

1908.  
NEW ZEALAND.

## AUCKLAND ELECTRIC TRAMWAYS :

REPORT OF ROYAL COMMISSION APPOINTED TO INQUIRE INTO THE EFFICIENCY AND WORKING  
OF THE BRAKES THEREON ON THE 14TH JULY, 1908.

*Laid on the Table of the House of Representatives by Leave.*

To His Excellency the Right Honourable William Lee, Baron Plunket, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George, Knight Commander of the Royal Victorian Order, Governor and Commander-in-Chief in and over His Majesty's Dominion of New Zealand and its Dependencies.

MAY IT PLEASE YOUR EXCELLENCY,—

1. The Commission intrusted to us by Your Excellency directed our attention to the following matters in connection with the brakes in use on the rolling-stock of the Auckland electric tramways :—

- (a.) Whether the brakes as at present existing on the rolling-stock used on the said tramways are in good working-order and efficient repair;
- (b.) Whether the systems of brakes adopted are suitable for use on the said tramways;
- (c.) Whether the motormen employed on the said tramways have an efficient knowledge of and are practised in the use of the said brakes;
- (d.) Whether the said brakes are used by the said motormen generally in a proper and efficient manner, and with due care and regard for the public safety;
- (e.) And generally to make inquiry into any matter or thing arising out of or connected with the several subjects of inquiry hereinbefore mentioned, or which in your opinion may be of assistance in fully ascertaining, explaining, and arriving at a fair and just conclusion in respect to the subjects of inquiry, and into the working of the existing law, or regarding the necessity or expediency of any new legislation in respect to tramway rolling-stock or the use thereof or the equipment or appliances in connection therewith.

2. Having now concluded our investigations and inquiries, we have the honour to submit to Your Excellency our report on the several matters referred to us.

3. Your Excellency's Commission, dated the 14th July, 1908, was received by us on that date, and we at once proceeded to Auckland and opened the Commission there on the 20th July.

4. The procedure was first discussed and formulated, and duly arranged.

5. We append hereto the Commission issued to us by Your Excellency, the minutes of our proceedings, which contain the names of the witnesses examined, and a report of the evidence taken on oath. We also append exhibits handed in and marked Nos. 1, 2, 2A, and 3 to 13.

6. Dealing with the five questions submitted to us,—

(a.) We found the brakes to be in fair working-order but not in efficient repair.

(b.) We are of opinion that the brakes as existing when in good order are sufficient for the ordinary control of the cars, but are not sufficiently powerful or quick in their action for use in emergencies.

(c.) We are of opinion that the motormen are properly trained and have an efficient knowledge of and are practised in the use of the brakes.

(d.) We consider the motormen use the brakes to the best of their ability.

(e.) We have to report having investigated the several subjects of inquiry and also having reviewed the working of the existing law relating to tramway rolling-stock, and as a consequence we consider that the General Government should undertake the periodical inspection of the rolling-stock of the tramway systems in New Zealand.

7. We have the following remarks to make regarding our findings under the several heads:—

(a.) There is clear evidence that the maintenance of the brakes in the past has been neglected, also that the company is now taking steps to place them in good working-order and efficient repair.

(b.) With a view to considering the capabilities of the brakes we conducted a series of tests on College Hill, a grade of 1 in 11·78, so as to compare them with the results of tests made on the Brooklyn line, Wellington tramways, a grade of 1 in 14. The results of the two tests are attached hereto in tabulated form.

The best stop obtained, using the hand-brake alone, was on a four-wheeled car carrying a load equal to the licensed number of passengers, travelling at a speed of 17·8 miles per hour down a grade of 1 in 11·78: the car travelled 232 ft. before stopping, the force developed by the brakes being 1·48 tons.

Using the same brake on an eight-wheeled car under similar conditions, at a speed of 22·1 miles per hour, the car travelled 620 ft. before stopping, the force developed by the brakes being 1·97 tons.

A third trial, using the hand-brake, track brake, and second emergency brakes simultaneously, when the car was travelling at service speed, stopped the car in 242 ft. This must be regarded as an emergency stop.

For comparison the following results were obtained in Wellington:—

A four-wheeled car, carrying  $1\frac{1}{2}$  tons more load, travelling at 14 miles per hour down a grade of 1 in 14, was stopped by the hand-brake alone in 74 ft., the force developed by the brakes being 1·93 tons.

With the hand-brake alone, an eight-wheeled bogie car, carrying 2·8 tons more of a load, travelling at 16·4 miles per hour, stopped in 215 ft., the force developed being 2·3 tons. An emergency application of the magnetic brake on this car at 12·7 miles per hour, stopped the car in 34 ft., the force developed being 4·4 tons.

The results obtained in the Auckland tests, using the electrical emergency brakes, were not as good as those obtained by the use of the hand-brake; which shows that the electrical emergency brake is useless for quick stops descending a hill.

We are therefore of opinion that, in the interests of public safety, an improved brake for use in emergencies should be adopted.

The Commission, having had extended personal experience in the use of the Newell Magnetic Combined Track and Wheel Brake, whilst not wishing to unduly advance its claims against competitors, consider it a suitable brake for use on steep grades such as occur on the Auckland tramways.

We are led to this conclusion by the very satisfactory results obtained in practice, by its reliability, and by its low cost of maintenance, and because this brake may be used as a service brake, only requiring, to convert it into an emergency brake, a quicker application, which would be the instinctive action of a motorman in the event of a sudden emergency arising; and also because the brake is applied by the use of the same handle on the controller as is used to apply power to the motors. The motorman's hand is always on this handle, so that he has nothing to do in applying his emergency brake but to turn it quickly. The use of the brake in service keeps the motorman practised in its use.

We consider that the essentials of a tramway brake are,—

- Reliability;
- Simplicity of application;
- Quickness of application;
- A minimum of physical exertion.

These conditions the evidence shows are entirely met by the Newell Magnetic Brake. Simplicity of action is necessary to avoid risk of confusion, whilst undue physical exertion causes fatigue and, in consequence, laxity of vigilance.

We found that several types of controllers are in use, requiring different movements for the application of the emergency brakes. This we consider a source of danger, as liable to confuse a motorman when successively using the different types.

Many complaints were made as to the inefficiency of the sand-gear, which, being a necessity for the efficient working of the brakes, was made a subject of inquiry. The principal fault appeared to be caused through clogging of the sand in the delivery-pipe by water thrown up by the wheels. As this fault exists to a very small extent in Wellington, we have concluded that the coarse, sharp sand used there, although obtained from the sea-beach, accounted for the better efficiency. The fine sand in use in Auckland is more likely to cause clogging, while at the same time it is not so good as a coarser sand for increasing the adhesion of the wheels. Considerable difficulty in working the sand-gear was observed, which could be easily remedied by closer attention to and slight improvements of the gear.

The motorman's gong and the sand-gear are worked by pedals not in view of the motorman. It is advisable therefore that the relative positions of these pedals with regard to the usual standing-place of the motorman should be the same on all cars, so that he would make no mistakes in using them. We found that the relative positions varied on some of the cars.

(c.) We found that the company had fitted up a skeleton car in the barn at Ponsonby, for the purpose of instructing the motormen. This car is fitted in such a way that all the faults which occur in practice can be reproduced, and their detection and remedy explained. Mr. Brenand, the superintendent of rolling-stock, regularly conducts lectures, explaining, with the use of the equipment described and a blackboard, the whole of the working of the car.

Practical teaching on the road is conducted by old and experienced motormen for periods varying with the ability of the learner. On the completion of the two courses an examination is held, on passing which the man becomes a fully qualified motorman and is allowed to take charge of a car.

The motormen subpoenaed as witnesses appeared to have an intelligent knowledge of the equipment of a car and its use, showing that they had been properly trained.

(d.) The evidence, together with our inspection, clearly shows that the maintenance of the rolling-stock has been very much neglected, which could not have happened to the same extent if the undertaking had been regularly subject to Government inspection. It might be urged as an argument against Government inspection that it is unnecessary when the maintenance is properly attended to; but we are of opinion, even in instances where maintenance receives the most careful attention, that Government inspection will do good by assisting to keep the maintenance at its high standard.

Further, we are of opinion that, in cases where systems are not paying, and proprietors are pressing for undue economies, the executive officers would welcome Government inspection as an assistance in the proper maintenance of the undertakings.

8. There were certain points brought out in evidence on which we wish to make the following remarks :—

(a.) (Page 3.) The question of glass fronts was brought up. We are of opinion that any fitting which tends to improve the conditions under which the motorman works will help to keep him in the best condition to exercise care and vigilance in the execution of his duty, and consequently tend to safeguard the public. During heavy rain and dust storms the protection afforded by the glass front enables the motorman to maintain the clearest view possible of the road, and thus he is able to instantly apply his brakes in emergencies which often arise under such conditions.

(b.) (Page 9.) Many complaints were made of the stiffness of the brakes in wet weather, caused by mud collecting on the gear. This is in part accounted for by the poor maintenance of the tracks, and also through the several local authorities failing to maintain the streets in a sufficiently good condition to induce the ordinary wheel-traffic to keep off the tram-line.

(c.) (Page 10.) Sand-gear : We are of opinion that the form of sand-gear which only ejects a small quantity on each pressure by the foot is preferable to the free-flowing type in use, as, should the gear jam and the valve not close, the whole of the sand is lost.

(d.) (Page 11.) Evidence shows that there is difficulty in adjusting pressures on the different wheels of the bogies. This difficulty would be overcome if the leverages of the gear were adjusted in proportion to the load carried by each wheel, and it is advisable that the gear be modified so as to enable adjustment of the shoes to be effected on the road.

(e.) (Page 13.) Difficulty is experienced in working the vertical wheels of the hand-brake rendered necessary on some cars fitted with glass fronts. This may be overcome by fitting each wheel or spindle with a ratchet, which the company has agreed to do.

(f.) (Page 14.) It is stated that cars have to be driven faster to make up for lost time. This we consider a very dangerous practice in view of the class of brake-equipment and the want of an efficient emergency brake.

(g.) (Page 15.) Defects booked in an indifferent manner. The management complains, and we consider rightly, that the motormen do not describe defects in such a manner as will guide the men who are engaged in repairing to locate them. We consider that it is the duty of every motorman, to the best of his ability, to book up the defects in such a manner as will exactly describe their nature and location. The company has instituted a school of instruction, so that motormen will not be able to plead ignorance as a reason for the use of indefinite and frivolous remarks.

(h.) (Page 18.) Motormen nearly all state that often no repairs were apparently effected after reporting cars defective, although the records show that they were attended to. We are of opinion that this tends to show that the general standard of maintenance used to be so low that repairers must have considered, as long as a car would run and the brakes could be applied in the shed, it was fit for traffic.

(i.) (Page 19.) Complaints made that rain obtained access to sand-boxes, causing clogging. This has been remedied by providing watertight covers to the boxes.

(j.) (Page 20.) The hand-brake will skid the wheels on a bad rail. The opinion was expressed by witnesses that the Christensen Air Brake was suitable for use on the Auckland tramways; but, as this only acts on the wheel-shoes, and as the present hand-brake is powerful enough to skid the wheels, no material advantage can be gained by the use of the air wheel-brake, which can only be considered as a means to lighten the labour of application and provide for quicker action. The wheel-brake alone, no matter how applied, would not be sufficient to

properly control the car. It is therefore necessary to use a track brake on the Auckland tramways, and we consider that if an air brake were installed it should be in the direction of applying it to the track brake, so as to make it an effective emergency brake.

(k.) (Page 22.) It is stated that sand-gear is often hard to work. We consider that this is solely due to defective maintenance.

(l.) (Page 22.) What is known as the second emergency brake is relied upon more by the motormen than the first emergency, which is specially provided.

The first emergency brake is formed by reversing the polarity of the fields of the motors, thus converting them into generators and short-circuiting them, the effect being to skid the wheels of the car through the mechanical resistance thus set up. This brake is used independently of any power obtained from the trolley-wire.

The second emergency is formed by reversing the motors and applying power to a small extent, which tends to revolve them in a reverse direction. The action depends upon the trolley-wheel remaining in contact with the trolley-wire, and also upon the automatic cut-out not coming into action. Should this brake fail, the controller-handle would be moved to its fullest extent, and what is known as the third emergency brake would then be brought into action. In this case the stronger motor becomes a generator, overcomes the weaker one, and drives it as a motor in the reverse direction to that in which the car is travelling.

The braking effect of the first emergency is considerably neutralised through the skidding of the car-wheels, so that it is often abandoned in favour of the second emergency. This brake, however, is barred from use by the company, as its action is very severe on the motors; and, as the third emergency is not reliable, often failing to act, the whole of these three electrical brakes cannot be considered satisfactory, particularly as all three tend to damage the wheels and motors of the rolling-stock, and only act on the four driving-wheels on the eight-wheeled cars.

Some motormen, feeling that the first emergency is not generally effective, use the second emergency, although contrary to rules; other motormen stated that they used the first emergency to comply with the rules, although knowing the second emergency was a better brake, in order to clear themselves in the event of a fatal accident. It appears to the Commission that the use of any brake which is liable to damage the equipment cannot be considered satisfactory, and that such an anomalous state of affairs, produced by the provision of several inferior emergency brakes, should be terminated.

(m.) (Pages 27 and 28.) Motormen complained that not sufficient time was allowed for working the Herne Bay and Kingsland routes according to the schedule time. The rate of speed, without allowing any time for stops, is 9·42 miles per hour for the former and 8·32 miles per hour for the latter route.

On the Herne Bay route, allowing for nineteen intermediate stops—four of which are compulsory—and for the slow speed possible up Hobson Street, Victoria Street, and College Hill, the actual speed would have to attain over fifteen miles per hour on favourable parts of the route to enable the motorman to keep to schedule time. The Commission consider that such a high rate of speed is attended by grave risks, with the brakes in use.

(n.) (Page 39.) Complaint was made by some motormen that a book formerly in use for entering car-defects had been substituted by single sheets. As this matter does not come within the scope of the inquiry, the Commission has no remarks to make.

(o.) (Page 40.) Wheel-brake chain jams on staff. The Commission considers that the brake-rigging should be modified so as to eliminate the chain double purchase, and thereby shorten the quantity of chain to be wound up, and so prevent its jamming.

(p.) (Page 51.) Track-brake blocks drop out, which shows defective design of holder. This matter is being remedied by the company improving the design of the holder.

It was mentioned in evidence that motormen, on finding the sand-punches deficient on cars about to be taken out, were in the habit of removing this article from other cars, and, as they are not interchangeable throughout the whole of the cars, it sometimes occurred that non-fitting ones were obtained. The Commission considers that it is the duty of the car-shed foreman to examine and see that every car is in running-condition before handing it over to a motorman.

The tramway manager, in order to show that the company was endeavouring to improve the maintenance of the cars, handed in the attached copies of foreman's reports.

9. In conclusion, we desire to acknowledge the assistance given to us during the inquiry by the officials and employees of the Auckland Tramway Company, the Auckland Tramway Employees' Union, and by Mr. H. Leah, car-shed superintendent of the Wellington Electric Tramways, and the courtesy and ability shown by them throughout. Mr. L. M. Shera ably and satisfactorily discharged the duties of secretary, and Mr. Jarret those of reporter to the Commission.

Given under our hands and seals, at Wellington, this thirteenth day of August, one thousand nine hundred and eight.

R. W. HOLMES.  
STUART RICHARDSON.

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