

OFFICES of the MELBOURNE TRAMWAYS' TRUST,
COMMERCIAL BANK CHAMBERS,
339 COLLINS STREET.

TO THE CHAIRMAN,
THE MELBOURNE TRAMWAYS TRUST.

Sir,—

I have the honor to submit my preliminary report on the Tramway tracks, as directed by the Trust by resolution on the 29th November last.

2.—I secured (as authorised by the Trust) the co-operation of Mr. Gerard Wight (M.C.E., Melb. Univ.), who discussed the whole subject with me and assisted me in the measurements.

3.—The questions to be investigated are, as I understand:—

First.—The wear and condition of the rails.

Second.—The state of the wood blocks; special consideration being given to the work that will require to be done before the Trust takes over the Tramways.

4.—I may recapitulate for the information of members the sections of rails used. Those laid down on the cable lines weighed respectively per yard: 87lb., 74lb., and 67 lb. The rails for horse trams were 57lb. The 87lb. rails were laid down in Spencer-street and Flinders-street (as far as Spring-street); in Swanston and Elizabeth streets from Flinders-street to Bourke-street, and on the Port Melbourne line from Queen's-bridge to the terminus.

5.—The 74lb. rails were used for the Richmond line from Spring-street to terminus; on the Fitzroy and Victoria street lines from the engine-house to terminus, and for short lengths on other lines. On the remainder of the cable system (except the St. Kilda Esplanade line) 67lb. rails were laid down.

6.—It was found that the section of the head of the 74lb. rails was not so good for wear as that of the 67lb., and the Trust in 1907 authorised the use of 67lb. rails where the 74lb. had to be renewed; this could be done without any difficulty, as the two sections were of the same depth.

7.—A considerable portion of the lines was originally intended to be worked by horse traction, and when it was decided to alter most of these to the cable system it became a question what to do with the stock of 57lb. rails which had been purchased. Most of these were sold to other tramways, and Mr. Duncan recommended that the balance should be used on the St. Kilda Esplanade line from Chapel-street to the terminus, where the traffic was expected to be very light.

8.—I may add that Mr. Duncan paid great attention to the correct rolling and chemical composition of the rails, and the Trust had a superintending engineer in England who tested each order both for strength and composition. The wear being such an unknown quantity, this precaution was a wise one.

9.—After several experiments we decided to measure the wear on the rails by means of exterior templates fitting on the outside of the head. We were able to make the measurements accurate to 1-32 of an inch, and every rail head was measured both on the outside and inside.

10.—The method adopted was to take out at selected spots a complete line of blocks across the line; this enabled us to measure at each section four rails, and the whole of the seven distinct divisions into which the blocks are divided by the rails and slot beams. We took in all 69 sections of the lines. Omitting new rails, this gave something like 370 rail measurements, which should be sufficient for a preliminary investigation.

11.—The general result of the measurements is to show that the wear on the rail head averages from 1-120 to 1-100 inch per annum. The new rails laid down appear, as far as we examined them, to wear about the same amount, but they are not so carefully rolled, and the templates do not fit so accurately. This will not in any way affect the wear, but when it is desired to measure them accurately it will be necessary to saw through the heads and gauge them with the standard.

12.—The very small wear is due, no doubt, to the extreme lightness of the rolling stock. Naturally, at crossings, curves and places where the brakes are much used, the wear is greater and renewals take place more frequently.

13.—**Grooving Old Rails.**—I must here refer to this subject, as so many incorrect reports have been circulated. It has been freely stated that the Trust has allowed the Company to

plane away the rail heads and weaken them, but in actual fact all that was done was to cut away a small piece of the outside lip of the rail where, owing to wear on the head, it projected and was an impediment to traffic, and which in no way affected the wearing qualities of the rail, (in many new tramway rail sections this lip is originally rolled lower than the head to allow of wear), and also to deepen the groove by a maximum of 6-32 inch; the average grooving has certainly not exceeded 1-8 inch (4-32), and the amount taken off by the grooving nowhere exceeds 1lb. per yard on a part of the rail where practically no strain takes place; and the effect on the wearing quality and strength of the rail is to all intents and purposes nil.

14.—The general result of my examination is that the old rails (after grooving) will in most instances be serviceable for some ten years after the expiration of the leases. The question whether the Trust can at the end of the lease require the T. and O. Co. to replace these rails by new ones, to comply with the words "good working condition" in the fourth schedule to Act 765, is a purely legal one on which I do not venture to give an opinion.

15.—The new rails laid down by the T. and O. Co. on various lines will probably last for twenty years from date of renewal.

16.—**Wood Blocks.**—There are two sizes of wood blocks used, viz., 6-inch deep for the 87lb. rails and 5-inch for the remainder. Tramway blocks are under very different conditions to those on ordinary roadways. The latter can be allowed to wear a considerable depth, but for tramways the wear should not be allowed to exceed three-quarters of an inch below rail level; and until the system of tarring blocks came into operation in 1894 the blocks had, when worn, either to be replaced by new ones or packed with sand. This latter expedient was usually carried out, but generally only to a small extent, except in Spencer-street and the lower part of Flinders-street, where the vehicular traffic is very great. The blocks here were turned and packed before tarring was introduced, and the packing varies from three-quarter inch to one inch.

17.—In the tramway system the blocks are held tight between the rails, slot beams and concrete bed, almost as if in boxes, and where sand is prevented from spreading laterally it makes a very unyielding base.

18.—The blocks are generally damp on the lower surface owing to percolation of water from below through the concrete bed. This dampness does not as a rule extend beyond one-eighth to a quarter of an inch. This causes the blocks to swell sometimes sufficiently to cant the rails. They are consequently wedged in so tightly as to make it difficult to take out a section without breaking up one or more blocks.

19.—Since tarring and sanding the surface were introduced the wear is practically nil, and the blocks are only disturbed when the rails require shifting. I found many of the blocks that were laid down when the lines were first constructed, and that were quite good, and will last for years if tarred. The cost of tarring is, I am informed, between £3000 and £4000 per annum.

20.—The question of the blocks is a very difficult one. I expected to find them in much worse condition than they actually are. I did not find more than half-a-dozen actually decayed, and these would not have been noticed had they not been disturbed, as they were wedged in so tight.

21.—It is one of the principal matters for consideration whether a block resting on a thin sand-bed and so tightly wedged in as to be difficult to move would by a court be pronounced as in "good condition" as provided in the Act. In any case I do not think that anyone would propose to take up all the existing blocks on the tramways and replace them by new ones to the great inconvenience of traffic; and probably some less drastic step could be devised.

22.—Mr. Duncan in 1893 gave evidence in the appeal of the T. and O. Co. against the City of Melbourne rating for the year 1892 that the rails would require to be renewed once during the lease and the blocks three times. This was before grooving the rails and tarring was introduced (the latter in 1894); and had these methods not been discovered his estimates would have been very near the mark—all the rails on the Brunswick line and a large number on other lines having been renewed before the grooving was thought of. Before the Royal Commission in 1912, after several years' experience, he stated that the life of the Melbourne cable tramway was about 40 years.

23.—In my opinion, if the Tramways were to-day made over to the Municipalities, nothing but ordinary current maintenance and repairs would have to be executed for the next ten years to keep them in "good working condition," and I think it probable that before that time expires the cable system will have given way to some more modern method of traction.

24.—I will proceed to make a few notes on the various lines:—

Richmond Line.—Opened for traffic on 11th November, 1885. Seven sections were made. The tramway from Spencer-street to Spring-street is laid with 87lb. rails; the maximum wear is 9-32 inch. From Spring-street to Lennox-street the outside 74lb. rails have been replaced by 67lb.; all the rest are the original ones laid down over 27 years ago. The maximum wear measured was 7-32 inch; this is less than 1-100 inch per annum. The blocks on this portion are in very fair condition. I found a large number of those originally laid down; the wear averages half an inch.

Collins Street Line.—Opened on 2nd October, 1886. Four sections made. From Spencer-street to Market-street, 74lb. rails; maximum wear, 6-32. From Market-street to the engine-house all the rails have been replaced by new ones. The blocks are generally in good order; those in upper Collins-street, near the Masonic Hall, are very wet. There is said to be a spring here that makes the ground damp.

Fitzroy Line (Brunswick-street).—Opened on 2nd October, 1886. Three sections made; 74lb. rails; maximum wear, 4-32 inch; blocks generally good.

Victoria Parade Line.—Opened on 22nd November, 1886. Three sections made. Mostly 74lb. rails. Maximum wear is 8-32 inch. Blocks generally good; in some places very soft at bottom.

Bourke Street Line.—Opened on 29th August, 1887. Three sections made. From Spencer-street to Queen-street all rails have been renewed, and from Queen-street to the engine-house the outer rails are new. The maximum wear on the old rails is 8-32 inch. The blocks are generally good. I noticed a fair number were those originally laid down.

Nicholson Street Line.—Opened on 26th August, 1887. Three sections made. Maximum wear, 6-32 inch. Blocks in good order, but softer than the average.

Gertrude and Smith Street Lines.—Opened on 10th August, 1887. Four sections made. Maximum wear, 7-32 inch. Blocks as in Nicholson-street.

Carlton Line.—Opened on 21st December, 1887. **Rathdown Street Line.**—Opened on 9th February, 1889. Four sections taken. Maximum wear, 6-32 inch. Blocks as above.

Brunswick Line (Sydney-road).—Opened on 1st October, 1887. Seven sections taken. The whole of the rails on this line have been relaid. The blocks are more worn than the previous ones, and a large number are soft at bottom.

North and West Melbourne Lines.—Opened on 1st October, 1887. Six sections taken. Maximum wear, 6-32. Blocks generally good.

St. Kilda Road Line.—Opened on 11th October, 1887. Six sections taken. Extensive renewals of rails have taken place on this line in different parts. Maximum wear on old rails, 9-32 inch.

Prahran and Toorak Road Lines.—Opened on 26th October, 1886. Eight sections taken. The outer rails have been renewed on the greater part of these lines. The maximum wear on the old rails is in Chapel-street, 8-32 inch; the blocks are generally good but damp.

Port Melbourne Line.—Opened on 17th June, 1890. Four sections taken. From Queen's bridge to terminus the line is laid with 87lb. rails. The maximum wear is 9-32 inch. The blocks are not so good as on most of the other lines, and are damp owing to the soil.

South Melbourne Line.—Three sections taken; 67lb. rails. Maximum wear, 7-32 inch. The blocks are generally good but damp.

Esplanade Line.—Opened on October, 1891. As already noted, this line was originally laid with 57lb. horse rails. It was thought that they would be serviceable for about ten years, but they actually lasted till 1907, or 16 years, when the greater part were renewed. The only old rails remaining are some of the inner rails between Chapel-street and St. Kilda road; these will have to be replaced before the end of the lease.

25.—**General Remarks.**—The resolution of the Trust which led to this report being ordered dealt with the compliance of the Company with the covenants set forth in the fourth schedule to Act 765, and to the leases of the tramways which follow that schedule closely. These covenants are three in number:—

First, the financial covenants.

Secondly, those referring to maintenance and repairs.

Thirdly, those relating to renewals.

These last two are detailed in section 14, sub-section 3 of the fourth schedule referred to above, which runs as follows:—"The Company shall during the lease maintain, repair and renew the roadway between and within the tramways and so much of the roadway as extends eighteen inches beyond the outside of the rails, and also maintain, repair and renew the tramways, and shall hand over the same to the Trust at the end of the lease in good working condition. These obligations as to repairs and maintenance shall be performed to the entire satisfaction of the Trust, whose decision or orders given by their Surveyor or other officer shall be final and binding; but this clause shall not deprive the Company of the right of appeal to the Supreme Court against any decision of the Trust as to any renewal of any of the lines; but such appeal shall be at the cost of the Company."

As regards the first, I think all the members of the Trust are aware that the T. and O. Co. has rigidly and faithfully carried out all its financial obligations to the Trust.

Secondly, as regards repairs and maintenance, these are to be performed to the entire satisfaction of the Trust, whose decision and orders . . . shall be final and binding. As the responsible officer of the Trust, I consider that these repairs, etc., have been satisfactorily carried out. There must always be bad patches that require attention on every large system, but I have always found these attended to very quickly. It must be remembered that a road cannot be repaired until it falls into disrepair. I have not found it necessary to ask the Trust to issue any written orders on the subject, as I have always found verbal representations attended to most promptly.

Thirdly, as regards the renewals. This is a much larger question. It applies to rails, blocks and machinery. This report deals only with the track. The Trust can order any renewals it thinks fit, subject to an appeal by the T. and O. Co. (at its own expense) to the Supreme Court. I have pointed out in my report how the case stands as regards rails and blocks. It is more a legal than an engineering question, and it is worth noting that the longer the renewals are delayed up to the end of the leases the better for the Trust, as it will have new material to start on.

26.—Some years ago the Trust obtained from its standing counsel, Dr. (now Sir John) Madden, an opinion on this subject, which I append:—"The words 'maintain, repair and renew' all point to the preserving of the road in a sound condition as such. 'Maintain' means to keep continuously in good sound practicable state against ordinary wear and tear; 'maintenir,' to keep in hand. 'Repair' means that if by any unusual cause the road is broken up the Company must put it right. 'Renew' means if it gets beyond repairing it must be made again.

27.—The detailed measurements of rails and blocks are on separate tables (not printed).

I have the honor to be, Sir,

Your obedient servant,

T. HAMILTON,

Engineer and Secretary.

10th March, 1913.