1907.

VICTORIA.

THE PARLIAMENTARY STANDING COMMITTEE ON RAILWAYS.

SIXTEENTH GENERAL REPORT.

PRESENTED TO PARLIAMENT PURSUANT TO THE PROVISIONS OF THE RAILWAYS STANDING COMMITTEE ACT 1890 (54 VICT., No. 1177), SECTION 18.

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The Honorable DONALD MELVILLE.

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SIXTEENTH GENERAL REPORT.

To His Excellency the Honorable SIR REGINALD ARTHUR JAMES TALBOT, *Knight Commander of the Most Honorable Order of the Bath, Governor of the State of Victoria and its Dependencies in the Commonwealth of Australia, &c., &c., &c.*

MAY IT PLEASE YOUR EXCELLENCY:

In accordance with the requirements of section 18 of the *Railways Standing Committee Act* 1890, the Parliamentary Standing Committee on Railways has the honour to submit the following Report of its proceedings:—

1. In the eight months which have passed since the date of the last General Report of the Committee, 121 meetings have been held, and 194 witnesses examined. The Committee in that period travelled 2,320 miles by rail and 389 miles by road.

2. Reports regarding the construction of railways in the following districts were presented to the Legislative Assembly last Session:—

Alexandra.
Neerim.
Dartmoor and Mount Gambier.
Flinders.
Eureka (Junction of the Murray and Murrumbidgee Rivers).

A Report on the question of an additional supply of water for the City of Ballarat and the Town of Ballarat East was also presented to the Legislative Assembly last Session. Two Reports, one dealing with the question of railway communication with Toombullup and Boggy Creek, and the other with the subject of railway extension to Port Campbell, have since been completed and will be laid before the Legislative Assembly at the earliest opportunity.

3. During the last Session of Parliament the following questions were referred by the Legislative Assembly to the Committee for inquiry and report:—

Railway communication with Cressy and Pitfield Plains.
Electric railway communication with the Yarra Bend and Kew Asylum lands, East Kew, and Doncaster.
Railway communication with Cohuna.
Railway communication with Lake Bolac.

4. Evidence was taken by the Committee respecting the proposed line from Beeac through Cressy and Pitfield Plains to Newtown, so as to give direct railway communication between Colac and Ballarat, and also to develop the agricultural lands around Cressy and Rokewood. As the Committee was unable to obtain from the Railways Commissioners, prior to the dissolution of Parliament, the estimates of the traffic receipts and working and maintenance expenses of the suggested line, no recommendation concerning the railway could be made. The evidence and estimates will, however, be considered by the next Committee when appointed.

Arrangements were made to inspect the routes of the projected lines to East Kew and Doncaster and to Cohuna, but owing to the termination of the Twentieth Parliament they had to be abandoned.

Work of the Seventh Committee.

5. From the appointment of the Seventh Committee on the 24th August, 1904, to its termination on the 21st February, 1907, it held 383 meetings, examined 573 witnesses, travelled 6,899 miles by rail and 1,481 miles by road.

6. The following questions were inquired into by the Committee during that period of 30 months, and Reports prepared dealing with them :—

1. Tocumwal Railway.
2. Lake Tyrrell Railway.
3. Bass Valley Railway.
4. Richardson Valley Railway.
5. Netherby Railway.
6. Tolmie Railway.
7. Bruthen Railway.
8. Dartmoor and Mount Gambier Railway.
9. Alexandra Township Railway.
10. Hurst's Bridge (Diamond Creek) Railway.
11. Neerim Railway.
12. Electric Street Railways.
13. Flinders-street Central Railway Station.
14. Ballarat Water Supply.
15. Flinders Railway.
16. Eureka Railway (Junction of the Murray and Murrumbidgee Rivers).
17. Toombullup and Boggy Creek Railway.
18. Port Campbell Railway.

On the average, therefore, each inquiry occupied but seven weeks, notwithstanding that the Committee had frequently to wait for the preparation of plans and estimates of the cost of the works before it could enter upon its inquiries and could not complete its investigations until estimates of traffic and working expenses had been prepared by the Railway Department.

Railways Recommended.

7. The following railways were recommended by the Committee for construction subject to the principle, suggested by the Honorable the Minister of Railways (Mr. Bent), of "loading" the lands increased in value by the building of the lines being adopted by Parliament :—

Name.	Length—Miles.	Cost.	Maximum Amount of Loading.
		£	£
Tocumwal	10½	28,000	Nil
Bass Valley	17¼	52,185	1,000
Richardson Valley	15¾	37,663	750
Lorquon-Netherby	14	37,800	800
Alexandra Township	4¼	25,864	500
Hurst's Bridge	6¾	43,000	338
Eureka	20	44,000	1,200
	88½	268,512	

(In addition to the above lines the previous (Sixth) Committee recommended the extension of the Beech Forest narrow-gauge railway to the junction of the Wattle Hill and Colac roads, a distance of 18 miles, at a cost of £59,876, subject to a "loading" of £1,500 a year.)

8. The railways which the Committee considered it inexpedient to construct were as under :—

Name.	Length—Miles.	Cost.	Estimated Annual Loss.
		£	£
Tolmie	19½	71,158	2,984
Bruthen	19¼	94,652	5,000
Dartmoor, towards Mount Gambier ...	44¾	133,774	4,754
Neerim	7	32,841	644
Flinders	15	97,500	3,933
Toombullup	24	50,000	2,000
Boggy Creek	31	93,000	...
Port Campbell	7¾	25,755	1,344
Electric Street Railways	20¼	144,309	...
	188¼	742,989	20,659

Cheapening Railway Construction.

9. In its last General Report the Committee directed attention to the undertaking of the Public Works Department, Western Australia, to build light agricultural railways in that State at a cost of £1,040 per mile. It was pointed out that this was less than half the estimated cost of the cheapest railway proposed to be constructed in Victoria. The Committee therefore suggested that inquiries should be made to ascertain the cause of the difference as, after allowing for the narrower gauge of the Western Australian railways, and the lighter rails, there was a discrepancy remaining which required investigation and explanation. Mr. Kernot, Acting Engineer-in-Chief of the Victorian Railways, has since informed the Committee that he looked into this matter. He found that in the estimate of the Western Australian lines no provision was made for the following items of expenditure :—Preliminary and permanent surveys, preparation of plans and specifications, supervision of contract work, land transfer expenses, junction with existing line, signals, engine-shed, platforms or landings for passengers or goods, buildings, approaches to stations, turntable, ashpits, water supply for locomotive, stock trucking yards, cranes, and a certain percentage for extras or unforeseen contingencies which were inevitable. If these necessary items were allowed for the difference in cost would, he said, be but £600 a mile, which was accounted for by heavier rails and wider sleepers and earthworks being used in Victoria, where the gauge was 5ft. 3in. as against 3ft. 6in. in Western Australia. The cost of sleepers was also higher in Victoria than in Western Australia where supplies were obtainable in the district through which the new lines would pass.

10. When the Committee was inquiring into the question of cheapening the cost of railway construction in hilly country, Mr. Kernot furnished it with particulars regarding the Shay locomotive, the use of which would, he stated, reduce the expenditure on such lines, as it would enable steeper grades and sharper curves to be worked and so lessen the earthworks. His report on the Shay locomotive is appended.

GEO. GRAHAM,
Chairman.

Railways Standing Committee Room,
State Parliament House,
Melbourne, 21st February, 1907.

Board of Land and Works,
Railways Construction Branch,
Melbourne, 19th February, 1907.

THE SHAY GEARED LOCOMOTIVE.

The adaptation of the steam locomotive to the working of steep gradients and sharp curves has progressed during late years so that very steep gradients, which were at one time considered to be only workable by the use of a rack or grip rail with special complicated engines running at very low speeds, are now being worked by adhesion locomotives. The most recent instance of this is on the Rimutaka incline, in the North Island of New Zealand, where, on the grade of 1 in 15 for a length of 2½ miles which was built on the Fell central grip-rail system, and worked with Fell engines, an adhesion engine is being run, and the Hon. Sir J. G. Ward, Minister for Railways, reports on the 1st August, 1906, that "the E. engine is now working on the Rimutaka incline, up which it has hauled a load of 100 tons, which is 35 per cent. more than can be taken by the Fell engine."

The E. engine referred to is of the Mallett articulated adhesion type, and consists of one large boiler carried on two six-wheeled bogies, each of which has cylinders and motion of its own. It is a tank engine without tender, and weighs, roadworthy, 66 tons. It differs from the ordinary general type of adhesion locomotive in having two distinct engines fitted to bogie trucks under one boiler to enable it to take sharp curves.

Another type of locomotive, which started with an original design made to suit the rudimentary requirements of hauling logs and sawn timber over rough temporary tramways in connexion with American saw-mills, is known as the "Shay geared locomotive." It was built to suit pioneering conditions where cheap track construction was more important than speed, and where, on account of the temporary nature of the work due to the cutting out of the forests and removal of mills, it was preferable to incur higher costs for haulage than to spend much money on substantial track construction.

The first of these engines was very small, being about 10 tons weight, and taking small trains on track laid with wooden rails, but in recent years they have been built up to 91 tons—one of that weight having been in use on the Canadian Pacific Railway in British Columbia, where it is reported to run on 1 in 25 grades with curves of about 4¼ chains radius.

Several hundreds of "Shay" engines are now in use. The larger sizes are built with tenders, and the whole weight of engine and tender is made available for adhesion. The motion is placed on one side of the fire box end of the boiler, and drives through a horizontal shaft with flexible joints running fore and aft at the level of the axles and driving the wheels through spur gearing. As three cylinders can be used and the drive is through a long shaft, the turning force will be more regular than with an ordinary locomotive, and a rather higher traction force can be gained without skidding the wheels. At the same time, these engines are not suited for high speeds—their ordinary running speed being quoted as from 6 to 12 miles an hour. As all the wheels run in short bogies, very sharp curves can be taken.

In view of the great importance of supplying a cheap and effective pioneer railway service to many parts of this State where the steep and broken nature of the country involves very heavy works on lines built to suit the standard classes of locomotives, the introduction of special locomotives is well worth consideration. In such situations as mentioned, a low speed of trains, though it increases working expenses to some extent, is not a serious objection as long as the capacity of the line suffices for all probable traffic, while the steepening of grades and sharpening of curves within limits permissible with the "Shay" engine make a very large difference in the necessary works of construction.

Should this engine be tried here, it should be tested on a line of standard gauge with curves which can be worked with most of the ordinary goods trucks now in use. These, with some few exceptions, will run round curves of 5 chains radius with moderate, and round 3-chain curves with rather heavy wear and tear, and the application of 5-chain curves freely with 3-chain curves in specially difficult places combined with a ruling grade of say 1 in 20 would make a very large reduction in construction cost, which would vary in amount in different localities, according to the local conditions.

The most satisfactory way of determining the question would be to make test surveys in one or two particular cases, so that comparative estimates could be prepared.

The possible savings in cost would be due to:—

1. Shortening of distance by use of steeper grades in places where easier grades necessitate long detours.

2. Reduction of sub-grade works, *i.e.*, earthworks, culverts, trestles, &c., by use of steeper grades and sharper curves to keep the formation nearer to the natural surface.

3. Cheaper track by using lighter rails and less ballast than necessary for standard adhesion locomotives, which require 60-lb. rails.

The "Shay" engine, with its low maximum speed and great flexibility, does not require so good a top on the road as the standard engines, except on very sharp curves.

Available information in this office as to variation of costs under different conditions of grades and curves has been examined, and indicates roughly that the cost of a 5ft. 3in. gauge line in steep timbered country might, in favorable circumstances, be cut down 30 per cent. as compared with present practice, or possibly more by introducing the "Shay" locomotive, but the difference of cost would vary largely in different instances, and in unfavorable circumstances might be little more than the reduction in cost of track due to lighter axle loads and more flexible wheel base of the locomotives.

Different cases must be considered on their individual merits.

Short temporary spur lines to saw-mills, mines, or other traffic producing spots could be made more cheaply by going freely to the fullest limits of gradients and curves.

It must not be forgotten that, with very steep grades and low speeds, the cost of haulage is bound to increase, the amount of wages and fuel being larger in proportion to the tonnage hauled, so that saving of interest by reducing construction cost would be more or less set off by increased working expenses. There are, however, many places in rough country calling for railways which could well afford to pay higher rates of freight than apply over our railway system at present in order to secure railway communication.

Information as to the working of the "Shay" engine on the Canadian Pacific Railway might be obtained through the Chairman of Commissioners if thought desirable.

Three "Shay" locomotives were imported into Tasmania some years ago, and I have made inquiries as to the experience with them, and attach a copy of the reply received.

(Signed) MAURICE E. KERNOT,
Acting Engineer-in-Chief.

Geeveston, Tasmania,
8th December, 1906.

Dear Sir,

We have yours of the 3rd instant inquiring as to the suitability of the "Shay" locomotive for steep grades and sharp curves.

The engine we are working is a 25-ton one, and is used for logging purposes only—the speed being from 7 to 10 miles per hour. We work grades up to 1 in 16 and curves of 1½ chains radius. We take our ballast up the grade, and often have over 40 tons. The engine is very much lighter on the road than a 15-ton four-wheel engine we have.

The repairs are very easy, but, of course, there is more wear with the cog gear than a direct driven engine.

For our purposes we can have nothing better, and should suit you on steep grades and new lines when the track is not too good.

Yours faithfully,

(Signed) JOHN HAYHOE,
General Manager,
The Huon Timber Co.

The Acting Engineer-in-Chief,
Victorian Railways.

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