for which had not been provided in the estimate; and the works were consequently not commenced until July 1856. By the middle of 1860 about Rupees 20,000 had been spent. In the mean time, the rates of labor had risen, and some omissions in the estimate had been discovered. The work done had also been considerably damaged by the weather, and in November in that year the then Collector (Mr. T. Clarke) reported that the completion of the work would cost nearly Rupees 10,000 in excess of the original estimate, besides over Rupees 3,000 as compensation for land taken up, and Rupees 6,640 for the improvement of the drains within the town, which latter sum it was hoped would be raised by public subscription.

7. The supplementary estimate, the necessity of which was thus brought to notice, turned out to be for Rupees 23,400, after allowing for previous expenditure. It was not sanctioned until 1862. The reason of this delay I have been unable to ascertain. It was followed by two other supplemental estimates for Rupees 6,000 and 6,500, respectively, which obtained the sanction of Government in 1863 and 1864. They seem to have been principally due to the omission from the original estimate of the item of turning and of certain masonry works.

8. The total of the above estimates aggregated Rupees 51,800. Their execution was proceeded with very slowly, apparently, though for what reason I cannot ascertain, until 1865-66, when funds ran short, and work on the project came to an end, fifteen years after the original estimate had been sanctioned. The expenditure up to this time was Rupees 31,300 which were simply wasted.

9. After 1865-66 the project seems to have fallen into oblivion until 1870, when Major Payne, who had formerly been employed on its execution, returned to the district as Acting Superintending Engineer. Under his instructions the Range Officer prepared an estimate of Rupees 16,000 for its completion. This was submitted to the Municipal Commissioners who thereupon requested information as to the probable available water supply in the months of January—June. This question does not appear to have received an answer.

10. No further proposals for the completion of this unfortunate project have been made, and, though the Municipality must have been considerably worried on account of it, I cannot think its abandonment a subject for regret, or recommend its resuscitation. As I have pointed out above it was essentially defective, and could have done nothing to supply what is now recognized the principal requirement of the town, viz., a good supply of good drinking water, to the train of which other sanitary improvements may be expected to follow, as in natural sequence.

11. From 1870 to 1872, the question of the water supply was unconsidered. In the latter year, the Municipal Commissioners requested the opinion thereon and on the other subject of drainage of Colonel Talbots, the then District Engineer. Colonel Talbot at once pointed out that nothing could be done without the aid of a competent Engineer who had leisure to attend to the matter, and under his advice the Municipal Commissioners applied to Government for the services of another, then employed on the Periyar Grand Road, to be placed at the District Engineer's disposal for this service during the season of the year when the climate rendered work in that locality impossible. This assistance Government stated that they were unable to give.

12. In 1874, the Municipal Commissioners renewed their application for professional assistance for which they were ready to pay. They also suggested that as no Engineer of experience in drainage and water works was not available for the post, several Municipalities might unite to get one out from England, and requested the assistance of Government in making the necessary arrangements. In reply Government stated that the District Engineer should not do what was wanted.

Proceedings of the Madras Government, Financial Department,
2nd October 1876. *No.* 1765.

13. On receipt of this order Colonel Roberts undertook to meet the wishes of Government, if assisted by a special survey establishment which was at once entertained.

14. In the mean time Colonel Roberts had left the district and had been succeeded as District Engineer by Colonel Fischer, who lost no time in turning his attention to the subject.

15. His first proposal was to construct in the valley of the Vaigai a new tank to be supplemented from the Periyar. For this investigation he applied for an additional survey establishment. But the proposal was not pressed on Mr. McQuhae's pointing out that it took years to get sanction and funds for large projects, while there would be no delay to speak of in commencing a smaller one suited to the supply of the wants of the town only.

16. Almost immediately afterwards the District Engineer pointed out that little could be done with one Surveyor only, that he could not himself devote much time to the project, and that there was full work for an Assistant Engineer in the town alone. On this representation being laid before the Municipal Commissioners, they at once offered to pay one-third of the cost of employing such an officer in the town alone; but Government, on application being made to them, stated that they were unable to grant this assistance.

17. The next project brought forward by Colonel Fischer for the supply of the town with water was that described in my letter referred to in G. O., dated 14th July 1876, No. 2005, Public Works Department. The proposal was, as Government could not take up that project, the Commissioners should, and stated that he estimated that for the sum of four lakhs not only could an ample and unfailing supply of water be brought to the town, but 30,000 acres of land irrigated, the water-rate on which would pay off the prime cost of the project in a very few years. A copy of his letter on the subject, No. 1620-A, dated 20th July 1875, is enclosed. This was laid before the Commissioners by Mr. McQuhae with the remark that "the proposed scheme appears to be altogether beyond the means of the Municipality and could not be put in a proper shape for consideration without very heavy preliminary expenses," and the Commissioners thereupon passed proceedings that they were not then prepared to take it up.

18. It is obvious, I think, that it would be impossible, even if it were within their legal powers, for the Municipal Commissioners of any town to take up a project so extensive and so far beyond their need. But I may be allowed to state my opinion that if either of the projects above mentioned which the District Engineer has recommended, which I believe to be feasible, and for which I think the district is much indebted to him, could be carried out, the difficulty of supplying Madura town with good drinking water would be solved. I have discussed these projects at some length in my letter recorded in the Proceedings of the Board of Revenue, No. 4779, dated 11th July 1876, and I need not repeat here what I have said there.

19. The third and last plan proposed by Colonel Fischer for the future town water supply is described in his letter to the Vice-President, No. 4004, dated 15th March 1876, a copy whereof is submitted herewith, together with five estimates, one register of the water in the Vaigai, and 3 nine plans (as engraved).

20. This proposal is to widen the channel leading from the Chittanai anicut on the Vaigai river into the Tenkarai tank, so as to carry a much larger volume of water than at present; to enlarge the Tenkarai tank and increase its capacity by nine millions cubic yards; and thence to convey the water to the town through a 6in. trench pipe for a distance of about 13½ miles (24,000 yards).

21. The estimated cost of this scheme, which makes no provision for the distribution of the water within the town, is 4½ lakhs.

22. The first objection to it is, I think, that it provides a great deal more than is wanted. The population of the town at the last Census was 61,987, of whom a considerable number live in outlying villages distant half to one mile from the town itself. On account of the enormous cost of distribution to such distances I do not think it will be possible to provide a water supply which shall extend to more than the town itself, the present population of which is about 45,000. Taking it however at 50,000, to allow for increase, and allowing three cubic feet (about 20 gallons) per head per diem to this number of persons, the annual requirements would be about 2,739,000 cubic yards, or hardly more than a quarter of the supply the District Engineer estimates the projected tank would hold. He argues, it is true, that nine millions cubic yards would be an ample supply for two years, from which it would appear that the supply required for one year is four-and-a-half millions cubic yards. But I do not know how these figures were arrived at, and have no data to test safe. I therefore think this is a larger project than Madura town needs. It is not necessary to undertake so much as the District Engineer suggests in order that the full benefit of the Vaigai water should be secured to the full extent of the Chittanai anicut. The Engineer's great additional expense until consumption so increases that additional storage is found necessary.

23. In my calculations I have intentionally excluded loss by percolation and evaporation which I think would be more than made up for by the small surplus which the tank would receive during the rainy months of April to July, independently of the main supply which would be thrown into it during the high floods of the monsoon months of October to December.

24. The next objection I have to this project is the obvious one of its enormous cost. I do not for a moment mean to say that Madura town cannot afford to spend so much in the way of improvements. I believe it can. I entertain little doubt that if the Professional tax were reimposed and economy exercised in the expenditure of the proceeds of other taxes, the town could afford to spend on the provision of a really good supply of water and system of drainage about Rupees 40,000 per annum, at 4 per cent. interest and with a sinking fund of 1 per cent., it would allow of a capital expenditure of Rs. 13,33,333, which is, I think, the most that should be seriously considered. But this sum must be made to provide for everything which is required, for bringing good water to the town, for distributing it through its streets, and for taking it out again through an efficient system of drains. The town cannot afford to spend two-thirds of it on the first object alone, and I doubt if so many lakhs of new wealth to bring good water to the town as far as Chittanai are worth so much distribution, though I question whether it would be safe to reduce the sum (of Rupees 40,000 will pay for distribution) under 6,000 or

7,000 cubic yards of water in excess of the present supply without providing means to take it out again. Such a course could only end in raising the subsoil water-level and in making the town, in the end, far more unhealthy than it is at present.

25. Fortunately, however, an examination of Colonel Fischer's rough estimates shows that a very good project might be carried out for much less than 4½ lakhs. As he has himself suggested, the iron piping, over 13½ miles in length, may be omitted, and the water conveyed to the outskirts of the town by an open channel.

26. Open channels for the conveyance of drinking water are no doubt objectionable, and should not be resorted to where other arrangements are feasible. But there is after all no insuperable difficulty in so fencing such a channel as to prevent access to it, and as the country between the Tenkarai tank and the outskirts of the town is not very densely inhabited, it should be possible, I think, to ensure the water reaching the town practically uncontaminated. Even if not, there can be no doubt that such a water supply might at least be preserved in a much purer state than anything now at the command of the inhabitants; and there would be no difficulty, and little expense in comparison with the cost of iron pipes, in providing suitable filtering-beds if experience proved them necessary.

27. Should the project be carried out in this modified form, one result of the omission of the iron piping would be that it would be necessary to provide a service reservoir, to hold, say, one day's supply, or 180,000 cubic feet, in the outskirts of the town. Such a reservoir would be about 135 feet square and 10 feet deep. I need not trouble Government with details, but my calculations are that it would not cost more than Rupees 40,000 at the outside. If so, the total cost of the project, not including filtering-beds, the practical necessity of which I think by no means clear, would be as follows:—

	Rs.
Improvements of the anicut on the Vaigai, and enlarging of the Channel and Tenkarai tank, according to the District Engineer's figures	35,000
Reservoir	40,000
Channel (by a rough calculation I have myself made on a liberal scale	16,000
Total ...	1,16,000

28. In making these calculations I have allowed ample dimensions and liberal rates. I believe them therefore to represent the outside probable cost of bringing water for the town supply to the Tenkarai tank, of storing it there in sufficient quantity, and of bringing it thence to a service reservoir in the outskirts of the town. If my figures are accepted, it follows that the town can easily pay the cost of these works, and can further afford Rupees 3,00,000 for the distribution of the water through the streets and for an efficient system of drainage. The question is whether this sum will be enough for these latter works. Unfortunately I am unable to answer it with any degree of certainty. The District Engineer has not apparently considered the question of drainage, and shows (in which I quite agree with him) that it is impossible for him to go into the details of distribution.

30. My belief, however, is that Rupees 5,00,000 will be quite sufficient for distribution and drainage, and I ground my opinion to this effect on what I understand to be the actual and estimated cost of similar works for the city of Madras.

30. In Madras the whole cost of water supply and drainage may, I believe, be roughly put as follows:—

	Lakhs.
Water supply including collection and distribution	14
Drainage	25
Total ...	39

Taking the population of Madras at four lakhs, this comes to 9¾ Rupees per head.

31. But the circumstances of Madras vary widely from those of Madura. In the first place, the Madras figures include the cost of collection and storage, and of bringing the water to the town, the cost of which, for Madura I have estimated separately. I have no information of the cost of these works in the case of Madras, but I imagine that I cannot be far wrong if I take it at four lakhs. This would leave distribution and drainage at thirty-five lakhs, or 8¾ Rupees per head.

32. Madras is, however, a large city, perhaps the most scattered in the world. The area to be dealt with in Madura is very compact. This will make an enormous difference in the comparative cost of water distribution. The largest Madras mains are, I believe, only two inches in diameter. If the District Engineer is right in his calculation that the whole water supply of Madura can be carried by a two-inch pipe, the largest distribution pipes would probably not exceed twelve inches. The resulting comparative difference of cost I am not in a position to calculate. But no one can doubt that it must be very great.

33. In the matter of drainage, again, similar reasons exist why the cost to Madura should be far less in proportion than at Madras. In the latter city, the natural levels of the ground are exceptionally unfavourable, a considerable portion of the area to be drained being, I believe, actually several feet below the necessary point of discharge. This necessitates the erection of extensive pumping-engines. In Madura, the whole town is so placed upon slopes either towards the Anuppanadi stream which surrounds the town on its northern and eastern sides, or towards the Kottakudi river which bounds it on the south, and I cannot doubt that the natural gradients are sufficient to ensure a rapid and efficient discharge of all drainage matter into these and thence to the north-east of the town where it would be immediately utilized in the irrigation of the land. More favourable conditions for the drainage of a large town could probably hardly exist.

34. Taking these differences, all of which are in favour of Madura, into consideration, I do not think I am overcautious in estimating that it distributing and draining it for the cost of Rupees ten heads, similar objects may be attained in Madura for 6¼ Rupees per head. The present population of the town is, I believe, not more than 40,000. But taking it at 60,000, as has

been done above with respect to the water supply, and estimating the cost at 6¼ Rupees per head, the sum of Rupees 3,90,000 would suffice for all requirements.

35. I venture therefore to think that it is perfectly practicable to give the town of Madura a thoroughly good supply of pure water and to provide for its drainage, at a cost within the means of the inhabitants.

36. But much more than has been done must be done, before the question can be considered to be in such a position that anything more than a mere opinion can be pronounced upon it. The town cannot launch out into so great an expenditure until detailed estimates of the cost of every item have been made and submitted to rigid professional criticism. And in my humble opinion the preparation of estimates is utterly impossible unless Government are pleased to assist the Municipal Commissioners by appointing to this duty some competent professional man.

37. I have mentioned above the several occasions on which the Commissioners have applied to Government for this assistance which in the circumstances of the country only Government are in a position to afford. I have now the honor to forward another application (Resolution, No. 36 of 1876) from the Commissioners to the same effect, which I earnestly hope Government will favorably consider. If Government are not in a position to depute any officer now in their employ to this duty at the expense of the Commissioners, they will, I trust, sanction the entertainment by them of an Engineer of their own. The Commissioners are willing to [illegible] for the employment of an Engineer, and, if none is available in the country, there can, I think, be no difficulty in getting one out from England. For many reasons, indeed, I am inclined to think that the latter would be the best course to adopt. It is not as if merely the questions of storage and of the conveyance of the water to the outskirts of the town had to be considered. With such questions the Officers of the Department of Public Works are familiar. But of distribution and drainage, of the comparative merits of this or that kind of pipe—iron and stoneware—this or that description of stand-pipe and the like, they can have had, as a body, little or no experience. Such questions are, I understand, dealt with at home by a distinct branch of the profession. It must also be remembered, I think, that before any definite conclusion can be arrived at as to what should be done, more than one well-probably have to be investigated. I refer particularly to Colonel Roberts' suggestion that the water supply of the town should be derived from [illegible] the river. To work this out, and [illegible] calculations I have made I venture to think it well deserving of close investigation, would require a knowledge of storm currents and [illegible], which I apprehend few persons can possess who are not fresh from England and familiar with the latest of the many new inventions there constantly brought before the public.

38. Such considerations are, however, for Government rather than the Commissioners to [illegible]. The Commissioners are fully conscious of their responsibilities. They have always been ready to [illegible] suggestions and to furnish funds. More they cannot do. The District Engineer has given his time and [illegible] to the subject, and has brought forward a rough project which appears capable of being worked out so as fully to realize

requirements. The predecessor threw out a valuable suggestion which seems to merit investigation. Some number of them could at once be The multiplicity of work of all kinds which devolves on the District Engineer of this large district prevents his giving any large share of his time to any one project, or devoting himself to the study of its details. Locally, in short, all that can be done that can be done; and it now remains with Government to render that aid without which one of the largest and most important towns in the Provinces under their control cannot but continue in a most unsatisfactory sanitary condition.

From the District Engineer of Madura, to the Vice President of the Municipal Commission, Madura, dated Tirumangalam, 11th March 1876, No. 4604.

I have the honor to forward the report prepared, in connection with the water supply of Madura town, as well as I have been able to prepare it, with the establishment available. I regret these should not be more complete, but for so large a project as is absolutely necessary a special Engineer should be employed for the duty alone, and I can only recommend your

Board to apply to the Government for this assistance as I have found it quite impossible to attend to more than is barely called for with the duties at the stations to the west, but I trust the details now collected may be quite sufficient for anyone to complete the project with a little

The principal question of the supply of water to Madura for both town and cultivation is to obtain a sufficient supply of water for the use of the population from wells in all probability at moderate depths, which is principally concerned; artesian wells cannot be successfully expected in the hard rocks which underlie the whole of the district, but there have been springs met with in some of the deep wells sunk in the sandy deposits, their sources are chiefly dependent on the rainfall on the hills to the west. Below the town of Madura the river Vaigai flows on the right bank of this river there is a considerable area of land which is irrigated from wells in all parts of the district, so much so that it is quite out of the question to suppose much of the water now used for irrigation could be diverted from its present channel for the supply of the town, as the cultivation would be destroyed. How very little evaporation there is from the surface of water can be illustrated from my tanks. A few days at the end of the rains, when the tanks are full, suffice to carry them over the whole year, and it is only when the rains fail altogether that they run dry during the year.

I have no doubt that the Vaigai river for nine months in the year will supply a million gallons per day for the use of the town, and for five years

[illegible] the Municipality have contributed [illegible]

[illegible] December there is no [illegible] and all that we could depend upon is [illegible]

I have no doubt that the Manjalar river in the [illegible] but for all seasons [illegible]

[illegible] which would be a very [illegible]

There are two or three tanks within [illegible] supplied from the Vaigai river, and it was hoped [illegible] would be sufficient to supply the town, but on [illegible] that the [illegible] Madura [illegible] to convey the water to the town in the usual manner, so that it would not have been [illegible] to [illegible] the [illegible] and [illegible] the [illegible] the [illegible]

million cubic yards of water could be stored in them, and as a full supply for the use of the town for a year is estimated at four million cubic yards, this storage would be ample, but I do not see clearly how to maintain the water at or about this level, as the freshes in the river are very uncertain from April till October in most years, without interfering with the irrigation, and we must have it about this height as the head above the town there is only twelve feet which is quite insufficient to force the water through the pipes when laid in the numerous narrow streets of Madura, and would given little or no command over the houses in the event of fire.

5. The next tank examined was the Eoveregan tank, and here a much better head could be obtained upwards of sixty feet, but only about three million cubic yards of water could be stored in it without destroying very valuable cultivation, and as this waterspread is so small and shallow and the water received into it must be supplied from the river it would very soon silt up.

6. The Melakal tank is the next one about in this valley; this also is very shallow, and if raised the waterspread will destroy wet cultivation and two or three villages.

7. Lastly, I determined to go up to the Chittani anicut and the Tenkarai tank which is supplied by it, and this is the work I would recommend your Board to take up for the supply of the town. It is upwards of a hundred feet above the town, the existing anicut requires very little improvement to send down a much better supply to the tank; it is not difficult to improve the supply channel to this at moderate cost, and we can raise and improve the Tenkarai tank so as to hold three yards in depth of water more than at present, and as its existing waterspread is upwards of two-and-a-half million square yards, if three yards of water be raised on this the contents would not be less than seven-and-a-half million cubic yards, but in executing the work it will be necessary to enclose some intermediate areas by which it is expected that fully nine million cubic yards of water can be stored for the use of the town—a supply amply sufficient for two years. No [illegible] would be destroyed by raising this tank and no villages, the only arrangement [illegible] to be carefully attended to in the supply of the existing irrigation about 600 acres, but there should be no great difficulty in this matter.

8. I estimate the probable cost of the work as below:—

		Rs.
1	Repairing anicut	1,000
2	Head sluices, &c.	2,000
3	Repairing Tenkarai tank and filling in intermediate areas	32,000
4	Improving old channel	11,000
5	Raising Theagarai tank	10,000
6	Bridge-weir?	3,000
7	Iron pipes fifteen diameter 3 inch thick, 24,000 yards	3,02,000
8	Laying pipes	24,000
9	Earthwork &c.	10,000
10	Sundries	5,000
	Total	4,50,000

9. I have not been able to go much into detail as regards this item, but I believe it is generally correct according to latest value except in the matter of iron pipes, and the data for these I obtained from the Madras Water Works which have been successfully laid now for some years; supposing the prices are landed at Tuticorin and all to Madura (what according to [illegible] would be under Rupees 100 a ton, but I have estimated the cost at this price [illegible] would be under Rupees 100 a ton, but I have estimated the cost at this price.

10. The line of pipes should follow the general canal adopted by the Surveyor from A to D the gradient there will be one in 375, from D to C the pipe should be laid on the bed of the old [illegible] Hariyar channel, the gradient will then be one in 770, from C to B the gradient allowed is one in 750 to suit the level of the ground to the old embankment, here a syphon should be built about

From the District Engineer of Madura, to the President of the Municipal Commissions, Madura, dated Butlagundu, 29th July 1875, No. 1629-A.

The Government having in G.O. of the 14th July 1873, No. 2005, declined to sanction the investigation of the project for constructing a reservoir on the Mattjalar near Butlagundu, I have the honor to suggest, for the consideration of your Board, the construction of this work in connexion with the water supply of Madura town so as to provide a permanent supply for the whole of any year.

2. It has been ascertained from levels that the Madacolam tank is high enough to command the whole of the town, and the registers of water in the Vaigai maintained last year by the Municipality show that we could keep this tank full probably for six months of the year, but it is impossible to store any greater quantity of water in it without destroying valuable cultivated lands above; it may be possible to store some more water for the use of the town in an adjacent tank, the Tenkal, but this reservoir cannot be much improved as the Railway passes through it and would be injured by any increase of water-level. I have examined the whole valley of the Vaigai to find a site for the water supply of Madura, and I do not believe a better one can be found than the one near Butlagundu which possesses almost every advantage such a work can require—an ample water supply, a fine basin for storage purposes, a most convenient site for a bund, and an abundance of good materials almost at site for its construction, and I do not think there would be any great difficulty in bringing the water stored here into the Madacolam tank for the use of Madura town.

3. First as regards drainage area, and water supply, there is a gathering ground above the site of the proposed reservoir of upwards of 100 square miles of excessively steep hilly country, and Mr. Levinge's rain registers show that the fall of rain is certainly not less than sixty inches in the registers we maintained last year on the causeway clearly show that from such hills about half the rain certainly drains off, so that we can calculate upon having an available supply of at least 250 million cubic yards of water; of this probably 150 million cubic yards is run off in the months of October, November, and December, and the other hundred million during April, May, and June chiefly; and in some small quantities during the rest of the year.

4. To keep Madura town well supplied with water throughout the year for all purposes including the flushing of the town drains four million cubic yards would be ample, and at Butlagundu we have then the means of securing all the town is likely to require for many generations.

5. The water from this reservoir would be let down the river-bed to the Chittanay anicut supplying the Tenkarai tank, the surplus of this could be conveyed to the head of the channel now supplying Kootiagoondah tank, and from this it can be easily led down into the channel now supplying the Madacolam tank, so as to be always available for the use of the town affording it an ample and never failing supply of water from one of the best sources in the whole district. Under these circumstances I trust the Municipality will be pleased to address the Government to allow the necessary investigations to be made and estimates prepared, for though the project has been disallowed as an irrigation work now it is its utility as a means of supplying water to one of the largest towns in South India is shown to be well worth considering the Government will perhaps no longer object to afford the Municipality the necessary assistance. I have two good surveyors in this district who could do all the field work, but it is necessary to obtain the sanction of Government for the site and for appropriating the water supply.

6. From the quantity of water which can be stored here probably some 30,000 acres of land could be irrigated in addition to affording the town all the water it will require; if the Government will give up the water-rate on this to the Municipality enough money could easily be raised on such security for constructing all the necessary works, as these are not likely to cost four lakhs and at Rupees 4 an acre the water-rate from 30,000 acres would be Rupees 1,20,000, so that in five years the whole capital with interest could be paid off without taxing the town a rupee.

7. It is of the greatest importance to secure a full supply of water to the Madacolam and Tenkal tanks before any is drawn off from them. For the use of the town as the irrigation under them close to a large market is most valuable; the irrigated area at present is 3,000 acres and as

sixteen feet high to suit the level of water in the reservoir when quite full after deducting all losses of head by friction, &c., and will be sufficient to force the water into the town as the floor of the town *eastern* is *twenty-six feet* below this level.

11. A survey plan with levels of the town has been prepared and is available for the distribution of the water, but I find it quite impossible to go into the details of this matter, it will be a very difficult one to complete for many like Madura which is full of such narrow streets running at all directions to each other, and a great deal of the head of water available will be lost if this is attempted for all such streets, but this is a matter open for the consideration of the Executive Engineer hereafter, the main points I have been able to establish are—

First.—That an abundant supply of water can be obtained from the Vaigai river for the use of the town, even in ordinary years such as those for which registers have been kept up during the months of October, November and December the quantity which passed down the river was 300 times as much as the town requires for a year's supply at present. And it is well known that from April to September floods of greater or less volume pass down this river in almost every month.

Secondly.—A storage reservoir can be constructed at the Tenkarai tank having for people command over the whole of the town and its ordinary bunds capable of holding two years' supply of water, and this can be conveyed to the reservoir by improving an existing anicut and its supply channel at very moderate expense.

Thirdly.—From the experience gained at Nagpore it is quite ascertained we can use cast-iron pipes out here as unobjectionably as in England, the most economical material for our purpose.

4. I regret this project has been longer on hand than I expected, but at the first [illegible] to the district when I took it up, and ignorance of the nature of its requirements as to the supply of water available in the mass regarding which no data whatever had been accumulated as this project has been under consideration, my own judgment and professional experience convinced me this river must have much better supply of water in it than was generally supposed, and the readings we have continued have fully confirmed my opinions on this point. In fixing on a site for a reservoir I have been much against my own inclinations compelled to go further up the valley than I could have wished, which has added greatly to the expense, and I have been till lately almost without any complete surveys, but the project now submitted is not calculated to cost more than Rupees 4 per head for a population of 80,000 at the rate of twenty-five gallons per diem throughout the year, and with the cost of distribution the outlay is not likely to exceed Rupees 10 per head, with ordinary care and management, if the charge for water is only 8 Annas per head a year, a moderate profit for the capital outlay, on outlay of 4 lakhs, and as there is no doubt that as water is procurable in such sufficient quantities there is no reason why a better supply than proposed should not be given enough at Rupees 1 per head a year was fixed, as in Bombay, would then be 3,200 gallons per capita, or 160 gallons for a penny taking the rupee as 16 d.

5. [illegible] Mr. Levinge's rain registers, which I consider very valuable, have been prepared from time to time and a trial bit for the Survey of a reservoir, amounting to Rupees 1,500 or 1,600 I can [illegible] any further service to the Committee in giving information on matters of detail as to projecting more elaborate estimates, I shall always be very glad to give all the assistance in my power, but as I said before, I cannot afford to devote myself to this any further, as I have remained the last year and a half employed on completing Coimbatore as it is very much neglected for all purposes.

P.S.—Since writing the above I have found an advertisement in the *Pall Mall Gazette* for [illegible] engineering engines, supplied by Messrs. Rose and Co., 7 Hastings's Street, Calcutta, it would be as well to write to them for the cost of these for the project.

favorably situated is probably worth not less than eight Lakhs of Rupees in value. It would therefore be far cheaper for the Municipality to incur the expense of constructing the reservoir at Puthagandla and obtain an ample supply water from it free for the town *for some four Lakhs of Rupees* secured on the greatly extended area of irrigation which such a reservoir could unfailingly maintain than to attempt to tidy on the rents cultivating under the Muthealum and Tankal tanks, and have to raise the capital for the purpose on the chance of obtaining something for the water in the town. After the works had been completed, and rights of consideration with interest thereon, the lands irrigated by them would become rent to the Government Revenue Department. I have only brought this project forward in this way ... as the best supply I could find for the town and after the Government had refused to accept it as an irrigation project, if then the Municipality are prepared to consider the scheme favorably, I trust the matter may be submitted to Government for early orders as we ought to begin the surveys as soon after November next as possible, and I have no doubt then that in *six months* the whole could be laid before the Board complete in every respect.

Precis of Papers relating to the Madura Town Water Project.

The project was originally started by Captain Hossley, Civil Engineer, in November 1849, and an estimate for Rupees 38,400-0-0 was submitted by him in July 1850. His proposition was to widen by nine feet, so as to double its discharge, the Pallevarayan channel, which has taken off *from the Vaigai about* 14 miles above Madura, for a distance of 1,800 yards; there to build a regulating sluice, consisting of two weirs, one to carry the usual quantity of water for the irrigation of the lands lying about on the channel, and the other to take the remaining water over a weir embankment across a second stream and channels and west Vellum and Mattoo streams, by means of channels according to plan A reservoir for the supply to be constructed in the bed of the Puthagandla tank, and the water to be conducted into the town by means of pipes.

2. The estimate was submitted by the Collector, Mr. Parker, on the Board of Revenue, with his letter, No. 32, dated 28th February 1851. He remarked that the chief object of the scheme was to remedy during the period of high freshes in the river, the deep drains of the town, which, owing to the flat level of the site, had little slope and by which the filth arising from the houses was apt to the great discomfort of the inhabitants and passengers. He further observed that as beyond the point at which the drainage was supposed to be the occasional supply of drinking water from the houses of the inhabitants of the central part of the town." He proposed to meet the expenditure from the Municipal and Choultry endowment Devastanam funds.

3. The Board of Revenue declined to accept the project and called for information as to the height above the river at which it might be expected to be in force and water flowing in the channel. They also asked whether water might be raised from the river by steam power to be available at the town stand. The Collector, in reply, furnished the information asked for as to the height of the water in the river, and that of the Civil Engineer, which would not be raised from the site by freshes all the year round.

4. The Board of Revenue then forwarded the estimate to Government who sanctioned it in their Order, No. 245, dated 15th September 1851.

5. No progress appears to have been made with the project, even the ground required for the channel not having been acquired, for the project, were then reported to Government on the subject, and the work was not commenced till July 1853. It appears, above been carried out with the middle of 1852 by which time about Rupees 30,000 had been spent on it. The channel was then proved insufficient owing to the increase in the cultivation of the country, and to the diversion of some water from the principal channel.

6. In their Order No. 2126, dated 24th August 1859, Government called upon the Collector, Mr. Orme to report on the progress of the water project, and the report he made on the 7th November 1859 in his letter, No. 1214. He stated that the embankment across the Vaigai, the regulation of the weirs, and repair of the channels had been carried out, and that the water had been let down the channel. Rupees 1,870-0-0 had already been spent, and such a sum of Rupees 18,730-0-0 in excess of the original estimate was required for the completion of the work. He also reported that the water to be brought into the town would not be used for domestic purposes, but only for flushing the drains, the levels of which were so defective that even to effect this a further expenditure of Rupees 6,540 would be required. This sum he stated that he hoped to raise by public subscription.

7. A revised estimate for the completion of the work after allowing for former expenditure was sanctioned by Government in their Order, No. 641, dated 1st April 1862. It came to Rupees 23,400. Further supplemental estimates for Rupees 6,000 and [illegible] respectively, were subsequently sanctioned in G.Os., dated 21st February 1863, and 2nd December 1864, respectively. Thus altogether Rupees 37,900 were sanctioned by Government besides Rupees [illegible] as on the original estimate, and Rupees 3,111 separately sanctioned and paid as compensation for land acquired. The sanctions aggregated, that is, more than double the amount of the original estimate. Of this sum of Rupees 35,900 Rupees 27,211-2-1 were paid out of the District Road and Income Tax Funds, and the work has been at a standstill since March 1866, as the balance was not available.

8. From 1866 to 1870 the matter appears to have been lost sight of, for what reason cannot be ascertained. It is matter, however, of common recollection that every one used to say that the levels were so wrong that water would not flow along the channel, and that it was useless going on with the project.

9. In 1870 Major Payne who had formerly been in the executive charge of the work returned to the district as Superintending Engineer, and under his instructions the question was taken up again by Mr. Leggatt, the Assistant Engineer in charge of the Range, who framed a fresh estimate for Rupees 16,900 for putting the work already executed into good order and for completing it. This was submitted to the Municipal Commissioners who in reply requested Mr. Leggatt to state the quantity of water likely to be received into the town by the conduct between the months of January and June. To this request no reply has been received, and the project appears to have been since completely abandoned.

10. On the 2nd October 1872, the Municipal Commissioners requested Colonel Roberts, then District Engineer, to report on the question of the town water supply. On the 3rd February 1873, they requested him to furnish them with his views as to the improvement of the drainage of the town.

11. In his letter, No. 4825, dated 10th February 1873, Colonel Roberts pointed out that the drainage and water supply questions must be considered together; he stated that he had already set the Town Overseer to work to take the necessary levels for bringing the water of certain tanks into the town along the old embankment, but he gave it as his opinion that, with the extreme difficulty that will be found in keeping the water uncontaminated en route, the idea of leading the water into the town in this manner should be abandoned. He further stated that the supply of the required water supply could best be obtained from a number of large wells to be built of rubble stones in the vicinity of the river above the new bund, and that this scheme be tried, whether by steam or other power to be decided hereafter, the reservoir and thence the town by distribution in covered pipes for the supply of the town; and recommended that, as questions of water supply and drainage are so connected in their details, application should be made to Government for the services of a special officer (named) to further investigate.

12. Application was accordingly made but without success (vide G.O., No. 1054, dated 8th April 1873, Public Works Department).

13. On application for the services of a professional man being refused in 1873, Government asked why the services of the District Engineer could not be obtained.

14. The District Engineer (Colonel Roberts) was then appointed to and undertook to get out the project, if a proper survey establishment was sanctioned. This was agreed to by Government and sanction accorded in G.O., No. 1193, dated 8th July 1874, Financial Department.

15. About this time Colonel Roberts left the district, and was succeeded as District Engineer by Colonel Fischer.

Proceedings of the Madras Government, Financial Department,
2nd October 1876. *No.* 1765.