(No. 51.)



## 1900.

## PARLIAMENT OF TASMANIA.

## "THE HOBART WATER ACT, 1893":

REPORT OF SELECT COMMITTEE, WITH MINUTES OF PROCEEDINGS, EVIDENCE, AND APPENDICES.

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SELECT COMMITTEE appointed on the 5th December, 1899, to inquire into the working and administration of "The Hobart Water Act, 1893."

MEMBERS OF THE COMMITTEE.

Mr. Butler. Mr. Crosby. Mr. Grant. MR. MORRISBY. MR. PIESSE. MR. PERKINS. (Mover.)

#### DAYS OF MEETING.

Friday, February 9, 1900; Thursday, February 15; Tuesday, February 20; Thursday, March 8; Friday, March 9; Tuesday, March 13; Wednesday, June 27; Friday, August 17.

#### WITNESSES EXAMINED.

Mr. James Clark; Mr. Tetley Gant; Mr. George Luckman; Mr. Arthur Eckford; Mr. James Frederick Stump; Mr. James Gregory; Mr. Henry Vincent Bayly; Honourable Frederick William Piesse, M.L.C.; Mr. Edward James Burgess; Mr. Henry Llewellyn Roberts; Mr. Edward Maher; Mr. Edward Maher, jun.; Mr. Robert Sydney Milles.

## REPORT.

Your Committee have the honour to report that, after perusal of the Hobart Water Acts, and papers relating to the working and administration thereof, and after hearing the evidence of the witnesses called before them, they find as follows :---

1. That the Hobart Water Act of 1860 was passed for the supply of water to the City of Hobart, the port, and suburbs.

2. That, in pursuance of this Act, and the various amendments of the same, during the last 40 years the sum of  $\pounds 159,500$  has been laid out in connection with the construction of waterworks.

3. That at the present time the surplus water for summer use is conserved in two dams, situate about two miles from Hobart, in the suburban district of Queenborough, which dams have been constructed at considerable expense, and have from time to time required extensive repairs.

4. The pipes which convey the water to the City and suburbs having, in many instances, been laid for a long period, a large expenditure in the shape of renewals will be soon required, in addition to the sum necessary for new mains, which the increasing population in the area supplied with water demands. The receipts, which in the year 1860 amounted to £4464 1s. 2d., have in 1899 increased to £15,232, but at the same time the cost of maintenance, which in 1860 was £2072 6s. 1d., has, with interest on loans, also increased in 1899 to £15,767, the year closing with an accumulated deficiency of £3806 17s. 7d. The suburbs, which in 1864 only contributed £217 4s. 6d. towards the rates, contributed in 1899 nearly £3000.

5. That the Act of 1860 was passed for the purpose of supplying both City and suburbs, and although the source of supply and place of conservation is situate in one of such suburbs—Queenborough—the water rate since 1892 has always been 3d or 4d. in the  $\pounds$  higher than in the City. Before the year 1892 the rate was equal in both City and suburbs and the evidence taken before your Committee tends to show that it was an understood arrangement when the Act of 1860 was passed, that the rates should be uniform in both City and suburbs.

6. That the supply to the suburbs is, in some cases, especially in parts of New Town, insufficient for the requirements of the district, some of the mains being small and old. No water is allowed to be used in the suburbs by the local authorities for flushing of gutters or other public sanitary requirements.

7. That the rate payers in the suburbs, whose annual assessment now reaches over  $\pounds 36,000$ , have no representative on the Council, and no voice in the borrowing or expenditure of money, nor in the fixing the amount of rates that are levied upon them.

8. That the growth of the suburban revenue since 1860 has at least kept pace with the expenditure on the suburbs, and evidence was given of individual cases, where the amount contributed by the ratepayer to the water revenue has greatly increased, but without corresponding advantage in the supply provided.

9. That there is not the difference sometimes alleged, between the assessments of similar properties in City and suburbs, and that the valuations of dwelling-houses in the suburbs are at any rate comparable with those of similar dwelling-houses in the outlying parts of the City.

10. That looking to the facts, and remembering---

(a) the longstanding arrangement as to equal rates;

(b) the lack of many services in the suburbs, rendered to the City;

your Committee is of opinion that there is no justification for the differential rating first imposed under the provisions of the Water Act of 1891.

11. That the Corporation pays nothing for the water used in flushing gutters—estimated at 60,000 gallons a day—or in public sanitary appliances, street-watering, or Corporation premises, none of which services are rendered to suburban ratepayers, nor for water used at the Hobart Slaughter House—about 6,000,000 gallons per annum—which, at the rate of 1s. per 1000 gallons, would alone yield a credit to the water account of £300, while the water account is charged with, not only the salaries and wages paid to officers and men of the Water Department, but also with one half of the salaries of the Mayor, Town Clerk, Accountant, Collector of Rates, Chief Clerk in Rates Office, Assistant ditto, Junior Clerk, City Surveyor and Director of Waterworks, Assistant ditto, Foreman of Works, and Messenger, amounting in the aggregate to £1121 15s. 6d.; and with an item which seems even more indefensible, viz., £450 for reut, when the accommodation provided is described as "two rooms for offices, and cellarage accommodation for mechanical staff, and yard room." If a proper readjustment of accounts were made—and in regard to the slaughter house it must be borne in mind that this undertaking yields a profit that for years past has gone in aid of the general Corporation funds—the water account, instead of showing a large debit balance, would be considerably in credit, for this inequitable procedure has continued for very many years. The Corporation, as Trustees for the Citizens of Hobart and the Ratepayers of the Suburban Water District, have, in this particular, in the opinion of your Committee, failed to equitably administer the Water Department.

12. That by a system of several minimum charges for water served through the same pipe for domestic use, for animals, and garden purposes, the water being also measured by a meter, the Corporation has in some instances been paid as high as 2s. per 1000 gallons. It is at least doubtful whether such a method is not a violation of the spirit of the Act. It is at any rate contrary to the practice of the Metropolitan Board, Melbourne, where the minimum charge, when water is used both for domestic and garden purposes, is the amount of the rate the property is liable to, as is apparently the intention of Section 56 of the Hobart Water Act.

13. That two of the most serious matters which came under the notice of your Committee were (1) the falling off in the supply of water from Mount Wellington, and the present sources available to the Corporation, and (2) the deficiency in revenue, which commenced since the year 1889, and in the year 1893 was over  $\pm 2000$ . With regard to the deficiency in the supply of water, it is quite evident that the quantity obtainable in former years is not now available. During the summer

season, for several years past, it has been found necessary to curtail the supply to consumers, and on some occasions to cut off the supply for several hours during the day. In the middle of the present winter the dams were not nearly full, and the daily consumption of water, even then, was greater than the amount coming into the dams. This state of affairs lasted as late as June last.

14. That, from the Report of the Director of Waterworks, it is quite clear that no substantial addition in quantity of water can be obtained from Mount Wellington, and it is now a question of great moment as to whether the supply should not be obtained from the River Styx. Appended to this Report is a plan of a suggested water-supply from a point about 20 miles above New Norfolk, of which the approximate cost is estimated at  $\pm 205,000$ . By the construction of such a work an ample supply would be available, and this supply will, without doubt, be required at no distant period for the fast-increasing population of the City and suburbs. The construction of this work, or of any additional work, should, in the opinion of your Committee, be undertaken only by a water trust, which would represent all the interests—both City and suburbs—now concerned in the supply of water.

15. That the decrease in revenue may, in a great measure, be accounted for by the reduction of rates in the City in the years 1893 to 1898, when the citizens were relieved to the extent of 3d. in the  $\pounds$ , whilst the suburbs obtained no similar relief, and, as a consequence, no benefit has ever been obtained from the provisions of Section 59 of the Hobart Water Act, which enacts "That if in any year the amount received is more than sufficient for all the purposes of payment of rates, charges, and interest, the Council is required, whenever practicable, to make a proportionate reduc-tion in the rates and charges payable by the consumers of water, to be in the next year made in respect of water supplied under and by virtue of this Act" (57 Victoria, No. 25).

16. During the sittings of the Committee the upper dam, erected at the cost of £34,000, has been found to be in so dangerous a condition as to require improving, at a cost of  $\pounds 7875$ . A copy of the Engineer's Report thereon, as obtained from the office of the Director of Waterworks, is attached hereto.

WILLIAM PERKINS, Chairman of Committee.

#### MINUTES OF PROCEEDINGS.

#### FRIDAY, FEBRUARY 9, 1900.

The Committee met at 11 A.M. Present-Mr. Butler, Mr. Grant, Mr. Perkius, Mr. Piesse. Mr. Perkins was voted to the Chair.

Mr. Ferkins was voted to the Chair. The Committee deliberated. Ordered, That Messrs. H. V. Bayly, S. H. Burrows, James Clark, T. Gant, James Gregory, George Luckman, and Arthur Eckford, be summoned to attend and give evidence before the Select Committee on Thursday next. The Committee adjourned until 3 o'clock on Thursday next.

#### THURSDAY, FEBRUARY 15, 1900.

The Committee met at 3 P.M. Present—Mr. Butler, Mr. Grant, Mr. Piesse, Mr. Perkins (Chairman). The Minutes of the last Meeting were read and confirmed.

Mr. James Clark was called in and examined.

Mr. Clark withdrew. Mr. Tetley Gant was called in and examined. Mr. Gant withdrew.

Mr. Arthur Eckford was called in; but not having prepared necessary information, was ordered to attend on the next sitting day.

the next sitting day. Mr. George Luckman was called in and examined. Mr. Luckman withdrew. Ordered, That Messrs A. Eckford, James Gregory, and James Stump, be summoned to attend and give evidence before the Committee on Tuesday next. The Committee adjourned until 3.30 o'clock on Tuesday the 20th instant.

#### TUESDAY, FEBRUARY 20, 1900.

The Committee met at 3.30 P.M.

Present — Mr. Butler, Mr Grant, Mr. Piesse. In the absence of the Chairman, Mr. Piesse was voted to the Chair. The Minutes of the last Meeting were read and confirmed.

Mr. Arthur Eckford was called in and examined.

Mr. Eckford withdrew

Mr. James Frederick Stump was called in and examined. Mr. Stump withdrew.

The Committee adjourned sine die.

#### THURSDAY, MARCH 8, 1900.

The Committee met at 3 P.M. Present—Mr. Butler, Mr. Grant, Mr. Piesse, Mr. Perkins (Chairman). The Minutes of the last Meeting were read and confirmed. Mr. James F. Stump was recalled and further examined.

examined.

Mr. Stump withdrew. Mr. James Gregory was called in a examin Mr. Gregory withdrew. Mr. H. V. Bayly was called in and examined. Mr. Bayly withdrew. Mr. F. W. Piesse was examined.

The Committee adjourned until 3 o'clock on Friday the 9th instant.

#### FRIDAY, MARCH 9, 1900.

FRIDAY, MARCH The Committee met at 3 P.M. *Present*—Mr. Grant, Mr. Piesse, Mr. Perkins (Chairman). The Minutes of the last Meeting were read and confirmed. Mr. E. J. Burgess was called and examined. Mr. Burgess withdrew. Mr. H. L. Roberts was called and examined. Mr. Roberts withdrew. Mr. R. Mahon was called and examined.

Mr. Roberts withdrew. Mr. E. Maher was called and examined. Mr. Maher withdrew. Ordered, That Messrs. R. S. Milles and E. Maher, jun., be summoned to attend and give evidence before the Committee on Tuesday next. The Committee adjourned until 3 o'clock on Tuesday, the 13th inst.

#### TUESDAY, MARCH 13, 1900.

The Committee met at 3 P.M. Present – Mr. Butler, Mr. Grant, Mr. Piesse, Mr. Perkins (Chairman). The Minutes of the last Meeting were read and confirmed. Mr. E. Maher, jun., was called and examined. Mr. Maher withdrew. Mr. R. S. Milles was called and examined. Mr. Milles withdrew. The Committee adjourned sine die.

#### WEDNESDAY, JUNE 27, 1900.

The Committee met at 3 P.M. Present—M. Butler, Mr. Grant, Mr. Piesse, Mr. Perkins (Chairman). The Minutes of the last Meeting were read and confirmed.

Mr. R. S. Milles was recalled and further examined.

Mr. Milles withdrew. The Committee deliberated. The Committee adjourned *sine die.* 

#### FRIDAY, AUGUST 17, 1900.

The Committee met at 2:45 p. M. Present—Mr. Butler, Mr. Grant, Mr. Morrisby, Mr. Perkins (Chairman). The Minutes of the last Meeting were read and confirmed. The Draft Report was tabled and read. Resolved, That the Draft Report be agreed to. The Committee adjourned sine die.

## $\mathbf{E} \mathbf{V} \mathbf{I} \mathbf{D} \mathbf{E} \mathbf{N} \mathbf{C} \mathbf{E}.$

#### THURSDAY, FEBRUARY 15, 1900.

### MR. JAMES CLARK examined.

1. By Mr. Perkins .- What is your name? James Clark.

2. And you reside at New Town? Yes.

3. And held a public position some years ago? Yes.
4. You were one of the petitioners against the 1893 amended Water Bill, were you not? I was.

5. Can you speak as to the supply of water at New Town in 1891, and up to the present time, and state whether there has been any improvement? The supply is much about the same.

6. What was the amount paid for water in respect of your premises in 1880? I have only resided in New Town since March, 1889, and the amount then was 1s. 4d. 7. What was the amount for 1889? 1s. 5d.

8. Has your supply of water improved since 1889? No.
9. What is the length of your private-service pipes? Two hundred feet.
10. State internal diameter of main from which you are supplied, and date when it was laid? I do not know.

11. Has there been any new main laid from which you are directly supplied? No.

12. State increase, if any, in number of customers supplied by the same main as your supply is taken from? Twenty-three new houses have been built, which, I believe, are supplied from same main.

13. Have you had any experience in the valuation of properties? Yes, I have had a fair experience. I have been valuator for the Building Society for about 11 or 12 years.

14. Are the houses at New Town fairly assessed? Fairly so. The assessments of houses at New Town, that is, on the Main Road, are higher than what they would be in the outskirts of Hobart.

15. Do you think there should be a difference between the city and the suburbs? No. I think there should be one rate only; no more in the suburbs than in the city.
16. Are you in favour of the water being managed by a water trust? Yes, 1 am.
17. Can you give any reasons for that? Because I think the Corporation are desirous of

making money in this way, which they use for other purposes.
18. By Mr. Butler.—They get money from you and use it in town? Yes.
19. By Mr. Grant.—What is your opinion as regards the waterworks generally and the system of water supply? I have not visited the waterworks for many years, but, I think, the time is coming when we will have to seek for a larger supply on account of increase in population, &c. 20. Where could we get it from? I think the best would be the Styx or Russell's Falls.

21. By Mr. Perkins.-Have you ever been a petitioner for a larger supply of water? At New Town, as a body, we have asked for water for our streets.

22. By Mr. Butler.—And you have been refused it? Yes.
23. By Mr. Piesse.—Have you any knowledge of the quantity of water available for fire-extinguishing purposes? I only know of one or two fires breaking out in the night, and I believe they burned themselves out; but I do not know whether this was on account of insufficiency of water or not.

24. As to your own supply, can you say if you have had a fair supply of water right through summer? My supply through the summer has been bad—since then have had a good supply; the summer? but I have had to put 120 feet of new service-pipe down on account of something being wrong with the old one; so that up to three or four weeks ago I have been very badly supplied. That, however, is not the Corporation's fault.

#### MR. TETLEY GANT examined.

25. By Mr. Perkins .- What is your name? Tetley Gant.

26. You are a resident of New Town? Yes, Risdon Road.
27. How long have you resided there? About 16 or 17 years.
28. What was the amount paid for water in respect of your premises in 1884? £14 13s. 4d. I was paying £8 3s. 4d. for water rates, and £6 10s. for taps.

29. By Mr. Butler.—And you were assessed at £250 a year? Yes.
30. By Mr. Perkins.—What was the amount for 1899? £14 9s. 2d.
31. By Mr. Butler.—You are now assessed at £200, and pay £11 4s. 2d. for water rate? Yes.

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32. By Mr. Perkins.—And £3 5s. for three taps? Yes.

33. Has your supply improved since 1884? No.

34. What is the internal diameter of main from which you are supplied, and date when it was laid ? To the best of my knowledge it is two inches, and was laid, I think, about 1867. I cannot say for certain.

35. Has there been any new main laid from which you are directly supplied? No, not that I am aware of.

36. State increase (if any) in number of customers supplied by the same main as your supply is taken from? A large increase on the south side, but could not venture to state number.

37. What benefit is the present service to you? As a house supply the service is sufficiently good. About five or six years ago, when there was a severe drought, we had to do without water for several days at a stretch; the longest was five days. So far as the land I live on is concerned, the

water supply is useless for the purposes of cultivation. 38. Irrigation of any kind? Yes, if I used water for irrigation I should deprive my neighbours on the south side of water.

39. By Mr. Butler.—Are you in favour of the water being managed by a body elected by the whole of the ratepayers? I should like to see water matters managed by those who would know how to manage them; I don't care who they are, but I think they should be elected by the ratepayers. 40. Or all who have to pay for the water? Quite so.

#### MR. GEORGE LUCKMAN examined.

41. By Mr. Perkins.—Your name is George Luckman? It is.

42. And you reside in Sandy Bay? Yes.43. How long have you lived there? I have resided there over 40 years.

44. For 16 years you were a member of the Road Trust? Yes, I was a member and secre-

tary for 15 years. 45. Were you not one of those who petitioned against the 1893 Act being introduced? I have signed several petitions, and I think one was about 1893.

46. Are you paying more for the water now than you were in 1880? Yes, the rate has gone up gradually.

47. Has the amount paid increased without the supply of water improving? Yes. At one time we paid 2d in the pound less than the Town people, because of certain money borrowed for which Hobart alone was liable.

48. Now you are paying 4d. more? Yes.

49. Do you object to being rated higher than the city, and why? I do object, because under the arrangement made with Mr. Lipscombe, chairman of the Water Committee of the Municipal Council at that time, Sandy Bay was to be supplied on exactly the same terms as the city, and for nearly 30 years they were so supplied. In company with Mr. Lipscombe I canvassed the district to obtain subscriptions, and persuade the people to take the water, and  $\pounds 140$  odd was collected, which was to lay the pipe down. down the pipe. This was done. We were to excavate, and they (the Corporation) were to lay down the pipe.

50. And  $\pounds$ 140 was collected? Yes, and paid towards the opening of the road. We cannot find the records now ; they are, no doubt, mislaid, as it was many years ago.

51. What did Mr. Lipscombe promise? That, whatever advantages were derived from the water, Queenborough was to participate in it.

52. Were any differences to be made in the rates when you made the arrangement? No, we were to pay the same as Hobart.

53. By Mr. Piesse.—You were to participate in all the advantages, and pay the same rate? That is it. Mr. Lipscombe also promised that we should have sufficient for irrigation purposes.

54. By Mr. Perkins.-And you did enjoy equal rights until 1891? Yes.

55. Did you give up any rights with regard to water that you then supplied yourself with when this arrangement was made? No; except surrendering the right to the Sandy Bay Rivulet Valley.

56. What supply have you had down Sandy Bay as to quantity and quality-lately-the last two years? We have a very good supply at the present time, but no more than we ought to have.

57. By Mr. Piesse.-The plea is that the Corporation went to additional expense in order to give the suburbs a better supply? We have no better supply.

58. By Mr. Perkins.—Are the assessments of the Sandy Bay properties fair? They have been increased.

59. Are they properly assessed? They are higher than the town.
60. By Mr. Grant.—In proportion? Yes.
61. By Mr. Perkins.—Do you know anything about the main that supplies you? We are supplied with a 3-inch pipe from Main-street.

62. By Mr. Grant.-How long has it been laid? About 27 years.
63. By Mr. Perkins.-The houses have largely increased, and are nearly double what they were? Yes.

64. By Mr. Grant.-In what condition is the main in that supplies you? I don't know. 65. Is your complaint in regard to the service that it is turned off, or that it runs too slowly?

Sometimes they turn it off to such an extent that we cannot draw.
66 At night I suppose you have plenty? Yes.
67. By Mr. Perkins.—Are you in favour of the water scheme being managed by a water trust to be elected by the ratepayers? Yes.

68. Is there anything else you would like to say? Not at present.

69. I will read your evidence taken before a Select Committee on the 13th October, 1893 :-"At the last Select Committee held on this subject, Mr. Davies asked Mr. Rait, 'You take no water at all that Sandy Bay could be in any way affected by ?' And Mr. Rait answered, 'No.' Mr. Hamilton asked, 'Do you take any water from any of the tributaries of the Sandy Bay Rivulet?' And the answer to that was 'No.'—What do you say to that? I am not saying you do. What I contend is that you have taken from us the Sandy Bay Rivulet Valley, where the present Waterworks are situated; that it is the only avenue for Sandy Bay to the south-east slopes of Mount Wellington, our natural watershed. If you read Capt. Cheyne's pamphlet, and the opinions of the law officers of that day, you will find that before 1860 the Hobart Corporation had only the right to the Guy Fawkes Rivulet, and when Mr. Gale established the present Waterworks, he took that valley and conveyed all the streams on the south-east and southern slope into that valley, which cuts off all our chance of ever supplying ourselves with water from those sources. We did not object then, because we believed a Member, or Chairman of your Committee, that we were to share all the advantages of the water-supply. Had we known as much then as we do now we would have petitioned against it, and obtained a supply of our own, for a few miles of piping from any one of the creeks would have been ample for our wants Sir Francis Smith would have granted us that, for he was a fair man, as the provisions of the Water Act, 1860, prove."

70. Will you now confirm this evidence? Yes.

#### TUESDAY, FEBRUARY 20, 1900

ARTHUR ECKFORD, called and examined.

71. By Mr. Piesse.-What is your name? Arthur Eckford.

72. And you are Chairman of the Queenborough Town Board? Yes.

73. For how long have you had a knowledge of the water-supply in Sandy Bay? For the last nine years.

74. Has it improved since you first knew it? No, it has not.

75. Have you any considerable length of service-pipe? About 120 feet of what I think is called  $\frac{1}{2}$  in. pipe 76. Do you know the size of the main you are supplied from? No, I don't.

77. What main is it? King Street main.

78. Do you know when it was laid? It was laid many years ago. I o 79. Has there been any new main from which you are supplied? No. I cannot say for certain.

80. Can you give any information as to the increase in the number of customers supplied by this main ? Some new houses have been erected in Bath-street.

81. But houses that are supplied from the same main as yourself? The main comes to the corner of Bath and King streets and stops there; my place is connected by the service-pipe.

82. Does it come from the City side? No, I believe the King-street service is the same as that of Bath-street.

83. Well, can you tell the increase in the number of customers? I should say eight or ten new cottages have been erected.

 $\overline{84}$ . Have you any means of judging whether there is a sufficient supply of water in the mains in case of fire? This is a question that has been brought before the Board more than once, and the Road Inspector has complained that in case of fire there would not be a sufficient supply of water. The Fire Brigade Board has recently sent us down a hose, &c., but there has been no permission

for our men to use the fire-plugs yet, that is, so far as I know. 85. By Mr. Butler.—Has there been any fire down there within the last two or three years? One, in Princes-street; it was burned right down.

86. Was the water supply sufficient for a fire? It was some time before the fire-plug could be discovered, but when it was there was a fair supply of water.

87. By Mr. Piesse.—Do you know anything of the condition of the main that supplies you? There are leakages from the fire-plugs at times. I have written in regard to the mains generally, and have complained to the Corporation that the streets are considerably damaged on account of the breaking of the mains. It is a source of continual annoyance to the Town Board.

88. By Mr. Butler.—A new main has recently been put down in High-street? Yes; and it has been very badly laid. I say this advisedly. 89. By Mr. Piesse.—What do you mean by "badly laid"? The way the road has been

finished off is discreditable to the Corporation.

90. What was the condition of the main when it was taken up in order that the new one might be laid? It was found to be in a filthy state, and nearly completely choked. If a medical

man had inspected the pipes, he would have said it was a positive danger to the people who consumed the water from them.

91. You know that some time ago the Corporation obtained further powers from Parliament by getting the Act altered with regard to rating, on the plea that they wanted to spend money in the suburbs, in order to increase the supply, and improve matters generally,—has that been done?

As far as I can gather from the inhabitants it has not; there is no difference. 92. What is your opinion as to the formation of a water trust?—can you speak for your district? The Members of the Town Board and the inhabitants of Queenborough are strongly in favour of a water trust. They believe they are paying rates without any representation, which is not in accordance with present-day legislation.

93. By Mr. Butler.--They are paying rates, but paying for what they get? Yes; but we have a right to be represented if we are paying rates. If we had a water trust there would be more equity, and any grievances or complaints would be attended to without going to a body which thinks that the suburbs have no right to representation. I may say that the inhabitants of Queenborough are strongly in favour of a water trust being formed.

94. By Mr. Presse.-With regard to assessments: have you any means of knowing what comparison there is between the assessment of property in Queenborough and Hobart, that is, so far as relates to the same class of houses ?--are you assessed higher or lower? We are assessed higher.

95. For the same class of houses? Yes. I have means of knowing most of the properties in Hobart, by reason of the business I am in, and I also know fairly well the properties in Queen-I must say we have a better class of houses in Queenborough than in Hobart, and the borough. houses of the working classes are better in every way.

96. By Mr. Butler.-Are your Queenborough houses assessed higher or lower than those in Hobart? Higher.

97. Take a six-roomed house in Queenborough, and one in Hobart,—what would be the difference in the assessment? The Queenborough house would be assessed higher.

98. By Mr. Piesse.—Do you think there is any justification for a higher rate? No; I do not know why it should be so. The Corporation seems to think that the subarbs should pay more than the City of Hobart, and that they are doing us a favour by supplying us with water. Under the 1860 Act, the suburbs and Hobart were to be at the same rate.

99. The plea is, that it costs more to supply the suburbs with water than it does Hobart? The answer to that is that the inhabitants of Queenborough have repaid, by means of rates paid every year, every sum that has been laid out by the Corporation in laying mains, &c. 100. You have, I suppose, asked for water for public purposes, such as flushing? The Cor-

poration have been asked several times, and the reply has been that they could not agree to have the water supplied. The Town Board has also asked for water for flushing purposes, but this could not be granted. The Mayor stated that they had to use salt water for the streets of Hobart, and that they could not allow us to use the water for our streets. I may state that our gutters and drains require flushing once or twice a week, at the least; but we cannot get any water for the purpose.

101. By Mr. Grant.-Do you think you have enough water for the W.C. system throughout the district? Most certainly not. The water supply is not sufficient, and sometimes the pressure is very low.

102. Is there any unfair use of the water in the district? No. The charge that has been made against Queenborough in this respect is untrue; and I have received a report to this effect from a man I can rely upon-the Inspector.

#### MR. JAMES FREDERICK STUMP, called and examined.

103. By Mr. Piesse.—What is your name? James Frederick Stump. 104. And you are Accountant to the Hobart Corporation? Yes.

105. Can you furnish the Committee with particulars of money borrowed on account of water, and the amount that is now outstanding? Certain small sums were borrowed previous to Act 43 Vict. No. 22, and were consolidated under such Act.

106. That is "The Loans Consolidation Act"? Yes. £90,000 and £9,500 (£99,500) were borrowed at the rate of 5 per cent. under this Act. Under 53 Vict. No. 57 the sum of £30,000 more was borrowed at the rate of 4 per cent., making, with above, £129,500. We have also a local loan under 47 Vi.1. No. 23, to the amount of £30,000, at 5 per cent. The total amount borrowed for water purposes is, therefore. £159,500, which amount is still owing.

107. There is a provision in "The Loans Consolidation Act" as to setting apart a Sinking Fund—are you in a position to state whether this has been complied with? Yes, we are paying £1150 as an annual contribution towards the Hobart Corporation Sinking Fund, £800 of which is charged to the Water Account.

108. Do you know whether this has been done from the beginning? No, not from the beginning. £600 (of which £400 was provided by the Water Account) used to be paid annually to the Sinking Fund until the Corporation Accounts were brought under the Government Audit, when the Auditor-General decided that it was not according to the Act, and from that time  $\pounds 1150$ has been paid annually.

109. The section states that the Council "shall set apart as a Sinking Fund such sums of money as shall be sufficient to pay the amount of the principal money so raised in the time or times within which it is provided in the debentures that it shall be repaid"? The Auditor-General carefully considered this matter, and he decided that  $\pounds 1150$  was the amount that should be set apart.

110. Can you give the due dates of the Debentures? The first loan of £100,000 was borrowed on May 1st, 1880, and is repayable at 50 years—that is June, 1930. There is another of £50,000, borrowed on the 1st May, 1888, at 30 years, due in 1918.

#### THURSDAY, MARCH 8, 1900.

#### JAMES FREDERICK STUMP, recalled and examined.

111. By Mr. Perkins.—How is it that the  $\pounds 800$ , portion of the annual contribution, is charged to the Water Account?  $\pounds 800$  is in proportion to the amount raised for water.

Mr. Stump here laid before the Committee, Report of Committee of Estimates, and Ways and Means of the Municipal Council of Hobart, from the year 1878 to 1900; Statement of Accounts from 1879 to 1898; and statements showing the amounts of water rates raised in years 1864, 1867, 1890, and 1898, from the suburbs, and Water Account for the year 1860.

SUBURBAN	WATER	RATE.	•
	Rate.	Special.	Total.
<b>1864.</b> Cascades Sandy Bay	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
· · · · · ·	· · ·	- · ·	£217 4 6
Total Rates Less Suburbs	• • • • • • • • • • • • • • • • • • • •	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	· ·
		£4498 13 6	
1867. Cascades Sandy Bay Park-street, (Glebe) New Town	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccc} 4 & 8 & 0 \\ 18 & 10 & 0 \\ 2 & 0 & 0 \\ 53 & 10 & 0 \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
			£645 18 8
Total Rates Less Suburbs	•••••	5224 7 10 645 18 8	
· · ·		£4578 9 2	
<b>1890.</b> Cascades Sandy Bay New Town Glebe Town	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
· · ·			£1913 4 0
Total Rates Less Suburbs	·····	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	and and a second se
		£10,145 19 4	
<b>1898.</b> Cascades Sándy Bay New Town Moonah Glebe Town	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$
Total Rates Less Suburbs		$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	
		£9505 0 0	· · · ·

11

#### 1860.

#### WATERWORKS.

. Receipts.	£	<i>s</i> .	• d.
Balance	1075	5 1ŀ	7
Water Rates, &c	3389	) 0	7
	£4464	12	2
Expenditure.	£	<i>s</i> .	<i>d</i> .
Salaries	1048	) 6	8
Wages	762	2 4	10
Artificer's work	60	) 18	10
Material	44	14	Ō
Advertising, printing, &c.	68	3 2	3
Miscellaneous	86	3 19	6

#### NEW WATERWORKS SINCE THE ACT PASSED.

 $\pm 2072$ 

6 1

Law charges	51	11	<b>2</b>
Salaries	175	0	0
Wages	1561	7	1
Artificer's work	- 39	15	1
Advertising, printing, &c.	4	10	0
Purchase of land	220	0	0
Material	108	9	10
Miscellaneous	39	15	0
Balance	191	17	11
in the second			·
	£4464	12	2

112. By Mr. Piesse.-You don't produce detailed figures for 1860? No; only the totals. 113. By Mr. Perkins.—The revenue for 1860 was £4464 12s. 2d.? The actual receipts for the year were £3388 0s. 7d.

114. What was the expenditure for that year? £4272 14s. 3d.

115. Can you give an account of the sum that has been expended in the suburbs? No; I. cannot give that.

116. By Mr. But/er.-You did not include New Town in the statement for 1864? No. nor Glebe Town.

117. By Mr. Piesse.-Will you say that the return given by you shows that the revenue from suburban water rate has increased from 1864 to 1898, about 13 times? This is not a fair comparison, as there was no New Town or Glebe Town in 1864.

118. But still there was the increase? The laying of mains, &c., will come to quite as much in proportion.

119. By Mr. Perkins.-Can you tell us what quantity of water is used at the slaughteryards? No; I cannot.

120. Is any account kept? Mr. Milles, I daresay, could give you an estimate, but there is no check. The Corporation is talking of having a water-meter placed there in order to show the amount of water used, and making it a charge against the slaughter-yards.

121. Do the Government buildings pay for water?  $\pounds 630$  per annum is paid for all the Government buildings in city and suburbs.

122. Is any charge made for the water supplied to Municipal buildings ? No; no measure is kept.

123. You commence the year 1898 with a debit balance of £2968 14s. 1d., and you end it with a debit balance of £3519 17s. 7d.—can you tell us the debit balance at the end of last year ? I have not got that account with me, but the Ways and Means for 1900 starts with £3023 8s. 10d. 124. I understand that, at a recent meeting, the Mayor said that at the end of this year they

would be £8000 to the bad-is that so? He is running the Loans Account in as well

125. What sum does the shipping contribute to the rates? For 1867 it was £168; 1890, £473; and 1898, £803. The estimated amount for this year is £750, and this is based upon the actual receipts for the previous year. It is better to under-estimate than to over-estimate.

126. Can you tell us how the Sinking Fund is invested ? Nearly all in Inscribed Stock.

127. In the name of the Commissioners? Yes. 128. Who are the Commissioners? I think they are the Mayor, Auditor-General, and the Treasurer.

129. By Mr Piesse.-What amount is falling due in 1902? £30,000, and in the Sinking Fund there would be a sum of from twenty-four to twenty-five thousand pounds to meet it.

## JAMES GREGORY, called and examined.

130. By Mr. Perkins.—What is your name? James Gregory.

131. Where do you reside? Princes-street, Sandy Bay.

132. And you are a member of the Queenborough Town Board? Yes.

133. And lately, Chairman? Yes.

134. Do you remember the 1860 Water Act being brought in? I do.

135. The purpose of that Act was to supply both the Čity and suburbs with water-is that Yes. so?

136. And for upwards of 30 years you were supplied at a uniform rate? Yes.

137. Do you know whether the inhabitants contributed anything towards the laying of mains? Yes. In order to get the main laid up to where I was building at the time, I was required by the Corporation to open the ground the whole length to the satisfaction of the Director of Waterworks, and, when the pipes were laid, to replace the earth and ram it thoroughly down, so that the Corporation was put to no expense beyond that of laying the pipes.

138. Have you any idea as to the amount that has been spent in laying mains in Sandy Bay since 1860? I have not kept any account of the cost; but I know that the branch-pipes from High-street are small, and not very extensive-some are 2-inch, some 3-inch. I think 3-inch is the largest branch-pipe from the main.

139. By Mr. Butler.-Do you know what they cost? No, I cannot say.

140. By Mr. Perkins.—Have you heard of any other inhabitants contributing towards their water-service? Yes; it has been done.

141. Are you allowed any water for use in the streets? None.

142. Are you not allowed any to flush gutters or drains? No. The only occasions we ever did use it was when any drains were choked up, and then our men had to borrow a hydrant, and they had to give a guarantee for its use, and return it immediately; we have done this on two or

three occasions only. We have applied for water for flushing purposes, but have been refused.
143. What was the amount paid for water in respect of your premises in 1880? 1s. 4d. in the £ up to £40, and 1s. in the £ on the remainder. The charge was a general one for City and suburbs alike.

144. What was the amount for 1899? 1s. 5d. in the £ up to £40, and 1s. on the remainder. The City charges for the same year were 1s. 1d. in the £ to £40, and 10d. on the remainder. 145. Has your supply of water improved since 1880? Not perceptibly.

146. Have you a good supply of water? I have always had a very fair supply, but the force is not what it would be with a larger main.

147. What is the length of your private service-pipes? From my yard entrance-gates to the kitchen is about 100 feet, and the size of service-pipe is  $\frac{1}{2}$ -inch in the bore.

148. State internal diameter of main from which you are supplied, and date when it was laid? In 1878, in order to comply with the Corporation's resolution for supplying water to my property, I had to employ labour in carrying out work already mentioned ; it is a 3-inch main.

149. Has there been any new main laid from which you are directly supplied? A new 4 or 5-inch main has been laid in High-street for a certain distance, but I believe the 3-inch main above mentioned is not directly connected with the same.

150. State increase (if any), in number of customers supplied by the same main as your supply is taken from? There are at the present time 21 customers connected with the 3-inch main in New and Grosvenor streets. The assessment values range from £20 to £70 per annum, but the average would be about  $\pounds 36$ —the total assessment amounting to  $\pounds 757$  annual value at 1s. 5d. in the  $\pounds$ , and  $\pounds 35$  at 1s. 1d. in the  $\pounds$ .

151. I suppose your objection is to a differential rate? Yes; it is wrong. Mr. Lipscombe, who was a member of the Municipal Council, promised us that if the water were allowed to come into the gully, the City and suburbs would be served alike. I might mention that every drop of water that comes into the City comes through the Queenborough district, and is stored in the Queenborough district. It is impossible, under the present arrangements, for Queenborough to supply itself with water, and Mr. Lipscombe pledged his word that we were all to be served alikeone uniform rate.

152. Have you any say in the expenditure on mains, &c.? None whatever. They come and open our streets when they like, and leave them in whatever condition they like.

153. Have you anything to say with regard to the supply at Ashfield-street—as to the number of people drawing from that main? There are about 15 or 16 properties there. 154. And they draw from what sized main? Three-inch now, but they were for a long time

supplied by a  $\frac{3}{4}$ -inch main. They would not, however, put the large one down until we made the

street, and they then tore up the roadway. 155. By Mr. Butler.—Have you had any fires in Queenborough lately? One house was burned down, but in this case the firemen arrived too late.

156. Is the supply of water good enough for a fire? The force is pretty good for a small pipe, but it would not be for a town fire-hose. We have a small hose for Sandy Bay, with a  $\frac{1}{2}$ -inch nozzle, which will throw up to about 40 feet.

157. By Mr. Piesse.-Is the water supply sufficient for fire-extinguishing purposes? I don't think it is, especially if it is a big fire.

158. By Mr. Perkins.-Do you know the state of the mains? The old main that was taken up some time ago was so corroded that the diameter was reduced in some places to about 1 inch out of 4 inches, and it was also in an abominable state.

159. By Mr. Piesse.-You have had some considerable experience in valuing properties, have you not? Yes, in City and suburbs.

160. Are the assessments in the suburbs lower for the same class of house than those in the City? The suburbs are assessed quite as high; I know that for a positive fact. I have noticed that several City assessments—take certain houses in Montpelier-street, for instance—are lower than they would be if they were situated in Sandy Bay.

#### HENRY VINCENT BAYLY, called and examined.

161. By Mr. Perkins.—What is your name? Henry Vincent Bayly.
162. Where do you live? New Town.

163. What was the amount paid for water in respect of your premises in 1880? Domestic, £5 13s. 4d.; and garden, £7; making a total of £12 13s. 4d.

164. What was the amount for 1899? Domestic, £8 16s. 8d.; and garden, £7 5s.; making a total of £16 1s. 8d.

165. Has your supply of water improved since 1880? I question it very much. I have

certainly seen no improvement during the last fifteen years. 166. What is the length of your private service-pipe? About 300 feet. 167. Can you state internal diameter of main from which you are supplied, and date when it was laid? About 2 inches, I believe; and it has been down about twenty-five or thirty years.

168. Has there been any new main laid from which you are directly supplied? No.

169. Can you give increase (if any) in number of customers supplied by the same main as your supply is taken from? I cannot answer that.

170. Čan you give any evidence with regard to private piping that has been laid? About half a mile of private piping has been laid without any cost to the Corporation, and through this three

separate properties are being supplied. 171. By Mr. Piesse.—What is your own supply of water like? During the summer months, when watering the garden, I frequently get a call from the house to stop, so that there may be sufficient for domestic use. This is the best supply I can get for £16 1s. 8d. Early in the morning I have been able to get a fair supply.

172. If you had a meter I suppose you would pay about half of what you do now? Yes. I have applied for a meter, but they have not supplied me with one yet.

#### FREDERICK WILLIAM PIESSE, examined.

173. By Mr. Perkins.-State your name and residence? Frederick William Piesse, Bay Road, New Town.

174. What was the amount paid for water in respect of your premises in 1880? £4 5s. 4d. 175. What was the amount for 1899? £9 5s. 9d.

176. Has your supply of water improved since 1880? It has not. Before 1880 l had as good a supply as now; it has been worse since then, but is now no better than before 1880. Not

infrequently there is not enough water to properly fill one half-inch tap. 177. What is the length of your private service-pipes? About 450 feet direct from Cross-street, and nearly 300 feet direct from Swanston-street; this is without reckoning branch supplypipes.

178. State internal diameter of main from which you are supplied, and date when it was laid? I understand the Cross-street main, laid more than 30 years ago, is 2 inches internal diameter. The

Swanston-street main, laid about 14 years ago, and attached to Cross-street main, is 3 inches. 179. Has there been any new main laid from which you are directly supplied? Partly supplied from Swanston-street main, mentioned in my last answer.

180. State increase (if any) in number of customers supplied by the same main as your supply is taken from ? To the Cross-street main, including the connected Swanston-street main, there are now 39 services, where in 1879 there were 13.

#### FRIDAY, 9TH MARCH, 1900.

#### EDWARD JAMES BURGESS, called and examined.

181. By Mr. Perkins.—What is your name? Edward James Burgess.
182. Where do you reside? At Moonah

183. And in 1898 you were supplied with water by the Corporation? Yes. In 1897 and 1898 I was using water which the Corporation required me to take by meter. 184. Was the supply of water by meter satisfactory? It was most unsatisfactory. The first

meter was put on to the supply-pipe for the orchard without inquiring from me where I was getting my general supply from; immediately it was put on I removed the tap and ceased to take the water. It registered from seventy thousand to eighty thousand gallons. They then put a meter on to the house supply, so far as I can remember, early in December, 1897, and that meter registered for that one month something like sixty thousand gallons. To this meter I took exception, because I knew I never used anything approaching that quantity of water. For about six months after that I refused to pay rates, and my case was heard before the Mayor (Mr. Hiddlestone) and other Aldermen, and it was determined that this particular meter should be tested by their own officials. They sent out, took the meter off, and replaced it with another. On the day it was brought into town I met, by appointment, the Mayor, Mr. Smith, Mr. Milles, the Jown Clerk, and others, and we spent the whole of the morning in testing the meter. Speaking from memory, the first test registered about 76 gallons, the second test about 79 gallons, and the third 4 or 5 gallous less than the 100; the quantity in each case should have been 100. Mr. Milles then stated, that evidently the meter was dirty, and that he would take it to pieces and re-oil it, after which it would register correctly. My contention all through was that the meter was unreliable, so I said, "We will see." After he had put the meter together again for the final test it recorded a lesser quantity than it had done in the three previous tests, and my statement that the meter was unreliable was therefore correct. The Mayor appointed a day when he would give his decision after having had the meter tested, but through some unforeseen circumstances, I think illuess on his part or that of the Town Clerk, the judgment was not given on that day, but on a latter date, and during my absence. The Town Clerk contended that he sent me notice of the meeting, but I deny this. I tried to reopen the case; in fact they served me with a notice, and I had all my witnesses ready and went into the Court. The Mayor then had a conversation with the Town Clerk and declined to reopen the matter, and wanted to know why notice to attend had been sent me. Mr. Hiddlestone went out with me to view the premises some months after having given his decision, and he saw at once that the statements which Mr. Milles had made were false. You see it was a question of fact as between Mr. Milles' and the Inspector's (Mr. Harbottle's) evidence, and my own evidence, and that of the lad who is my servant, and they relied upon the evidence of their officials in preference to my own. Mr. Hiddlestone, after seeing that I was in the right, was anxious to reopen the case, but the then Mayor, Mr. Davies, would not do so.

185. And you were sued in respect to a measure of water shown by this unreliable meter? Yes. The ground on which the Mayor gave his decision was that-inasmuch as the meter registered a lesser quantity than 100 gallons, therefore I was being charged less than I should have been.

186. What was the amount paid for water in respect of your premises in 1880? About £5. 187. What was the amount for 1898? I think I am well within the mark when I say about £12.

188. Has your supply of water improved since 1880? No, it has very materially altered for the worse.

189. What is the length of your private service-pipe? I cannot say for certain. About five years ago the Corporation laid a new 2-in. pipe, and from that my service-pipes are very short. The main-road pipe is 4in, and, I think, has been down at least 30 years, and never been cleaned or had any attention paid to it.

190. Has there been any increase in the number of customers supplied by the same main as your supply is taken from? Just the same number of people, Mr. Clarke and myself.

191. By Mr. Piesse.-Do you know whether the meters are issued without being tested? Mr. Milles stated, in the presence of the Mayor and myself, that such was the case. The meters were issued by him without being retested. I asked him on what grounds, and he said they were sent to them guaranteed, and were taken as being correct. The price charged me for the third quarter of 1897 was 30,000 gallons at 1s., and 60,000 at 10d., with rent of meter, 2s. 6d. For the first quarter of 1898, I was charged for 59,000 gallons at 1s., with loan of meter, 4s. 6d.; for the second quarter of 1898 I was charged 1s. a gallon for 65,000 gallons, and 2s. for loan of the meter. [Demands for these were produced by Mr. Burgess.] I might mention that the new meter, since I have been connected with the Glenorchy Water Trust, is evidently registering very badly, as Mr. Terry stated that it seemed to be registering a much less quantity of water than it appeared we were actually using.

#### HENRY LLEWELLYN ROBERTS, called and examined.

192. By Mr. Perkins.-What is your name? Henry Llewellyn Roberts.

193. And your are an auctioneer, residing in Hobart? Yes.

194. Can you give us any information as to the way in which water matters may be better managed? My opinion is that no water should be supplied, except through a meter. 195. Would you include the smallest buildings? Yes, all; in the same way as the Gas

Company supply their gas. The Corporation could very easily supply them by borrowing money. With regard to small cottages, it is very often the case that several are owned by one person, and one meter would, therefore, do. It does not require one meter for each cottage. My complaint against the supply of water without a meter is (taking my own case, for instance) that I pay a very high rate -I suppose one of the highest in the City,  $\pounds 150$  a year—and also pay for animals in addition, whilst my neighbour has a tap for which he pays 25s., and he can use it without restriction I am limited to a certain quantity of water, while my neighbour can use it day and night, and pays nothing like what I do.

196. Can you give us an instance of a fountain? I have heard of one, which the neighbours, state runs rather freely.

197. And do you know what is charged for it? I don't know. There is another great waste of water, and that is with regard to the urinals. I have seen them running day and night.

198. Do you know what the Coffee Palace pays for water? About  $\pounds 60$ .

199. Are they on meter? Yes. 200. What do you think of the charge for water in the suburbs? I don't see any reason for a difference in the charges. The Gas Company charge just the same for the supply of gas.

201. By Mr. Piesse.— Can you say whether there is any great difference in the value of the same class of dwelling-houses in the suburbs and in the City? I don't think there is, but I have had no occasion to consider this question.

202. By Mr. Perkins.—Do you think it fair to charge to the Water Account half the Municipal expenses? I cannot say on what grounds they do so.

Mr. Roberts then presented the following figures, re Hobart water supply :---

Present income about £15,000 per annum.

Derived from charge for (approximately) 800 thousand gals, per diem at 1s, per thousand,  $\pounds 40 = \pounds 14,600.$ 

Summer consumption said to be 2 million gals., hence there remains 1,200,000 gals. duily unaccounted for (value at 1s., £60 daily), that quantity at  $9\frac{1}{3}d$ . per thousand will furnish present income. Assuming that the *average* amount is  $\frac{2}{3}$ rds of Summer Consumption, it would be 1300 thousand per

diem at 1s., value  $\pounds 65 = \text{nearly} \pounds 28,000.$ 

If under meter in all cases the Consumption averages one million per diem, the revenue at 1s. will be over £18,000 (£3000 more than at present).

Charge for supply by meter should not exceed what will furnish sufficient to pay all charges on the fund under clause 52 of Act '93.

If cost of Meters is £3 to £4, rent at 10s. per annum will give nearly 15 per cent. on outlay (which can be borrowed at  $3\frac{1}{2}$ ; 5s. per annum would cover all expenses and provide for repairs and renewals.

#### EDWARD MAHER, called and examined.

203. By Mr. Perkins .- What is your name? Edward Maher.

204. How many years were you connected with the Fire Brigade? About 34 years. 205. Are you acquainted with the Hobart Water Supply? Yes.

206. Can you state what condition the mains are in generally? There are some very old portions, but during the time I was connected with the Fire Brigade a great improvement took place. At one time the mains were so small that the City was not protected.

207. What state are the mains in in the suburbs-Sandy Bay, for instance? At Sandy Bay some new mains have been put down, but I do not know to what extent. In some parts there i very good pressure, and in others it is very bad. Some of the pipes are old and corroded. 208. By Mr. Piesse.—Do you know the original diameter of the Campbell-street pipe? In some parts there is a

think it was 3-inch, but in some parts it was only effective as  $l_{\frac{1}{2}}$ -inch.

209. By Mr. Perkins.-Do you know the state of the pipes at New Town? They were very bad; but the Superintendent has reported on this.

210. By Mr, Piesse.—Do you think there is sufficient water in the Risdon Road pipe for the protection of property? No, not in my opinion.

211. Do you know the pipe in Cross-street, New Town, at the back of Mr. Gant's property? I do not think there is sufficient there for fire-extinguishing purposes. A cottage owned by Mr. Chesterman, in Montagn-street, was burned down, and at that time there was a very poor supply of -in fact we had to take it in buckets.

212. Do you remember the fire which took place in Davenport-street, Glebe Town, three or four years ago-what was the pressure then? I cannot say for certain, but I think there was a very good pressure. When I was in charge of the brigade I had, in many cases, to back the water up to the fire; I employed a man specially for this work.

#### TUESDAY, 13TH MARCH, 1900.

#### EDWARD MAHER, JUN., called and examined.

213. By Mr. Perkins.-What is your name? Edward Maher, jun.

214. And you are Superintendent of the Hobart Fire Brigade? Yes.

215. Can you speak as to the state of the pipes of the water-supply in the suburbs of the City? Yes, I make a round of inspection every quarter. New Town is very badly supplied on the east side of the Main Road, particularly Risdon Road: in fact, there is not sufficient water there to keep the ball in its place. It has been reported a good number of times, and the Corporation seud someone to clean it out, but in a few months it is as bad as ever again.

216. By Mr. Piesse .- Have you tested Risdon Road yourself lately? I test it every quarter, and am going to report at the end of this month.

217. Is the supply always short? Yes, there is no water at all for Mr. Jordan's place, which is at the end of the main.

218. And there is a lot of valuable property along that road? Yes. If a fire were to occur at the tanuery we would have to bring the hose from the Main Road. At the recent fire in Piriestreet I had to take a line of hose from the Main Road at the Post Office, but to get a good supply I had to reduce the nozzle.

219. At that fire did you happen to notice how you laid the hose—I believe it went over two or three fences? There was about 850 feet of hose, and that length would reduce the pressure slightly.

220. But do you think the fact of the hose crossing the fences would interfere with the pressure? If the bose gets kinked, then the pressure will be reduced, but not if it simply passes over the fence.

221. By Mr. Butler.-Would the weight not make it give? No, the pressure would keep it up.

222. By Mr. Piesse --- Have you noticed any other line of main ? On the east of the Main Road, from Roope-street down to Bay Road, the pressure is not very satisfactory.

223. Do you know anything of the water-supply in Forster-street? Yes, a new 3-inch main

has been laid, and there is plenty of water there now. 224. What about the supply at the fire in Montagu-street—Mr. Chesterman's house? are no plugs there at all. There is also no pressure at Duff's brickyard. There

225. Can you say anything about other mains that have come under your notice? At this side of Pirie-street a new 3-inch main has been laid off the Main Road, but it only goes to the other side of Mr. Pearce's house.

226. By Mr. Butler.-Do you know anything of the Sandy Bay system? On the east of Sandy Bay it is bad in places, especially Bath-street, alongside the rivulet. Queen-street is very good.

227. By Mr. Perkins.-What is the supply like at the lower side of Sandy Bay? There is no water there at all. The end of the main is near the Magdalene Home.

228. By Mr. Grant.-What is the main like in Quayle-street? It is a new main in Quaylestreet. I understand that £900 has been voted to take a line of main down Parliament-street, and a new main has been put down in Duke-street. There is plenty of water down the Main Road as far as the "Nook.

229. By Mr. Piesse.—Can you say anything as to Mount Stuart Road? been put up there. It extends almost to the building erected by Mr. Searell. up at the back of Dr. Benjafield's. A new main has An old main goes

230. What caused the choking of the Risdon Road pipe? It has been choked for years. The Corporation breaks the pipe and gets the scrapers to work, but they cannot clean pipes out properly in this manner. I do not think there is a  $\frac{3}{4}$ -inch waterway in this pipe. I intend putting the gauge on, but I don't think there will be a five-pounds pressure. If you put a hydrant down, the water comes up, but that is all; whereas if you went to a fire you would require 95 or 100 pounds

pressure, and you can get this in any part of the City. 231. By Mr. Perkins.—What are the City mains like? In the centre of the City the supply is sufficient. There is a main on each side of Elizabeth-street.

232. By Mr. Piesse.-What is the state of the mains on Battery Point? Very bad. There is no pressure at all in Arthur Circus, and although a plug is just at the intersection of the roads, there is no water. The turncock will, of course, give a small supply. A fair pressure is obtainable in Kelly and South streets.

233. Can you speak as to the supply on the Glebe? A new main has been laid in Edward-street, but the best supply is in Davenport-street. There is a very fair pressure in Bell-street.

#### ROBERT SYDNEY MILLES, called and examined.

234. By Mr. Perkins .- What is your name? Robert Sydney Milles.

235. And you are Director of the Hobart Waterworks? Yes, I am.

236. How long have you been in that position? Since the end of 1892.

237. Can you tell us the quantity of water used at the Slaughter-yards unnually? It was metered some years ago, although no record is at present kept, and from records it appears that they used about six millions a year—that is about twenty thousand gallons a day.

238. By Mr. Piesse.—Is it more or less now? So far as I can gather, it is less now. Several new fittings have been put in, and the management is different. 239. By Mr. Perkins.—I suppose the water used by the Slaughter-yards is not charged for?

No, it is not.

240. Can you give us the quantity used for the streets, exclusive of salt water? When the streets were being watered by fresh water only, including the flushing of the gutters, the maximum was about 110,000 gallons a day, but since salt water has been used this amount has been reduced to about 60,000 gallons.

241. By Mr. Piesse.—Of course that is only for a limited period of the year? Immediately the dry weather sets in, about August or a little later, the watering of the streets is commenced, and is increased as summer advances.

242. By Mr. Perkins.—What quantity of water is used for Corporation purposes—Town Hall, urinals, &c.? I made an estimate in February, 1899, and including horse-troughs, the quantity used is about 90,000 gallons a day.

243. By  $\dot{Mr}$ . Piesse.—Do you supply some of the suburbs with water troughs? Yes, they are all included in this estimate.

244. Can you say what a half-inch pipe will do continually running? It will run about £175 worth of water in the year.

245. How many public urinals are there? About four, I think.
246. By Mr. Piesse.—Are the public-houses supplied by means of meters? Yes, nearly all

the urinals in the hotels are supplied by meter. 247. By Mr. Perkins.—What amount of water is paid for by the Coffee Palace, Club, &c.? In 1895, Hudley's, the Ship, Heathorn's, Westella, Coffee Palace, and the Tasmanian Club used  $4\frac{1}{2}$  million gallons. It was paid for under a sliding scale, 1s. and 10d. per thousand.

248. By Mr. Piesse. At most of these places there are urinals which are semi-public, is that so? Yes

249. Have you any idea of the quantity of water that will pass through them? From 150 to 200 gallons an hour when they are running, but many of the hotel proprietors, since they have had to pay, cut them off a good deal at night time. I can give you the quantities of water that the Government buildings used a few years ago when they were metered. Nearly eight million gallons per quarter were used in 1888.

250. By Mr. Perkins.—What do they pay for it? They now pay £630 a year. They paid £500 in 1890; £620 in 1891; and in 1892, £620. 251. And the supply is not metered? We are keeping a check meter at the Railway and

some of the other Departments, in order to see what they are actually using for special purposes. I might state that if the Railway Department had been properly charged they would have paid more than the additional subsidy that the Government gives us. Some years ago the Government paid £500, and, if I remember rightly, when the Main Line Railway was taken over the additional sum of £120 was allowed us, but this £120 will not pay for the water used by the Railway Department.

252. Can you give us the cost of repairs in the suburbs, and state whether the present system is more costly than need be? [Mr. Milles laid before the Committee a statement furnishing this In regard to this statement, Mr. Milles said that it was difficult to apportion the information. wages, and that the amounts were given approximately.]

253. By Mr. Piesse.—Have you thought of any better way of carrying out suburban repairs instead of sending the staff out? Yes, I have thought of it several times.

254. You see at the present time you have to trust to the men doing their work properly? re are arguments for both sides. We have only a limited number of men working from the There are arguments for both sides. centre station, and if we had men for each district the most part of their time they would have nothing to do.

255. Do you think it would answer to let repairs by contract? I think this course would be very unsatisfactory.

256. Can you give us any information as to the supply of water in the suburbs for fire-extinguishing purposes? It is as good as can be expected It is certainly much better than it was a few years ago; and if you were to examine the mains, quantity of water, and the pressure, you would find there is very little to complain of. I have a Pressure Gauge Book, and we keep it would find there is very little to complain of. I have a Pressure Gauge Book, and we keep it recorded up. We started it in 1894, and the pressure is increasing very considerably in districts, and not only that, but the volume of water has increased.

257. Let us take for instance, Risdon Road-what can you say about this? Risdon Road is an old 2-inch main, and it is one of the worst districts we have. Few of the old 2-inch mains laid about 1860 are still down, and, of course, they will not give the volume of water that new mains will.

258. By Mr. Perkins.—Have you got the pressure of the Risdon Road? No, but I can give you the pressure on the Main Road. From the top of Swan's Hill the pressure is 120 pounds to the square inch, and a very big volume, and the lowest is at Augusta Road, 88 pounds. At the Maypole Hotel it is 110 pounds; at Mr. Brownell's it is 90 pounds; and at Mrs. Barrett's, 105 pounds. In connection with the recent fire in Pirie-street, the Fire Brigade took the water from the 2-inch main instead of from the 3-inch. The fire-plug was on the new 3-inch, and they should have connected on to it, but they did not do so.

259. Can you give us the pressure at Arthur Circus, Battery Point—I understand there is none? It is 56 pounds to the square inch just by Runnymede-street. 2? It is 56 pounds to the square inch just by Runnymede-street. 260. By Mr. Butler.—What is the Hampden Road pressure?

In 1894 the lowest was 42 pounds, while at the present time the lowest is from 70 to 95 pounds.

261. By Mr. Piesse.—In a 2-inch pipe that has been down for 40 years, what do you suppose would be the effective size? It will depend a good deal upon the locality. If a big draw of water is constantly going it will not be less than three-quarters of its original size.

262. Can you supply us with the charge for water supplied by meter? Mr. Milles read extracts from By-laws made by the Municipal Council of Hobart on the 15th December, 1899, which came into operation on the 1st day of January, 1900 :--

(b.) The charge for water for domestic or other purposes, or for domestic and other purposes, by meter, shall be One Shilling per thousand gallons.

(c.) When water is supplied by meter for any of the undermentioned purposes, the minimum quantity of water to be charged for in any one year shall be in each case as set forth hereunder namely :---

Water for irrigation purposes	25,000 gals.
Syphons	60,000 ,,
Machinery and trade purposes	• 40,000 ,,
Bottle-washing	40,000 "
Photography and any like process	40,000 ,,
Fountain-sprays, &c., for shop windows	40,000 "
Livery stables	100,000 ,,

(e.) Where water is supplied by meter to any premises for both domestic supply and for any other purpose or purposes the minimum quantity of water to be charged for in any one year shall be the amcunt of water calculated at the rate of One thousand gallons for every 1s. of the Water Rate payable in respect of such premises, together with the prescribed minimum or minima for the other purpose or purposes.

(f.) Where water is supplied by meter for domestic and other purposes, or for domestic or other purposes, payment for the same shall be made quarterly in advance, and payment shall be made for onefourth of the minimum quantity so to be charged for as aforesaid; and if at the end of the year the quantity of water consumed exceeds the minimum quantity to be charged for in respect of such premises and purposes, then payment shall be made for the difference between the amount of water paid for and the total amount of water consumed. In every case such payments shall be subject to adjustment as soon as practicable after the close of each year.

(k.) The rent payable for the use of meters and fittings for any purpose shall be at the rate of Ten Pounds per centum per annum upon the actual cost of such meter to the Corporation, payable quarterly, in advance.

263. By Mr. Piesse.—I suppose the end of a service gets clogged sooner than other portions? Yes, "dead ends," as we call them, unless there is a large quantity of water used, will always collect any sediment.

264. By Mr. Perkins.—Have you any idea of what it would cost for a reticulation service of the City and suburbs? I think there are from 10 to 12 miles of old mains we have got down, and the cost, with the services, would come to about  $\pounds 1000$  a mile. In one of my reports to the Council a few years ago I went into this question a little, and I worked it out as follows:—We have about 70 miles of reticulation, and as the life of the mains at the extreme is 35 years, two miles would have to be renewed each year to keep the reticulation in good order.

265. And you consider it would cost about £2000 a year for up-keep? Yes, to keep them thoroughly renewed; that is without the extensions.

 $2\overline{66}$ . By Mr. Butler.—And there should be a new pipe every 35 years? Yes, that is the outside limit.

267. By Mr. Perkins.—Is any fund provided for this work? It is all done at present out of revenue. Every main that is taken up now and relaid is done out of revenue.

268. By Mr. Piesse.— Can you say whether you have expended a sum equal to or more than that amount? Mr. Milles laid before the Committee a "Material Account" from 1889 to 1898.

269. Has anything been done to the Risdon Road main? A new service has been put on to the Cemetery, and this will relieve the deposit a good deal.

270. What is the size of the nozzles for fire-extinguishing purposes? They vary from  $\frac{1}{2}$ -inch to 1-inch, and I will guarantee to supply a  $\frac{3}{4}$ -inch nozzle almost anywhere in Sandy Bay. Right up at the top of Parliament-street I will do so. All through Sandy Bay, with the exception of one or two streets, the pressure is very fair indeed, and the volume of water is good.

271. Do you think the cost of supplying the suburb of Sandy Bay with water is greater than supplying some of the outskirts of the City—the Corporation brings its main down King-street for not only Sandy Bay, but part of the City, and is it likely that the cost of your service there would be greater than supplying outside portions of the City itself? Yes, I think it would. The revenue brought in by the service in the suburbs is considerably less than what it is in the City. It must be remembered that a large number of people in the outlying districts of Hobart put the water on at their own expense. Take Arthur-street, for instance, where two or three persons laid a servicepipe right up to the top of the street.

272. By Mr. Butler.—Would it not cost you as much to lay water on to a block, say on Lansdowne Crescent, as laying it on a suburb block? I cannot say. It would be a question of measuring up the length of mains.

273. By Mr. Piesse.—But Sandy Bay is right under your supply; you must bring the pipe through? Until 1893 the supply came through the Marquis of Hastings to Sandy Bay, and it was owing chiefly to the requirements of this suburb that the 10-inch main was laid.

was owing chiefly to the requirements of this suburb that the 10-inch main was laid. 274. By Mr. Perkins.—Why did you not stop at Sandy Bay instead of bringing the main into town? It was considered advisable to do this so that two mains may be drawn from. It has improved the supply to Battery Point, and the shipping too.

275. In your accounts I notice you have an item, "Wages and carting "-- can you say what these wages are paid for? All the mechanical staff, plumbers, labourers, &c., and all men employed in maintenance and other work.

276. Does it include the wages of men who are employed in the laying of new mains? Yes. 277. By Mr. Grant.—When was the 10-inch main laid in Sandy Bay? I think it was in

1893. It was charged to Loans Account. Our Wages Account averages about £38 per week, and includes the City Turncock, caretaker at the Marquis of Hastings, and others. 278. By Mr. Piesse.—What has been spent on new works, say for the last few years? For

the last eight years it will be about £3000, roughly speaking.

279. By Mr. Perkins.—Are meters tested before being fixed? The condition in the purchase of our meters is that they have all to be tested by the Metropolitan Water Board, Sydney, by which Board the testing of nearly all the meters in the Colony is done. Each meter is to be correct to within, I think, 2½ per cent. either way. This is a sensitive test, and perfectly correct. 280. Is there any local test? Yes, whenever there is any dissatisfaction. It would entail considerable cost if all meters were also tested here. The testing that they are subject to in Sydney, we think is quite sufficient

we think, is quite sufficient.

281. Is there any way of testing while they are in regular use? If we notice any discrepancy in reading we ask the consumer if he desires to have it tested, and if it is found that the meter is registering correctly, he pays for the test, but not if it is found that he has been paying for more water than he actually used.

282. By Mr. Piesse.-Have you found all meters satisfactory? With the exception of two cases.

283. By Mr. Perkins.---What is the cost of testing? It runs from 3s. to 5s., according to the size of the meter.

284. And any customer may have his meter tested? Yes, under the conditions.

285. By Mr. Piesse -- From Swan's Hill to the end of the service, what is the size of the main? It is a 6-inch at the top of Swan's Hill, and that goes to Augusta Road, a 4-inch down to the Maypole, and then a 3-inch.

286. And is that main considered sufficient for New Town? Portions of it are considered insufficient in summer, when the draw is very heavy.

#### WEDNESDAY, 27TH JUNE, 1900.

#### • MR. MILLES, re-called and examined.

Mr. Milles laid before the Committee the following list of new services laid in New Town District :-

SUMMARY of New Services laid in New Town District since new 6-inch Mains

were laid in 1890.

For the year	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	Totul
· · ·			· ,								
New Town-road	5	2	7	11	3		3	4	1	1	·37
Elphinstone-road				1	1	•••	1			3	<u>6</u>
Jordan Hill-road				10		2	2	1			15
Mount Stuart-road							1		· 6		7
Risdon-road							·	1			1
Arthur-street	1	1	3	1					1		7
Mona-street	1				2		1	1			5
Cross-street			2								2
Foster-street				2				17			19
California-street		1								¦	1
Pirie-street				9		1					10
Clare-street		1			1				<sup>.</sup>		2
Angusta-road	•••	1		2							3
Hope-street		· · · ·		1	1			i			2
Bedford-street				1		•••					1
Swanston-street					1					1	2
Stales atmost	1				1		1	<b>.</b>		1	3

In answer to statement made by one of the previous witnesses as to the pressure of water in Sandy Bay, Mr. Milles said : "I had the pressure taken this month at twenty different places in Sandy Bay, the lowest pressure being 84 pounds to the square inch, and it goes up to as high as 130 pounds.

287. By Mr. Perkins.-What streets were the pressures taken in? All over Sandy Bay: Sandy Bay road, Duke-street, Grosvenor-street, Parliament-street, New-street, Lord-street, &c. pressure varies from 130 to 84 pounds.

288. Mr. Gregory may have been speaking of a time before you laid the new 4-inch main down? I do not know.

289. By Mr. Butler.-Do you charge renewals against Loans? Enlarging mains is chargeable to Loans.

290. By Mr. Pirsse.—With reference to the question of water charges—that is under the head of animals, garden-taps, and three or four other ways—I would like to ask whether on the whole these charges are worked fairly—I know a case where a man on a very small property paid  $\pounds 10$  16s. 6d. for 100,000 gallons of water—Do you think this a fair charge? I suppose you mean that if all these charges were put together and divided into the amount he has consumed by meter, it would come out at 2s.; well, there might possibly be a case of this kind, but I think it is one by itself.

291. On the question of leakages—it has been assumed that there are a lot of people using water and not paying for it—that is, more water has been used than you get a fair return for—is it not likely that the department loses a good quantity from defective pipes? There are leakages in all waterworks.

292. But not more than an average? Well, I do not think it is more than the average here. I have the report of one of the leading engineers of waterworks, and he puts the loss down, in some cases, to as high as 50 per cent., owing to leakages.

293. By Mr. Butler.—What is the cause of the water coming in on the Customs site—is it caused by a leakage? No. We have proved that it is not. Our reticulation pipes are under high pressure, and a leak from a half-inch pipe will reduce the pressure considerably. If, therefore, there was such a leak at the Custom House site the pressure would come down at once. All the mains concerned have been tested, and are up to a high pressure; also all the lifts in the Bonding Warehouse have been kept going, which would have been impossible if a leakage had occurred. I think it is reasonable to assume that this water comes from the creek. We found it in Hunter-street in the same way. With reference to the question of Mr. Piesse, years ago several old pipes were cut off instead of being disconnected, and were "dumped-up" on the property. This may be the cause of a few leakages, but I think there are very few of these "dumped-up" pipes now, as we have been hunting them up.

294. By Mr. Piesse.—Would it not be fair to make some allowance to hotel-keepers where water is kept running in public urinals? This point has been considered. I think it would be rather difficult to make a reduction in this way unless it is based upon a very broad principle. All the hotels would want the same privilege.

295. With reference to meters, are you able to supply them whenever they are asked for. and do you do so? Yes.

296. One of the previous witnesses told us that he applied for one, but his request was not granted? There may be one or two individual cases in which we did not supply the meter asked for; but speaking generally, they are supplied when asked for.

297. In the accounts I notice a sum of  $\pounds$ 400 charged to the Water Department for rent, Town Hall—what accommodation do you get for that? Two rooms for offices, and cellarage accommodation for the mechanical staff.

298. By Mr. Perkins.—Can you tell me the total amount of the works that have been completed at the Waterworks since its commencement in 1860? I think it is £163,877. Works carried out under loans being as follows: —

Amount of Loans raised.		Works carried out under Loans.	
1. Various Loans consolidated under 43 Vict. No. 22	£ 99,500	1. Expended in construction of Old Storage Reservoir Head Works, from "St. Crispin's" downwards, purchase of land, service reservoirs, and reticulation of City	£ 99,500
2. Loan, New Storage Reservoir, 47 Vict. No. 23	30,000	2. Construction of New (Upper) Storage Reservoir, and No. 2 10-inch main from Storage Reservoir to Hill- street Reservoir	<b>3</b> 0,000
3. Loan, 53 Vict. No. 29	<b>30,0</b> 00	3. Completion of Upper Storage Reser- voir, the Restoration of Lower Reservoir, Laying No. 3 10-inch main, from Reservoir, to Sandy Bay, Battery Point, and Wharves; laying new mains in City and Suburbs, and improvements in re- ticulation system generally	30,000
TOTAL	£159,500		£159,500

299. Are there any means of ascertaining how this amount has been appropriated? I think it can be obtained from the books. It has been apportioned on the reservoirs from the commencement.

300. I would like to know what the last reservoir (the upper one, I call it) has cost in construction and repairs? I think £30,000 was the first cost; but that did not complete the work. Some money (£4650), was afterwards expended on the work which was borrowed from another fund; it has been adjusted now.

301. A few thousand pounds have to be paid back that was borrowed to complete the reservoir,

and, according to your last report, it will take at least £5000 to repair it now. Is that so? Yes. 302. By Mr. Grant.—Due to imperfect construction? I would not like to say that.
303. By Mr. Piesse —During the last five or six years has not the supply of water decreased? Yes; and it has never been so low in the winter as it is at the present time. The whole of the water coming from the mountain will not meet the demands, and we have been drawing from our presenting to have been for our presenting to have been for our presenting to make up the definition. upper reservoir to make up the deficiency. There is about 9 feet left there now, and we have about 18 or 20 feet in the lower. In fact, during the last five or six years the supply has been getting less and less.

304. Was there ever an estimate made for the information of the City Council for a supply of water, say from the Styx or Russell's Falls River? Yes. I made two reports on that scheme; one in 1893, and the other in 1898, and will submit same to the Committee. The first was a flying survey; the second one was after a more detailed examination of the country.

305. You propose in this scheme to bring the water by open conduits, do you not? Yes; from the intake, for a considerable distance.

306. By Mr. Perkins.-Is there any danger of the water being fouled? The intake is about 15 miles above Glenora; and although part of it may require covering, yet, I think, the major portion can be left open.

307. By Mr. Grant.-I believe you have been engaged in investigating the source of water on Mount Wellington to see if any additional supply can be obtained-have you had any success? Well, not to the extent that some persons imagine. It might help us for a year or two, but will not give a large permanent supply from the present small water reserve.

308. If what you recommend is carried out, do you think that any substantial increase will be made in the supply? We may increase it to a certain extent. There are a large number of little streamlets that are getting right under the surface-ground and down to North West Bay that really belong to us, and we may be able to get these, though the increase thereby may not be very much.

NOTE .- Mr. Milles then described the proposed scheme from the river Styx, and explained that from the second examination of the country, he found it was possible, in addition to being able to obtain the water scheme, to embody one, which by increasing the upper works, and bringing in a larger supply of water to a point the other side of New Norfolk, about 1000 horse-power could be there obtained, as well as utilising the same water for irrigating the lands along the river Derwent within about 100 feet above the river level.

### APPENDIX 1.

23

## HOBART WATER SUPPLY.

## ABSTRACT OF COST, CITY AND SUBURBS, FOR YEAR 1899.

· Locality.	Material.	Wages and Cartage.	TOTAL.
Sandy Bay District. Sandy Bay, 5 in. main Lambert Avenue, 3 in. ditto Lord-street, 4 in. ditto Parliament-street, 4 in. ditto Edward-street, 3 in. ditto Proportion of City and Suburban Maintenance	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
	722 0 11	356 17 1	1078 18 0
New Town District (including Glebe). Fraser-street, 3in. main Shoobridge-street, 3in. ditto Domain Road, rod Proportion of City and Surburban Maintenance	$ \begin{array}{r} 6 & 18 & 9 \\ 16 & 13 & 0 \\ 13 & 9 & 6 \\ 49 & 14 & 0 \\ \hline 86 & 15 & 3 \end{array} $	$ \begin{array}{r}  33 & 9 & 9 \\  4 & 0 & 0 \\  4 & 6 & 6 \\  167 & 5 & 10 \\ \hline  209 & 2 & 1 \end{array} $	$ \begin{array}{r}     40 & 8 & 6 \\     20 & 13 & 0 \\     17 & 16 & 0 \\     216 & 19 & 10 \\     \hline     295 & 17 & 4 \end{array} $
	Silverne -		
Reservoirs and Mountain Supply. Service Reservoir Mountain Supply Cascade Reservoir (repairs) Ditto (maintenance) Bower Screen, &c. Garden Crescent Reservoir Springs Cottage	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
	160 18 6	788 11 10	949 10 4
City. Liverpool-street, 5 in. main Campbell-street (North Hobart water supply), 6 in. ditto Molle-street, 3 in. ditto Franklin Pier, 3 in. ditto Montpelier-stret, 4 in. ditto Crelin-street, rod Mary-street, main Proportion of City and Surburban Maintenance	$\begin{array}{c} 86 15 1 \\ 1323 2 9 \\ \dots \\ 34 14 3 \\ 1 9 8 \\ 3 3 6 \\ 4 11 2 \\ 298 4 3 \\ \hline 1752 0 8 \end{array}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
Summary. Sandy Bay District New Town District (including Glebe) Reservoirs and Mountain Supply City GRAND TOTALS	722 0 11 86 15 3 160 18 6 1752 0 8 £2721 15 4	356       17       1         209       2       1         788       11       10         1390       9       7         *       2745       0       7	$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$

\*Some of the material used having been paid for previous to 1st January, 1899, the total amount, viz., £2721 15s. 4d.. does not agree with the material paid for during the year.

#### APPENDIX 2.

#### WATER SUPPLY. HOBART

#### EXPENDITURE - REVENUE.

Veen	Estimated .	Assessment.	Solonias	Wagas	Matorial	Interest	TOTAL	Shinning	Special	Govern-	TOTAL	Su-lus	Deficience	Cost of	Cost of
rear.	City.	Suburbs.	Salaries.	wages.	Material.	Fund.	DITURE.	Surpping.	Special.	ment.	REVENUE.	Surplus.	Denciency.	of Mains.	of Mains.
1889 Rates	£167,988 1s. 4d. –1s.	£24,327 1s. 4d.—1s.	£ 1203 —	£ 2340 —	£ 1986	£ 7711 —	£ 13,813 —	$\begin{array}{c} \pounds \\ 402 \\ - \end{array}$		£ 500 —	£ 13,172 —	£. 	£ 640 —	± 	£ 
1890 Rates	£170,481 1s. 3d.—11d.	£25,227 1s. 3d.—11d.	1185 —	2199	409	8702	13,286	407		500	13,052		238	1315	64
1891 Rates	£174,950 1s. 3d.—11d.	£26,152 1s. 3d.—11d.	1290	1737	540 —	7222	11,402	648 —	ınalyse	620 —	13,898	2496		251 —	
1892 Rates	£180,716 1s.—8d.	£27,162 1s. 4d.—1s.	1340	<b>206</b> 0	692 —	7523	12,216	695 . —	ls not <sup>e</sup>	620 —	12,395	178		41	
1893 Rates	£185,396 1s.—8d.	£28,546 1s. 4d.—1s.	1473 —	2359	1850	7820	14,337	656 <sup>°</sup> .	Specia	647	12,302	·	2034	332 —	518
1894 Rates	£186,263 1s.—8d.	$\pm 29,346$ 1s. 4d. $-1s$ .	1200	2265	2011	8098	14,502 —	610		63U	12,383	. —	2119	261 	
1895 Rates	£183,589 1s.—8d.	£30,830 1s. 4d.—1s.	1193 	2309	288	6940 	11,807 	673 —		630	12,251	443	· 	153 —	
1896 Rates	£178,012 1s.—8d.	£30,642 1.s. 4d.—1s.	1197	2241 —	305 —.	8666	17,505 —	619 —	£977, Meters £587, Taps	630	14,592		2912	296 	506
1897 Rates	£175,423 1s. 1d.—9d.	£31,710 1s. 5d1s. 1d.	1132	1966 —	620	8559 —	13,031 —	715 —	$\pounds 1208$ , Meters $\pounds 1050$ , Special	· 630	13,866	835	— . —	$\frac{409}{-}$	215
1898 Rates	£175,485 1s. 1d.—10d.	£32,838 1s. 5d.—1s.	1145	2482 —	·1881 	8557 —	15,303 —	803	$\pounds$ 1329, Meters $\pounds$ 1116, Special	630 —	14,751		551 —	804	. 364
1899 Rates	£178,695 1s. 2d.—11d.	£31,002 1s. 5d.—1s.	1168	2745 —	591 —	8551† 	15,438 —	1103*	£1347, Meters £1098, Special	630	15,934‡	496		3×0 —	1089
		:								<u></u>		£4448	£8494		

(No. 51.)

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Deficiency in 11 years, £4046. Since 1894 a charge of £400 per annum has been made against Waterworks Account of Rent of Offices. Also, since 1896, £400 per annum has been charged for additional Sinking Fund. \* Price increased to 1s. 9d. per tun. † In addition to this amount of £8551, the sum of £713 7s. 7d. has been paid in Interest on Over-Expenditure, under 59 Vict. No. 47. ‡ This amount includes £702 5s. 6d. for purchase of Reticulation Service of Moonah by the Glenorchy Water Trust, under 62 Vict. No. 61.

NOTES.

#### Appendix 3.

#### HOBART WATER SUPPLY.

To the Chairman of the Waterworks Committee.

Sir,

In accordance with instructions, I proceeded on the 1st instant to the valley of the Russell's Falls River, to examine that district as a source of water supply for Hobert and suburbs, and I have now the honour to submit the following report thereon:—

In the course of my flying survey I examined the following sources of water supply :----

No. 1.-Russell's Falls River.

No. 2.-Junee River and Mount Humboldt Creek (tributaries of Russell's Falls River).

No. 3.—River Styx.

No. 4.-River Plenty.

At the time of my visit it was found to be a very favourable opportunity for gauging the several waters, as there had previously been continued fine weather, and but very little rainfall, with the result that the rivers were at an exceptionally low run, and, therefore, gave a very fair approximation of what the probable minimum supply would be in summer time.

In considering this scheme of additional water supply, I have kept in view the proposal of supplying not only Hobart and the adjoining suburbs, but also all other districts which could reasonably be embraced under the scheme.

It has therefore been assumed that five million gailons per day will be required in addition to the present estimated supply of 1,800,000 gallons per day. This would consequently meet the requirements for many years to come, and also allow for a considerable amount of irrigation to be undertaken.

In all the calculations it has been considered that it would be necessary to bring the supply into Hobart so as to be discharged into a service reservoir, situated at an altitude of not less than 400 feet above sea level. The accompanying locality plan has been prepared to illustrate this report.

#### Russell's Falls River.

This river has a fall of about 44 feet per mile. Owing, therefore, to the difficulty in obtaining the required altitude of 700 feet, it has been found necessary to go up as far as the town reserve at Tyenna, some 15 miles from Glenora by road. The main river at this point gave twenty (20) million gallons per day, which is just four times the amount required. Above this point the river flows through a number of selections situated in somewhat flat country, from which it carries a large amount of solid matter in suspension, and, in order to avoid this, I believe it would be found necessary to go some three or four miles further up the river ; this would be in steeper country, and less liable to contamination.

#### Junee River.

This stream is a tributary of the Russell's Falls River, and takes its rise in Mount Field West. The quantity of water flowing down was six-million gallons per day. This water is most exceptionally clear for a mountain stream, and, probably, runs over limestone rock. There is a large swampy flat at its junction with the main river, and it would be advisable to go up some distance above this, in order to obtain the water free from vegetable matter. This would so increase the distance that it practically condemns it as unsuitable.

#### Mount Humboldt Creek.

This stream is said to originate from a small lake on Mount Humboldt. It joins the main river a little above the Town Reserve. The gauging of this stream gave eight million gallons per day of such water as appears in every way suitable for domestic purposes, and as it runs over rocky country it is but slightly darkened in colour in flood-time. There are no selections of land taken up above the point where it would be tapped, and therefore could be kept free from pollution.

I consider that Mount Humboldt Creek would be the most suitable source of water supply from the whole of this watershed of the Russell's Falls River, and would be found more preferable in many ways than the main river itself.

The necessary works for this proposed scheme would be roughly as follows :----

A covered channel of masonry, or other lasting material, starting from the intake at an altitude of about 750 feet above sea-level, and graded with a fall of about five feet per mile. It would cross over the Russell's Falls River, and follow down the valley of same on the south side to a point near the main road bridge which spans this river. It would then take a southerly direction up the valley of the River Styx, crossing same (by syphon), and continuing down the valley on the eastern side for about three miles, when it would take an easterly direction, crossing Dry Creek, from whence it would contour round and go up the Plenty River valley, crossing same (by syphon) it would come back on the eastern slope of that valley in a northerly direction, and then continue on to Lloyd's Hill, where it would join the head of the main-pipe line opposite to the 25-mile-post on the main road, at an elevation of about 550 teet above sea-level. The pipe-line would then follow the main road to Hobart, with branches running off where required, as, for instance, to North Bridgewater; and from Cornelian Bay Point across the River Derwent to Beltane, and on to Bellerive, and running into a small distributing reservoir suitably located.

The outlet of the main-pipe would be brought into the present service reservoirs on Hill-street, at an altitude of about 300 feet, and, when it was found necessary, it could be extended to a higher service reservoir, which could be constructed at an altitude of 400 feet above sea-level.

The chief items under this scheme would be, approximately

32 miles covered channel.

30 in. to 24 in. diameter wrought-iron pipe-mains. 25

12 in. to 3 in. diameter wrought and cast iron distributing-mains. 13

Intake-weir, small reservoir, &c.

The estimated cost of this scheme is, roughly,  $\pounds 230,000$ , in which is included a sum of  $\pounds 20,000$  for small works and contingencies.

In connection with this scheme, several alternative proposals for shortening the route have been considered, but, so far, the results are not satisfactory, as, in the absence of proper surveys, nothing can be determined with accuracy.

#### River Styx.

After the examination of the Russell's Falls scheme, I traversed the Styx River for a distance of some 15 miles up from Glenora. Although I did not-obtain quite a sufficient altitude at the farthest point which was reached, I believe it is perfectly practicable to obtain the probable required elevation of 700 feet which is necessary for the intake, and this within a reasonable distance. I understand that the whole of the land in this watershed above the point alluded to is Crown land, and, therefore, the water would be safe from being polluted. The gauging of the river shows that there are 25 million gallons of water flowing down per day, which is exclusive of the water drawn out for irrigation purposes. Therefore, it appears, there would be no distribution of interfering with one original matter is the time of matter is the matter. would be no danger of interfering with any existing water-rights. At the time of my visits the water seemed to be in every way adapted for a domestic supply, and from reliable information received it seems that there is only a slight discolouring observable during flood-time, and which only lasts for a few days.

The proposed method of bringing in this supply is similar to that from the Russell's Falls River, by means of covered channel to the 25-mile point near main road, and thence by pipe-main. The route would be much the same as previously described.

This scheme would include the construction of-

20 miles of covered channel.

25 30 in. to 24 in. diameter wrought-iron pipe-mains. "

13 ", 12 in. to 3 in. diameter wrought and cast iron distributing-mains. Intake-weir, small reservoir, &c.

The estimated cost of these works is £205,000, included in which is a sum of £18,000 for small works and contingencies. Like the previous scheme there appears at present no way of shortening the route to advantage.

#### River Plenty.

I examined this supply up to about Seven miles from its mouth, where the gauging of the water gave five million gallons per day. As it would be necessary to go many miles farther up this valley in order to obtain the required altitude, and also in view of the smallness of the stream, I do not recommend the consideration of this supply.

I am of opinion therefore, that the question of obtaining a permanent water supply from this district, lies between the Mount Humboldt Creek and the River Styx; of the two schemes, I believe that the latter will be found to be the most suitable and less costly, both as to first cost and maintenance. As to the expediency of the scheme, there is no doubt that the existing works are insufficient to meet

the fast-increasing demand for water, and that provision will soon have to be made for an additional supply. If a storage reservoir be constructed below the existing one it would be possible to meet the requirements for some few years to come, but even then it is doubtful if there could be made any further extensions into the suburbs. It must be remembered that there is a considerable population within the existing area of the suburbs. It must be remembered that there is a considerable population within the existing area of supply yet to be provided for. Provision will also have to be made for additional consumption when the

water-closet system comes into general use under the Metropolitan Drainage Scheme. This water-supply scheme is of such magnitude that it would in all probability be beyond the present powers of the Hobart Corporation to carry out such a work alone.

In order that this long-talked-of scheme may be definitely settled, and remembering what a benefit such a scheme would be, not only to Hobart, but also to the surrounding districts (which latter are now mostly dependent upon house-roof water), I believe the most satisfactory plan is to hold a conference on the subject, and I would therefore suggest that representatives from the outside districts confer with the Council upon the whole question.

If," in the meantime, it is found necessary, further surveys could be made with a view to complete information and estimates.

The purity of the water, which is a most important question, has not yet been dealt with technically, and this und many other matters would be considered at the conference.

Should either of the abovementioned schemes be considered favourable, I would recommend that steps be at once taken to have the necessary lands reserved for the purposes of the supply.

I have the honour to be,

Sir,

Yours obediently,

R. S. MILLES, Assoc., M.I.C.E.,

Director of Waterworks. March, 1893.

Note. -- After a visit to the proposed source by some members of the Water Works Committee, a motion was tabled at a meeting of the City Council in February, 1898, asking them to vote the sum of  $\pounds 300$  for the purpose of obtaining a permanent survey of the proposed scheme from the River Styx, which, after long discussion, was lost.

### APPENDIX 4.

## REPORT of the Director of Waterworks on the Upper Reservoir of the Hobart Water Supply. Office of Director of Waterworks, June 2, 1900.

SIR, You have already been informed of the fact that, on the 12th ultimo, during the lowering of the water in the upper reservoir, preparatory to commencing the work of repairs to the slips, a further movement had taken place, and which required closer examination before the work was proceeded with. Your Committee, accompanied by His Worship the Mayor, have since visited the site, and I was requested to make a supplementary report thereon as soon as possible, which I have now the honour to submit for your consideration. The inner face of the embankment, when completed in 1881, had an average slope of 1 in 3, which is that generally adopted for earth embankments, and, as stated in my last report, I understand that it was originally intended to cover the whole of this slope with rough cube stone pitching, but this was carried up only to a certain distance, viz., to about the 480 feet level, the by-wash level being 502 feet, the remaining portion of the slope (measuring some 90 feet) was (overed with freestone rubble pitching, Owing to the heavy consumption of water in the summer time of the last few years, the water has been drawn off rapidly from this reservoir, and four years ago it was noticed that a considerable creeping movement had taken place in certain portions of the rubble pitching, to such an extent as to cause a slip. It was then decided to replace this rubble pitching with good cubed stone pitching, first of all removing all the soft material, and replacing same with a better class of filling. This work was duly carried out, but during the construction of same it was discovered that the material composing the inner slope of the embankment had a large portion of sand intermixed with it, and it was of such a nature that it retained a great deal of water; consequently, when the water in the reservoir was lowered, the natural slope, or "angle of repose," of this material, was flatter than that of the enbaukment itself, and, being surcharged with water, it began to creep downwards. This new cubed pitching was put in for a length of 115 feet, and 31 feet in depth, measured on the slope, and it was bedded on the top course of the old cube pitching, which, up to that time, showed no sign of movement. An extension of this slip took place again in 1898, and a long report on the subject was submitted on the 13th June of that year, to His Worship the Mayor, in which it was then estimated the repairs would cost from £800 to £900; but it was decided to postpone the work. When the water in the reservoir was drawn off again last summer, it was discovered that there were still signs of further creeping in the rubble pitching, at either end of the new work done in 1893, and this, by the 2nd April last, had developed into one of considerable magnitude, and a report was brought up to the Council at that date, recommending that further repairs be effected, similar to that previously carried out. On the latter date, the old cube pitching still remained in its original position, and consequently, it was not anticipated the work would extend beyond what could then be seen. Since then, however, the slip has increased considerably in area, and the old cube pitching has failed to carry the superincumbent weight. I therefore deemed it necessary to discontinue taking any further water out of the reservoir. Cross-sections of the embankment have since been taken, and other information obtained as to the nature of the embankment itself, with the result that it is now proved that the slip extends down to the toe of the embankment, the old cube pitching having been buckled up in several places : not only has the surface material and old pitching moved downwards, but the new cube pitching has likewise now been brought down with it to an extent of some 15 inches to 18 inches from its original position. It is evident, therefore, that the repairs will have to extend to the toe of the embankment, which means that it is now too late in the season to commence the work, if the reservoir is to be filled again before next. Having made a careful examination, I am of opinion that the main or central portion of the embanksummer. ment is safe and sound, and that the reservoir may be again filled with water before next summer, with very little risk (if any), beyond the question of the present slip moving further down. I would therefore recommend that the reservoir be again filled as soon as possible to the most convenient level, so that as much water as is available may be stored for the coming summer, and that the actual work of repairs be postponed till the end of the year, or when the season and circumstances are favourable; in the meantime, have all the required material and plant obtained, and ready at hand for immediate use. Although the details of construction may be slightly varied, I am of opinion that the best method of carrying out the repairs will be by removing the soft material in the slip, and replacing with a better class of material. Build a strong rough cubed stone wall along the toe of the embankment, and cover the new filling with strong cube pitching, making the lower courses of considerably greater depth, so as not only to add weight, but to prevent any recurrence of the buckling action. As this work will, necessarily, take several months to complete, it will be absolutely essential that all the material should be prepared beforehand, and arrangements made for com-mencing the work at the very earliest opportunity. From the information at present available, it is antici-pated the work will embrace fully 27,000 superficial feet of the embankment, and in certain portions of which the soft material will have to be excavated several yards in depth, and, as this is mostly at the lower level, the work will, naturally, be somewhat costly, owing to the difficulty of removing it. I have made a detailed estimate of the work which will have to be done; but, nevertheless, it is somewhat difficult to estimate the exact quantities, although, I feel sure, the work will embrace an area quite equal to that stated above, and the estimate of which is £5000. In connection with this estimate, I would point out the peculiar position in which the work is situated, the distance which the excavated material will have to be taken, and, generally, the confined space in which to carry out the repairs, all tending to increase the cost of the work. To carry out any other cheaper method of repairing the embankment (unless a large amount of water space is given up) would be very inadvisable, and there would still remain a considerable chance of a similar accident taking place at some future date. I have only to add that I have every belief in the general soundness of the embankment itself, and if these surface slips are permanently stopped, no other trouble need be expected.

f am, &c.,

The Chairman Waterworks Committee.

R. S. MILLES, Director of Waterworks,

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#### APPENDIX 5.

#### **REPORT** on the Upper Storage Reservoir of the Hobart City Water Supply.

#### Hobart, July 23, 1900.

Sir, In response to your request to the Chairman of the Melbourne and Metropolitan Board of Works that one of the officers of the Board should come over to Hobart to consult with your engineer on the above reservoir, in courtesy to your Municipality my Board left the matter in my hands, to either visit Hobart myself or to select a capable officer for the purpose. On the suggestion of the Officers and Servants' Committee of my Board I decided to come over myself, and give you the best advice I could.

In connection with the matter, I have examined the original lithographs prepared for the execution of the work, in 1884 by Mr. James, C.E. The cross-section of the reservoir dam in these lithographs shows that the original design contemplated a bank 15 feet wide on the top, with slopes on the water side of three to one, and on the down-stream face of two to one. A puddle-wall was designed to reach to a height of about 18 inches above high-water-mark, with a top width of 5 feet, and a batter on either side of 1 in 10, giving a width of about 20 feet at the surface of the ground, where No. 9 section has been taken, below which the sides of the puddle-wall are shown to batter inwards, being carried down to and properly connected with the rocky foundation under the dam by passing through the mudstone rock into the sandstone below it.

This puddle-wall was to be enclosed in selected adhesive material, placed in the embankment in 9-inch layers, having an inward slope of 1 in 12, and rammed. This material was to be carried three feet (3 feet) above the puddle-wall, where it was to be fifteen feet (15 feet) wide, with slopes on both sides of the centre line of the dam of one to one (1 to 1).

At the down-stream face the earthwork was to be made up to the slope of two to one (2 to 1), with stony material laid in 9-inch layers, with a slope inwards of 1 in 13.

The face next the water was to be stony material, with gravel and clay, laid in 9-inch layers, with an inward slope of 1 in 12, and well rammed.

The water-face was to be protected by handpacked pitching, twelve (12) inches thick, laid on six (6) inches of puddle, from the foot of the slope up to the 490-feet level. Above this level the pitching was to have been cubed-freestone pitching, laid on 6 inches of clay puddle, with a curbing-course two feet deep by one foot wide (2 feet by 1 foot) on the top of the embankment.

The outlet culvert was designed of masonry, built in a trench in the solid ground, curving round the northern end of the dam. The invert of this culvert was fixed at 460 feet, and the high-water-mark at 500 feet; thus the maximum available depth of water was 40 feet.

A masonry water-tower extends from the culvert above the water-level. The discharge from the reservoir is effected by a fifteen-inch (15-inch) pipe laid in the culvert from the tower to the lower face of the dam.

The lower inlet to the tower forms the only means of scour for the reservoir, and is also the lowest draw-off level.

The upper draw-off pipe is at the 489-feet level, at which a 12-inch pipe opens into the tower.

Where the tunnel crosses the puddle-trench the foundation was designed to be cement concrete, a diaphragm being carried round the culvert to tooth into the puddle-wall, and thus prevent the creeping of water outside the culvert.

The trench over the culvert up to the natural surface of the ground was to be filled with puddle from the inlet end up to the puddle-wall. The tower was also to be enclosed in puddle. The draft specification shown to me by your Director of Waterworks as that prepared by Mr. James contains, *inter alia*, the following provisions:---"All clay used in building the dam is to be taken from sites selected and approved by the engineer, and none other shall be at any time used by the contractor on the overlap with thost which is outlight approved by the contractor." these works but that which is entirely approved by the engineer."

In a side-note in red ink, apparently in the Consulting Engineer's handwriting, there is a note: "I am going to recommend a concrete instead of a puddle-wall in the middle part of the dam, as I would not trust the clay in such a position; also, it is, I think, useful to be used in mass near the tower."

Puddle concrete was specified for the protection of the inner slope, on which the pitching was to be laid.

This concrete was to be composed of one part of puddle and one part of bluestone metal, of 1-in. gauge. The Consulting Engineer considered this unnecessary, and recommended a layer of broken metal or

gravel only in place of the puddle concrete. The adhesive material to be used in the inner and outer slopes was to be obtained from excavations in the bed and area of the reservoir on the northern side of the Sandy Bay Rivulet.

The puddle was originally specified to be carried up in horizontal and even layers, not exceeding 8 in. in thickness, to within 3 feet of the crown of the dam and along its centre line. The following note appears on the specification, that "the engineer may reduce the height of the puddle-wall if he think fit, or increase it."

A further note also states that "if, on account of accumulation of water, or for any other reason the engineer shall so direct, the contractor shall substitute cement concrete for the puddle in the trench to such extent and such dimensions as may be directed, and the same shall be paid for at the schedule price of cement concrete.

"The earthwork comprising the inner portions of the embankment immediately in front and at the rear of the puddle-wall shall be composed of selected material to be entirely free from all timber roots, stones, or other extraneous and objectionable matter. The selected material shall be the full width of the dam at its crest, and 3 feet above the top of the puddle-wall. "The remaining portion of the inner slope shall be composed of soil free from all extraneous material,

as above specified.

"The whole of the inner slope of the dam is to be covered with freestone pitching, viz., the upper portion of slope, a strip 50 feet in width, parallel with high-water line, to be covered with the best description of rubble-pitching."

The drawings and specifications were in accordance with the best-recognised English practice, but, unfortunately, it is very evident that the clavey material available at the site of the reservoir, and which has been used in the construction of the embankment, is of a totally unreliable character if used by itself.

There appear to have been three main variations from the original drawings. 1st. The puddle-wall was not carried up above the by-wash level, but only to a height of 467.50 feet, or 32.50 feet below the original high-water level, and 34.50 below the present by-wash level, and only 7.50 feet above the invert of the outlet tunnel. 2nd. Instead of the inner face of the dam being carried out as specified, it has been formed of the so-called clayey material obtained from the site of the reservoir, and not only was this done, but the upper portion of the puddle-wall has been formed of this material, as for as I can gather. 3rd. The cube pitching was not used in the upper face of the reservoir, broken stone having been used in place of it, while the rough pitching was only carried up to the 480-feet level.

The work of construction was carried out by Mr. James, in 1886, 1887, and 1888. Water was first taken into the reservoir in 1888.

Up to 1892 the reservoir was kept nearly full, after which date the City was, I believe, placed on the constant supply. During the summer of 1895-6 a heavy draw-off took place, after which the first slip was noticed in 1896. The rough rubble-pitching was forced upwards by the semi-fluid pressure of the saturated material in the bank higher up the stope. This soft material was taken out and replaced by gravelly material, and an area of the face above the rubble-pitching, one hundred and fifteen feet along the bank by thirty-one feet up the face (115ft. x 31ft.), was covered with good cube-pitching. The reservoir was again refilled in 1896, and lowered in 1897, at which time hardly any movement was observable. In June, 1898, on the water being lowered, a crack showed above the repaired work.

June, 1898, on the water being lowered, a crack showed above the repaired work. The reservoir was again filled in 1898, and drawn down again in the summer of 1899-1900, when further disturbances were evident. Soundings taken on May 29, 1900, showed that the pitching had bulged upwards on section lines Nos. 8 and 9, while on No. 10 the disturbance was above the then water-line at the 477 45-feet level.

Since November 16, 1899, when the level of the water in the reservoir was 502 00ft., being full, the following have been the various water-levels :---

Date.	Level.	Date.	Level.	Date.	Level.
Nov. 16th, 1899	502.00	March 3rd	493.00	May 20th	478.50
Dec. 29th, ,,	<b>5</b> 01.50	,, 10th	491.00	" 27th	<b>47</b> 8·00
Jan. 6th, 1900	500.00	" 14th	490.00	June 3rd	476 <b>·</b> 50
,, 11th, ,,	499•25	" 21st	488.00	" 6th	<b>47</b> 5·50
" 16th, "	498.95	" · 23rd	486.50	,, 13th	<b>47</b> 4·00
" 20th, "	$\dots 497.95$	,, 26th	484.00	,, 16th.:	<b>473</b> .00
" 24th, "	499•95	,, 31st	483.00	" 23rd	470.50
" 28th, " …	499.00	April 6th	484.00	July .8th	<b>472·</b> 00
Feb. 31d, "	$\dots 498.00$	, 14th	<b>483</b> •00	,, 14th	<b>477</b> ·0·)
" 10th, "	497.00	May 1st	482.00	" 19th	465.00
" 17th, "	$\dots 495.50$	" 6th	478.00	•	
" 24th, "	494.00	,, 13th	479.00		•

The invert of the scour chapped is 460.00 feet, and the lowest point in the bottom of the valley is, approximately, 455 feet, while the pitching on section No. 9 reaches to 448 feet.

I arrived in Hohart on July 18th, and, having called upon the Mayor, obtained the drawings and other details connected with the reservoir, and arranged for a visit of inspection with Mr. Milles on Thursday, when that gentleman took sections over the central portion of the embankment to obtain a record of the slips on that date, July 19th.

Bores were taken at various points on the face of the embaukment, to ascertain the condition of the earth under the pitching and metal.

The first bore was made at a point on the embankment, the level of which was 498.27. The auger was worked down to 495.27 in 6-inch lengths. The material brought up in each case was damp, clayey sand. The reservoir was filled to this level on February 17th, since which time this portion of the bank has had an opportunity to drain.

The second bore was placed at a point, the reduced level of which was 493.82, and the auger run down to 488.82 feet, with results similar to the first bore. On March 21st the water in the reservoir was 488.00 feet.

The third bore-hole was put down in the northern corner, where the new pitching abuts against the old. The level of the bank at this point is 47767. This bore was sunk to 47550. In this case also the material had drained, and was merely damp.

The reservoir level on June 13, or about 36 days back, was 474.00.

The fourth bore-hole was sunk at a point where the earth of the embankment is at a level of 475.79. The auger was worked to 470.96 feet, and a bar was jumped down into a slum at 468.96. The reservoir was filled to 477.00 on July 14, and to 465.00 on July 19, so that the water was up to this level only a few days ago.

The fifth bore-hole was made at a point where the bank is at a reduced level of 469.48. The auger was sunk to 465.48, and a bar forced to 464.48 in very wet ground, which depth was below the level of the water in the reservoir.

On examination under a magnifying lense, each one of the samples taken from these bores showed a very heavy percentage of sand, the actual amount of clayey matter present being very small.

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The material, when worked by the hands in water, showed the presence of a very small amount of actual clay.

To further test the bank a shaft was sunk in the embinkment, at the site of the No. 3 bore, on Friday, July 20; the material was only damp down to 469 47 feet, at which point water was struck in the shaft This was the level of the water in the reservoir only a few days ago, and as this point was 40 feet back from the water-level on July 19, it is only fair to asssume that the water was still draining out of the embankment as the water-level fell.

During my examination I noticed that the face of the bank had slipped as far back as the 493.00 level, which is only about 35 feet from the centre of the puddle-wall, and 29 feet from the kerbing.

My attention was directed to the points from which the material for the bank was obtained, which, in its natural condition, has caused considerable trouble by slipping into the reservoir.

The natural slope of this material, when exposed to saturation, is only from 5 to 9 to 1. A material of this character must necessarily be dangerous to use where the bank is liable to saturation by water, and is to be constructed to a slope of 3 to 1 only.

As this was the only material available near the reservoir site, it would have been better to have adopted the American practice of making the embankments of coarse and fine gravel, mixed with sufficient clay and sand to fully fill up the interstices between the gravel. The existence of the fault in the geological formation is an indication that it would have been less

risky to have adopted a different site for the dam.

I am further of opinion that, in a site like this, with material of such doubtful character, it would have been wiser to have adopted a concrete instead of a puddle-wall for the centre of the embaukment. This idea seems to have been present in the minds of the engineers when preparing the draft specification.

The whole of the material of which the inner face of the dam is composed consists of a material which, under water, becomes a sandy silt, with a very flat angle of repose. 1130 cubic inches of this sandy silt only weighed 86 lbs., or 131 lbs. per cubic toot, while 31½ cubic feet of the sandstone used for the pitching weighed 2 tons 5 cwts. 2 qrs., or 5096 lbs., or 162 lbs. per cubic foot.

I am of opinion, after very careful inquiry and consideration-1st. That if the reservoir be again refilled without strengthening the bank, on its being again emptied there is every probability of the slip extending nearer, and, perhaps, perilously near to the puddle-wall;

therefore, I strongly advise against this being done. 2nd. That it is a matter of very grave regret that the puddle-wall was not carried up to the height originally intended, or that a Portland cement concrete wall had not been constructed in lieu of the puddlee-wall.

3rd. That coarse and fine gravel, or broken stones, should have been incorporated with the local material in making the inner slope of the dam. The flat angle of repose of the material, and its liability to slip when saturated with water, would have then been obviated.

4th. That with the material of which the bank is now made the water in the reservoir will always tend to percolate into and saturate it. From time to time, when the reservoir is emptied, the bank will keep on slipping, as the material will always endeavour to take up its natural angle of repose, the result being that the bank will always be in a state of unrest, causing disintegration, which may ultimately extend to and through the puddle-wall, with the grave probability of total loss of the reservoir, in which case the lower reservoir would also be liable to destruction.

In order to remedy the existing state of affairs, it has to be borne in mind-

1st. That it is very undesirable to refill the reservoir in its present condition.

2nd. That it is absolutely essential to have as much water stored in the reservoir before the maximum demands of summer arise as possible.

I have endeavoured, in my recommendations, to reconcile these conflicting conditions.

Up to the present time, as far as I can ascertain, the reservoir has shown no signs of le king on the lower side; therefore I feel justified in concluding that the embankment is shown no signs of le king on the in the line of the puddle-wall. My opinion is, that it is absolutely necessary to prevent slipping of the embankment by either reducing the slope at which the present material is trimmed, or by adding material which will remain stable at a less angle of slope. The only suitable material for this purpose is stone. The former course would mean that the internal slope would have to be reduced to 5 or 7 to 1, which

would be not only costly, but would seriously reduce the storage capacity of the reservoir; therefore, I recommend the second alternative, as herein set forth

1st. At the level of 471 feet a berme, with a fall of 1 to 10, should be constructed 20 feet wide, extending inwards towards the reservoir, with a slope of 5 to 1, until it reaches the present bottom of the reservoir. The water should be reduced to the invert level of the outlet tunnel before this part of the work is carried out. This strengthening berme, or apron, should be composed of sound freestone obtained from the quarry above the dam. The material will require no dressing; all stones obtained from the quarry of the quarry above the dam. The material will require no dressing; all stones obtained from the quarry of good quality should be used, from the largest stones that can be handled to the smallest metal. The large stones should be equally disposed throughout the work with smaller stones, filling the vacuities, so that, as far as possible, as compact a mass as can be obtained is produced. The smaller stones should be hand-packed, and heavy rammers used to produce a firm bed, the object being to provide as solid and immovable a mass as possible.

2nd. At the level of 471 feet a dry-rubble wall of cubed freestone, in regular courses, should be built from end to end of the embankment, until the natural surface is met with on either side. The vertical height of the wall should be 6 feet, with a backward slope of  $\frac{1}{2}$  to 1, the beds being set at 2 to 1, falling towards the centre line of the embankment. The width at the 471 feet level should be 8 feet on the bed, the back of the wall should be roughly vertical. The foundation should extend downwards to 469 feet, and berth against an apron 5 feet wide on the berme composed of heavy, roughly-squared stones of about 2 feet deep. The top stones of the wall should be of large size, wrought to sustain the pitching on the slope. The apron stones should be securely packed, to take the horizontal thrust of the wall. 3rd. From the top of the wall, at about 477.70 to 486 on the present embankment, the present pitching should be raised and replaced at a slope of 5 to 1, the earth of the bank being removed, where necessary,

and mixed with broken stone, so as to give a uniform thickness of at least 2 feet under the pitching of broken stone, gravel, and earth, the stone and earth being in the proportion of about 1 to 1, one of metal to one of earth.

4th. At the 486-feet level a rough boulder-wall is to be built from end to end of the dam. The face of this wall is to be at an angle of one to one until it meets a slope of 5 to 1 from the 501 feet level. The bed of this boulder-wall is to be at an angle of 2 to 1.

This wall should be 5 feet thick at the top, with a roughly-vertical back.

5th. From the top of this rough wall-back to the 501-feet level, the face of the dam is to be made up with broken stone from one to three inch gauge to a depth of at least 2 feet.

I would strongly advise that steps be at once taken to arrange for a tramway, on an inclined plane, on to the face of the dam. The 20-feet berme should be started forth with, and completed as rapidly as possible.

As I have previously mentioned, the water should be lowered at least to the level of the outlet tunnel, as by reducing the present water-level the bank will be assisted to drain, when the present pitching can be utilised to build the first retaining-wall. This should be completed right across the dam, and the slopes made good to the 486-feet level. As the pitching is removed to construct the rubble retaining-wall, the slurry, if any, should either be removed or thoroughly incorporated with broken stone. If the work be carried out evenly across the reservoir, the water can be gradually stored as the work

rises.

The object aimed at in these recommendations has been to reduce the slope of the earthwork to 5 to 1, instead of 3 to 1, and to heavily weight the toes of these slopes to prevent further movement.

Dry rabble and boulder faces are recommended to provide for free drainage of the bank, as the water

falls, as well as to hold back any possible slips. The material at present available at the reservoir site has been utilised in what is considered the best possible manner.

I have sketched out what I consider the most economical method of dealing with what is a very serious emergency. I have not, through want of time, prepared an estimate of the cost, but this can readily be done after the necessary working drawings are prepared to carry out the work.

In conclusion, I have to state that I have recommended what I consider, under the circumstances, to be the most advisable method of strengthening the bank, consistent with efficiency, combined with economy of time, material, and money.

I have the honour to be,

Yours sincerely,

To the Mayor of the City of Hobart.

W. THWAITES, M.Inst.C.E.

#### SECOND REPORT.

501, Collins-street, Melbourne, 6th August, 1900.

#### Мемо.

#### STRENGTHENING UPPER RESERVOIR, HOBART CITY SUPPLY.

With respect to my report on this matter, I find that to carry out all the cube pitching recommended by me would require the quarrying of a larger amount of cube stone than I anticipated, as the material on hand will not go so far as I at first thought. I would advise the following modifications:— Ist. That the lower retaining-wall be of cube stone, 5ft. thick, with the back wall  $\frac{1}{2}$  to 1, instead

of vertical. The present bank to be excavated to the level of about 466 50, and filled up with broken metal to the levels and slopes necessary to receive the lower course of the retaining-wall and the apron.

2nd. That instead of the cube stone apron between the two retaining-walls, that large rough stones be used, bedded on their largest faces, and filled up with spalls and metal. 3rd. The upper retaining-wall may be constructed with a back-slope of 1 to 1, instead of vertical.

the thickness of the wall at right angles with the face being 5ft.

4th. All the earthwork of the old bank should be reduced to 5 to 1, and filled up to the proposed profiles or bases of walls or apron with broken stone.

5th. If the lower apron and retaining-wall, and the rough pitching, be carried out to the 486 level. I think that there will be no danger in filling up to the 490 level this coming season.

W. THWAITES, M.Inst.C.E.

W. T.

#### J. G. DAVIES, Esq., M.H.A., Mayor of Hobart.

I have to thank your Director of Water Supply for his assistance in enabling me to lay before you what I consider the most economical and best method of dealing with the peculiar circumstances of this reservoir.

Office of Director of Waterworks, 15th August, 1900.

Sir, I have to report that, in accordance with arrangements made, I met Mr. Thwaites, Engineer-in-Chief of the Melbourne and Metropolitan Board of Works, on July 19 last, soon after his arrival in Hobart, whose services the Council obtained to report on the slip in the embankment of the upper reservoir. During this and the following few days I was engaged in turnishing him with information relative thereto, in addition to discussing the subject generally.

As soon as his report was submitted, a meeting of the whole Council was held on July 30, when, as it was found that Mr. Thwaites, owing to not having sufficient time at his disposal, had been unable to give

an estimate of the cost of the work; and there being several matters in connection with the report that required further consideration, it was decided that I should at once proceed to Melbourne to consult further with him.

I arrived in Melbourne on August 1, and having submitted to Mr. Thwaites a detailed plan, showing his proposed method of dealing with the question, together with an estimate of the cost, I had several consultations with him on the subject, the result being that he has now made a further report, dated the 6th instant, in which he proposes to make certain modifications on the original report. I likewise, before leaving Melbourne, made an approximate estimate of this modified scheme, which I referred to him. I have since revised this estimate, with much the same result, and I herewith attach the same for your consideration.

On these two reports, I beg leave to make the following remarks :—In the first place, Mr. Thwaites recommends (under date July 23), that the reservoir be not again filled till the lower portion of the work is carried out. In my report of June 2, I stated I thought there would be very little, if any, risk of again filling the reservoir before the repairs were commenced. It was only a few days previous to my report, viz., on May 26, that I had taken cross-sections of the embankment, and, at "that date," no signs of any settlement in the main portion of the bank were then noticeable, there being at that time 18 feet of water in the reservoir. When the levels were again taken, on July 3, just one month "after" my report was made, and two weeks before Mr. Thwaites' arrival, and when there was only 10 feet in the reservoir, it was found there were signs of settlement in portions of the stone kerbing on the crest of the bank. If this and other information had then been available, the recommendation to fill the reservoir would not have been made.

In my report of June 2, I proposed to build a strong footwall at the toe of the embankment, to prevent the slip from moving any further into the reservoir, and excavate some of the live portion of the slip, and reduce the slope of same to nearer its natural angle of repose; and, after having replaced this with more suitable filling, such as now suggested by Mr. Thwaites, cover the same with heavy pitching, resting against the footwall.

The scheme proposed by Mr. Thwaites is, practically speaking, the same as mine for dealing with the toe of the bank, viz., by building an apron-wall carried up to the 471-feet level. Instead of placing the pitching to one uniform slope, he recommends to terrace the face of the embankment by building two longitudinal and parallel walls no the bank itself, and place cube pitching (now altered to rough stone pitching) between these two walls, by this means making the face into three steps, the slope of each being five to one. The object aimed at in each of our proposals being to prevent the slope moving down any further, and, at the same time, not to reduce the storage capacity to any great extent.

This method of terracing is, undoubtedly, a good one, and one which I quite approve of, providing sufficient holding power can be obtained in order to keep these surcharged walls in anything like a permanent position. Should, however, a movement of any serious extent take place in either, or both, of them, at any future date, it may be found necessary to further strengthen them.

In my opinion, this is purely a question of experience and judgment as to dealing with a large mass of made ground in a bank which, through certain conditions, has commenced to slip, and will continue to do so, unless prevented by some means. At the same time, the question of not reducing the capacity of the reservoir, as well as the safety of the embankment itself, must always be kept in mind. If the reservoir were a large one, the task of repairing the work would be an easy one. Some objections may possibly be raised, even whatever design is adopted ; but, taking all the circumstances of the case into consideration, I am, and have always been, of opinion that the toe of the bank must be first secured ; and, for this reason, I would recemmend the Council to decide to proceed with the modified proposals, subject to the question of constructing the upper wall being left for further consideration, and, therefore, dealt with later on, as circumstances may arise ; and, also, that the line of fracture for several feet in depth be repaired before the reservoir is again filled to a height more than the 490-ft. level.

As I stated in my previous report, and which Mr. Thwaites agrees to, no doubt the details of construction may from time to time have to be somewhat varied. It is, therefore, uncertain what the exact quantities of the work to be executed will be; but I do not think it will be found that they will be less than those given in the schedule, the total estimate of which, at fair prices, being £7875.

It will be seen that, in this estimate, no provision is made for the extension and alteration of mains, which will be necessary in order to effectually carry out the work, and, at the same time, make provision for maintaining the proper supply of water to the city and suburbs, some difficulty about which will, probably, be experienced during the summer time. I anticipate this part of the question will be separately dealt with by the Council, and, consequently, I made preliminary arrangements for the same when in Melbourne.

I cannot but point out that it will doubtless be towards the end of the year before the reservoir is again ready to receive any storage water; and this, unfortunately, being in the dry portion of the season, there will probably be a very small surplus of water from the mountain available for storage; consequently, the greatest care must be exercised during the coming summer on the part of all consumers, to prevent any possible waste of water, in order that the domestic supply may not run short, though, of course, everything in this respect will depend upon whether the season is a dry one or otherwise.

I have only now to add that, remembering the many difficulties which were met with in the reconstruction of the Lower Reservoir in 1893, when no outside opinion was obtained, and when so many attempts to repair it had failed, the Council should have no hesitation in believing that this work will be carried out as successfully as that was.

Yours, &c.

R. S. MILLES, C.E., Director of Waterworks.

His Worship the Mayor,

JOHN VAIL, GOVERNMENT PRINTER, TASMANIA.

