RUNNING JOURNAL

20c

VOL. 4 JANUARY 1968 NO. 3

THE TRAMWAY MUSEUM SOCIETY OF VICTORIA LTD.

THE TRAMWAY MUSEUM SOCIETY OF VIC. LTD.

REGISTERED OFFICE:
141 HIGH ST. PRAHRAN 3181

VOL. 4
No. 3

CHAIRMAN: R.H. PRENTICE
13 HIGH ST. PRAHRAN 3181, VIC.
PHONE 51 2664

SECRETARY: S.E. FITZSIMONS,
FLAT 9, 8 FINLAYSON ST.,
MALVERN 3144 PHONE 507983.

MEMBERSHIP PROMOTION OFFICER
BARRY E. GEORGE
16 SALADIN AVENUE,
GLEN WAVERLEY, 3150
TELEPHONE: 232 7608

THE TRAMWAY MUSEUM SOCIETY OF VICTORIA LIMITED was founded in 1963 as a non-profit organisation, and incorporated under the Victorian Companies Act 1961.

Registered Office of the Society — 141 High Street, Prahran, 3181.

EDITORIAL COMMITTEE: J. RAWNSLEY (Editor) R. PRENTICE, J. FITZSIMONS, B. GEORGE
A. HOWLET, C. ANDREWS, G. TURNBULL.

EDITORIAL.

The Editorial Committee hopes that you liked our "JOURNAL" in it's new format. The continued production of "R.J." in this manner will be, of course, subject to finance being available, and the only way we can obtain money is either by donations or profit from excursions. Should the patronage fall away in the latter, then the "JOURNAL" will revert to ordinary duplicated type. The success of the magazine depends on YOU, not the Directors or the Editorial staff, for they can only authorise and/or produce a Journal limited to the resourses of the Society. Your support is requested - be it by articles, news items, pictures or donations. Thank you!

There were some errors in the first issue. THAT HEADING, (we must apologise to Malcolm Rowe - the author of the article); and other small mistakes, but generally the results were good. Let us hope that we can improve even more on our first issue.

Front cover photograph.

Santa's Special Tram (No. 32 on Ballarat's roster) photographed in Sturt Street at 9.05 a.m., Saturday 18th. November, 1967, after carrying a group of children and Santa from the Victoria Street terminus to Myers.

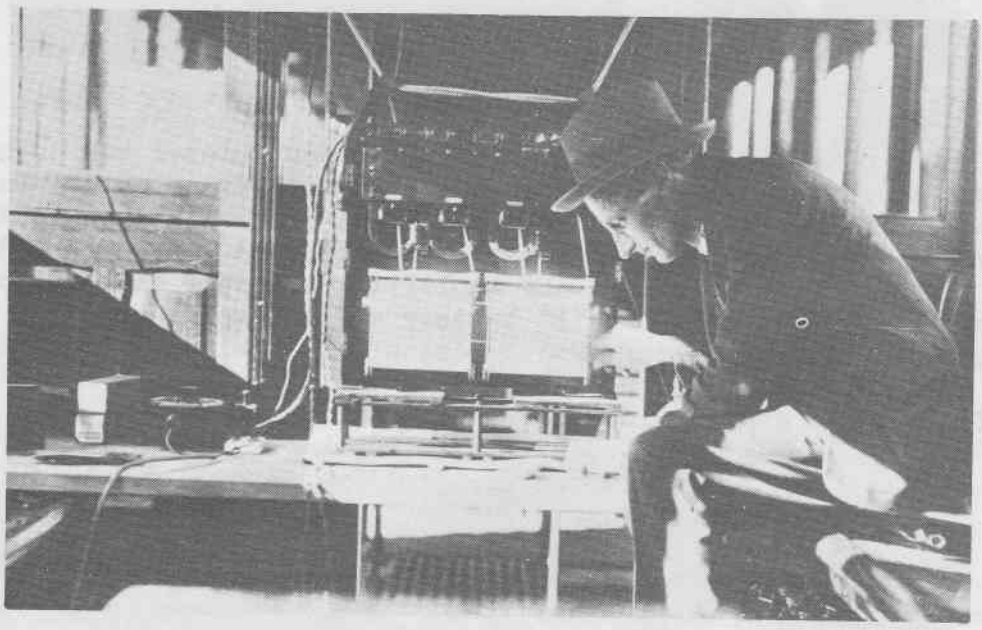
T. M. S. V. archives.

Measurement and Reduction of Tramcar Noises.

By R.H. PRENTICE

Noise from tramcar operation which has been besetting engineers, has not been neglected in Melbourne, where the Tramway engineers have been experimenting with both tramcar design, and track construction over a number of years.

In 1929, the engineers, to see what extent noise was being reduced by experiments, decided to build a recording set which gave graphs of noise produced.



The recording unit is clearly shown in this view of the interior of "W" class No. 386.

The engineer is deeply engrossed in studying the results of tests on the graphic recording. Note instrument panel in doorway.

M. & M. T. B. photo.

The first set built was a 3 valve amplifying unit, a recording multi - ammeter in service with the plate of the last amplifying valve recording graphically. The "pick up" was a wireless loud speaker attachment, to which was fitted a fibre horn. This set was used for some time, but with the advancement of wireless components, it was decided to alter the set and bring it up to date and this alteration was carried out. With this new wiring, it was now possible to check up all battery voltages by inserting a plug into the sockets connected to the different components, and so insure that voltages were maintained at the correct figure (a very important point). By the use of one half of a push - pull transformer, a steady direct current

flow was maintained through the recording meter; the use of a choke coil and condensor made the outfit free from distortion, so that no false reading was obtained.

The "pick up" was still the loud speaker attachment. It was feared that some choking action or resonance was likely to arise from the use of the horn on the "pick up", also that the air pocket at the back of the diaphragm in the speaker attachment would have a damping effect on the diaphragm. An electrostatic or condensor type microphone was, therefore, obtained and connected to the set; a .5 ohm potentiometer being a wire wound resistance divided into 10 steps to give a logrithmic scale, each having the following values :-

No. 1	step.	680 ohms.
" 2	"	690 "
" 3	"	1380 "
" 4	"	2750 "
" 5	"	5400 "
" 6	"	11000 "
" 7	"	21800 "
" 8	"	43000 "
" 9	"	87500 "
" 10	"	175000 "
	Total	350000 ohms.

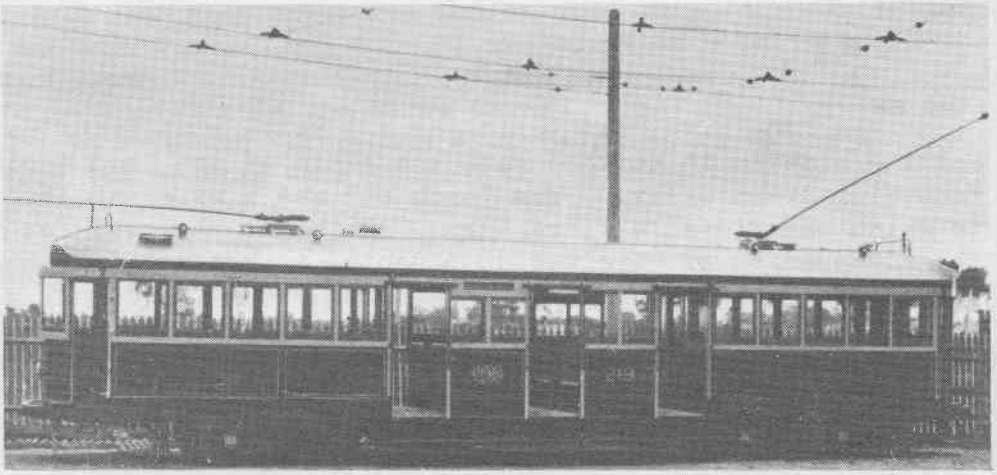
The chief function of the potentiometer was to keep the output of the microphone within the range of the amplifying set. This means that when a loud noise was to have been recorded, the resistance to the grid of the first valve was increased, and with a soft noise it was decreased.

The valves in the amplifying set were changed to U.X.112A throughout, by this means, only one "B" battery voltage was across the whole set, and only one "C" battery voltage was needed also; this tends to eliminate any errors.

Experiments dealing with the reduction of noise have been made as follows and divided into different sections :-

(1) Trucks including wheels, gears, etc.
(2) Carbodies, trolleys, etc.
(3) Track construction.
(4) General and laboratory tests.

Unless otherwise stated, all experiments were carried out on "W" class cars with 26" wheels; these are 4 motor bogie cars weighing 17 tons, as illustrated.



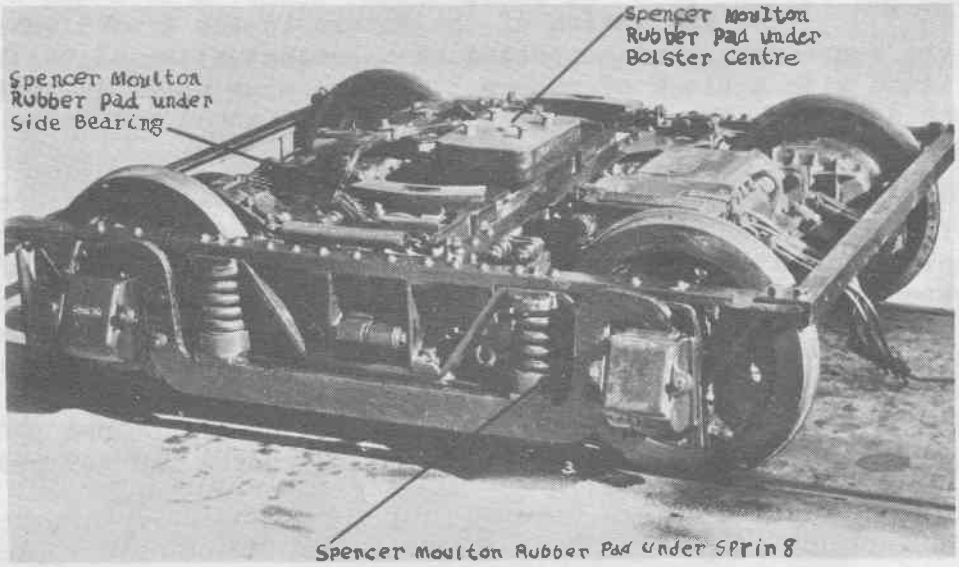
"W" class tram No. 219 as built.

M. & M. T. B. photo.

(1) TRUCKS.- All iron flat washers were replaced by fibre ones; this had a good effect, as it stopped quite a lot of jingling which took place.

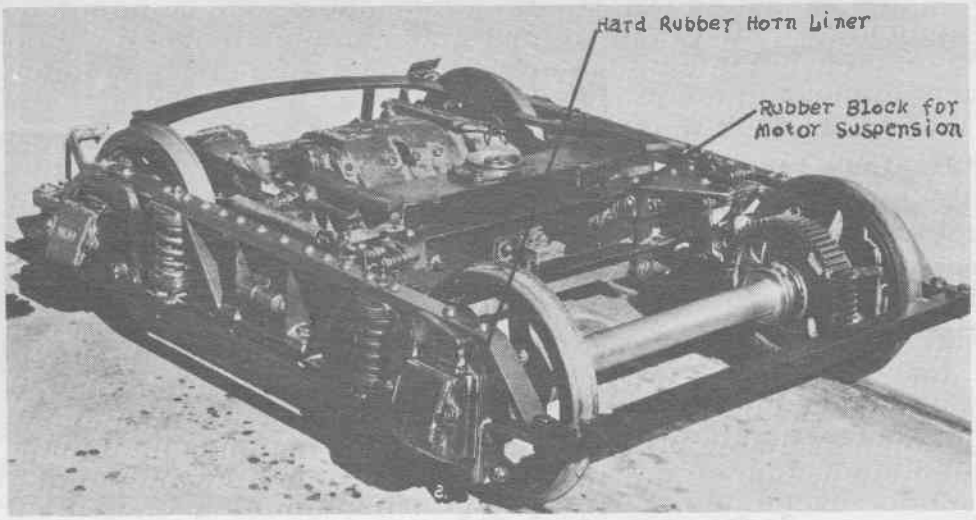
Steel horn stay liners which fit between the axle box and horn stay were replaced by an asbestos brake lining moulded to shape; this also stopped jingling which took place when the steel liners became loose.

Rubber was tried between bolster centre and bolsters, also under radial plates, but the noise record showed no improvement.



A No. 1A truck showing the rubber pads as described above.

M. & M. T. B. photo.



A No. 1B truck with test rubber pads under other parts as compared with the 1A truck.

M. & M. T. B. photo.

An interesting experiment was tried by enclosing the two trucks under a car. This was done by building on the truck frame a complete box made of celotex board. At first the trucks were run without any top covering, but as no improvement could be noted, the covering was extended over the top of the wheels; the sides of the box reached to within 6" of the ground; the sides and portions of the top were on hinges so that maintenance of the truck could be

carried out. It was noted that the temperatures of the motors were higher than on other cars without this arrangement, but not to the extent of endangering the motors.

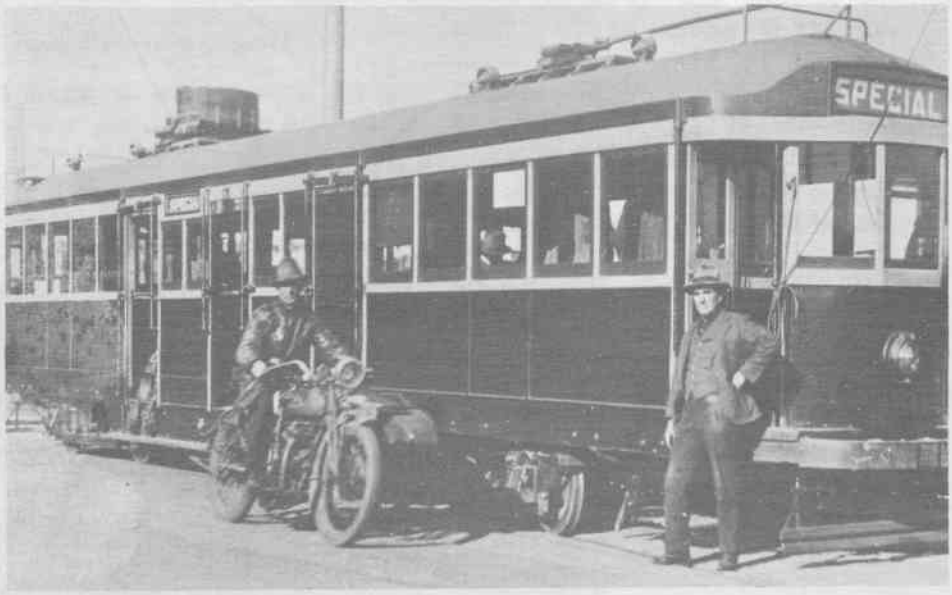
The car was run in service for about 2 months, but no improvement in noise reduction could be noted.

The rod connecting the hand brake staff to the brake beam being loose, used to jingle about; to overcome this, a steel wire rope is now used on all cars.

The suspension of the motors in the trucks was altered to the "Nose" type suspension, and supported on a bracket attached to the truck transome fitted with a block of rubber 3" thick, upon which the motor "Nose" sits; this was done with the object of reducing the impact and noise from the motor due to shocks, and when passing over crossings.

WHEELS. A disc wheel centre was first treated by fastening 4 rubber pads of $\frac{1}{8}$" thick rubber about 5" square on each side of the centre. The rubber was held in position by a sheet of iron covering each piece of rubber. The pads were held to the centre by bolts which were insulated from the centre by rubber.

The axle, on which the centres were pressed, was suspended in the air, and the tire hit with a hammer; it was noticed that all ring from the tire and centre was absent. This seemed so satisfactory that a car was selected, and after a preliminary test, it was fitted with these pads on all wheel centres, and the run over the same track, but the noise was not reduced to any appreciable extent.



"W" class tram No. 386 poses for the photographer prior to departing for Royal Park to undergo further tests.

M. & M. T. B. photo.

Spoke cast steel and cast iron wheel centres fitted to cars were tried for noise against cars fitted with cast steel disc centres; but no reduction in noise could be detected.

Tires were treated in several different ways; in nearly every case there was a complete absence of ring when the tire treated was hit with a hammer, but when in service, no reduction of noise could be detected.

The following are some of the ways tires were treated :-

A copper ring was placed between the tire and centre when the tire was being shrunk on.

On the inner faces of 2 tires, a VEE was cut about $\frac{1}{2}$" wide at top, $\frac{3}{4}$" wide at bottom and $\frac{1}{2}$" deep, and into this recess lead was beaten. In this experiment the lead worked out after the car had been in service a few weeks.

On the inner face of a car set of tires, a strip of rubber $\frac{1}{8}$" thick and $\frac{1}{2}$" wide was clamped. This was done by turning out a recess $\frac{3}{8}$" deep, and over the rubber, a ring of steel was riveted through the width of the tire.

The flanges of 2 tires were treated by machining half the flange away, and inserting a piece of $\frac{1}{8}$" thich rubber about $1\frac{1}{2}$" wide against the face of the tire, and was held by a steel band which was rivited on. The steel band was machined to make a uniform flange, but these tires only lasted 2 weeks in service owing to the flange opening out.

"W" 386 in Royal Park, undergoing some of the tests as outlined in the text.

M. & M. T. B. photo.

GEARS - Quite a lot of noise is produced from the gears, and this part of the car has had a lot of treatment in an endeavour to prevent noise. New gears and pinions usually produce very little noise after they are run in, and it is only after much wear has taken place that noise is produced; slack bearings also have the effect of giving play in the gears. Therefore, to eliminate as far as possible these conditions, the tolerances for renewing bearings are as fine as possible, also pinions are renewed before they become very slack. A lot of special gears and pinions have, however, been tried, but no appreciable reduction of noise was produced, but it was noted that generally, steel cast gears were quieter than forged ones.

The following types were tried :-

Gears with a ring of lead beaten into a groove cut into the rim under the teeth. (These were made by the Cincinatti Tool Steel Co.).

Gears with a steel ring welded under the rim made by General Electric Co., also by Westinghouse - Nuttall Co.

Gears made with a receptable or cup under the rim into which grease is supposed to work, and thereby silence the gear: these gears were supplied by the G. E. Co.

Gears, the centre of which were filled with a cork compound, supplied by the General Electric Co., also several gears had pads of rubber and

wood fastened to them to try and silence excess noise.

In a number of cases, the gears have had the teeth ground after hardening, thereby eliminating any distortion that may take place during the process of hardening.

Bran and also fine cork were tried, mixed with the gear grease to silence gears. It certainly achieved its object, but its life was short lived. After a car had run a few miles, the gears were as noisy as before the application; it, therefore, appeared that gear noise can be reduced by the use of a correct lubricant.

Aluminium gear cases were also tried, but tests showed that more noise resulted with the use of them.

A pair of phosphor bronze gear wheels with tooth dimensions similar to ordinary car gears meshing with steel pinions, were in service for about 18 months with promising results.

Worm gearing was fitted to 2 safety cars (class X1 No's 459 & 460), which have been in service for at least 2 years with very satisfactory results; it was reported that these gears ran silently.

(2) CARBODIES - To test the theory that curved side panels were quieter than straight ones, a curved side bogie car (Class "L" No. 103) and a straight side bogie car (Class "W" No. 509) were run over the same track, and a noise record made. The cars were then taken to the workshops and the trucks changed, No. 103 trucks going under car No. 509 and vice versa. A noise test was again made, but the results proved that noises produced by the trucks was the same, irrespective to which carbody was on them.

Steel panels on the carbodies have a tendency to drum, and to overcome this, lagging was resorted to, i.e. at the back of the panel, a heavy canvas was fastened; this stops the drumming.

7 ply wood panels were tried in the place of steel, but no noise improvement could be noted; this result was the same when aluminium, plymetal or plymax panels were used. On 2 cars, between the carbody and the underframes, $\frac{1}{4}$" thick rubber 4" wide was inserted, also on one car, mascolite (a type of felt) was used, the idea being to insulate for noise the carbody from the underframe; on these cars, no improvement could be detected.

A slight reduction in noise level was noted in the saloon of cars with rubber floor covering, instead of malthoid; this was apparently due to the rubber absorbing some of the sound.

The glass in the window sashes was kept tight, also sahes were fitted with springs to prevent rattling.

TROLLEY NOISES - Noise was produced by the trolley wheel, both on the overhead and in the saloon of the car. The noise on the overhead was transmitted along the wires, and down the steel standards. This cannot be very well overcome, although it was proved by the noise recorder that 8 to 10 per cent of noise from a very quiet running car, comes from the overhead; these tests were taken both in the open with parks on each side, and between high buildings, and the same percentage reduction was noted in each place.

To reduce noise in the saloon, 1" felt, $\frac{1}{2}$" soft rubber, $\frac{1}{2}$" cork, $\frac{1}{2}$" mascolite also springs placed between the trolley bases and platforms were tried, but the noise from the truck predominated in the saloon, so that it has not yet been proved conclusively that any reduction had taken place by the adoption of any of these ideas, but further experiments were conducted with the noise recorder to see if any reading could be obtained that would give evidence of noise produced inside the car by the trolley base having been reduced by the

above means. Trolley base fittings were removed from the roof of the car, and placed on timbers raised above the roof, running the full length of the saloon, and fastened only to the bulkheads. A car fitted with these longitudinal timbers for a trolley base supports ran in service. This base did, without a doubt, reduce the trolley noise inside the car. The only objection to this arrangement was the added weight of the timbers on the roof of the car, and it not being possible to fit it to all types of cars.

A trolley pole filled with sawdust, was tried on a car, but no improvement could be noted.

The hook for holding down the leading trolley pole on bogie cars was lined with asbestos brake lining to reduce the noise produced when placing the pole under the hook; this was found to be very effective.

(3) TRACK CONSTRUCTION - A number of tests for recording the noise produced by various kinds of track construction were made.

A standard "W" class bogie car was used for all these tests; a car was selected that gave very quiet running, and was fitted with newly turned tires so as to keep the car noises down to a minimum, and so have the track noise predominate. In all tests, a speed recorder was placed in the car, and, as far as possible, a speed of 20 m.p.h. was maintained whilst passing the "pick-up". The car coasted when passing the "pick up" to obviate, as far as possible, gear noises. The rails were cleaned or scrubbed by a track cleaner car prior to the tests being made, and all dirt, etc., removed; great care was taken to see that there was not even the slighest "flat" on the wheels. During one of the tests, the wheels picked up a small piece of bitumen, and the noise produced was such that the test was held up until it was removed. Tests were made on clean, and unclean rail.

A summary of a series of tests made on different kinds of permanent way construction, and also the effects produced by high buildings adjacent to the track, are given below. These tests were made on different dates, and are not comparable with each other on account of all the factors not being similar.

Summary:-

(a) Rail fillers (all on stringer track with no rail cushion).

	Sound Intensity.
Cement filler.	9.5.
Bituminous filler.	9.3.
Wooden filler.	8.8.

The effect of different types of rail filler on the noise would appear to be negligible.

(b) Rail cushion.

	Sound Intensity.
$\frac{3}{8}$" Ormonoid cushion on stringer, with bitum. filler	11.0.
$\frac{3}{8}$" Ormonoid cushion without stringer, with bitum. filler	10.5.
$\frac{3}{4}$" Ormonoid cushion without stringer, with bitum. filler	10.6.
Ordinary stringer track, bituminous filler	9.3.

The use of bituminous rail cushions would appear to increase the noise level, rather than reduce it, compared with timber stringers.

(c) Various sleepers. (all with asphalt paving).

	Sound Intensity.
Steel ties with rail concreted in (excluding doubtful results where echo was present)	7.5.
Composite ties with rail not concreted in, but filled with bituminous materials, and with bituminous rail cushion between ties.	7.0.

	Sound Intensity.
Ordinary stringer track with rail not concreted.	7.25.

There seemed to be no marked advantage with any of these types from point of view of noise.

(d) Ordinary stringer track, but not scrubbed or cleaned.	14.0.

GENERAL - It seems that from these tests that rails having equally clean surfaces from corrugation, and supported on a concrete base so as to have no appreciable deflection, will give approximately the same noise intensity whatever the type of sleeper, cushion or rail filler used. An asphalt surface would appear to be less noisy than a wood-paved one, possibly due to better contact of the paving material with the rail.

SUMMARY :-

	Sound Intensity.
(a) 102 lb. rail, sleepers, concrete base with rail not embedded, bituminous penetration	5.1.
(b) 90 lb. rail, sleepers, concrete base and paving. Tar macadam along each rail. This track was about 7 years old and the rail moved appreciably.	5.4.
(c) 102 lb. rail, wooden sleepers, concrete base with rail embedded, bituminous filler, wood paving.	5.7.
(d) 102 lb. rail, steel ties, concrete base with rail embedded, cement filler, wood paving.	5.25.
(e) Same as (d) but bituminous filler.	6.5.

It will be seen that the track with macadam paving is less noisy than that with wood paving, but the differences may have been exaggerated by the absence of buildings in the former case.

Comparing steel ties with wooden sleepers, the result appears to be slightly in favour of wood, but here the results could have been affected by the different types of verandahs and buildings behind the "pick up". Probably with identical rails and beckgrounds, the difference would be negligible.

With regard to rail filler, cement filler with $4\frac{1}{2}$"x$\frac{3}{8}$" Ormonoid appeared to have an advantage over precast bituminous filler. However, in the light of tests made 13 - 1 - 29 in Malvern Road, it is difficult to say with any certainty, as a small difference in the condition of the rail surface may outweigh the differences caused by the filler.

Summary, 20 -6- 29.

Construction.	Locality.	Sound Intensity.
102 lb. rail, sleepers on concrete base, bitumen penetration paving.	Wallen Road, opposite open paddock.	4.4.
90 lb. rail, sleepers on concrete base, concrete paving.	Swan Street, opposite ordinary residences.	5.4.
102 lb. rail, sleepers on concrete, woodblock paving.	Swan St., opposite shops with low verandahs.	5.6.
102 lb. rail, sleepers on concrete, woodblock paving.	Swan St., opposite building (Dimmeys).	6.0.

A test was carried out to see if any reduction in noise took place when the track was wet. A car was run past the "pick up" several times on a clean, dry track and a hose was then turned onto the track, so that it was made wet all over, and the car was again tested, but no reduction in noise could be noted.

A test was carried out, inside the car, to see the effect of different tracks, and it was noted that there was a reduction of over 50% when the car passed from track laid on a concrete foundation with wood block covering in a paved street, to reserved track laid on wood sleepers in open ballast.

The Engineers of the Tramways Board have always been alert to the noise problems, and over the years, various other experiments have been carried out. Examples include the following, but it must be understood that the items mentioned below are but a few of the many tests that have been tried.

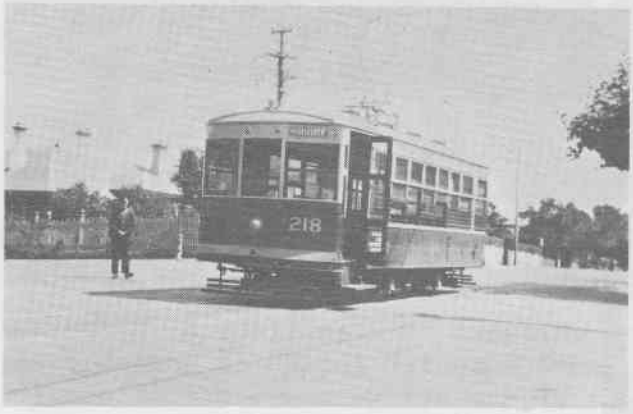
* *

It was Mr. Strickland's contention that ballast track made less noise on account of more space between motor casings and track, hence his observations were incorporated into the design of the "W3" class tram and No. 9 trucks with 33" wheels. The automotive type of suspension on this type of truck eliminates the chafing, rubbing and wearing noises on the horn guides. The placing of the brake cylinders on each truck cuts out the thump of the brake rigging when the brakes are applied.

A spring suspended ear was installed on the Brunswick line during conversion from Cable trams to Electrics - this was to lessen wire squeal.

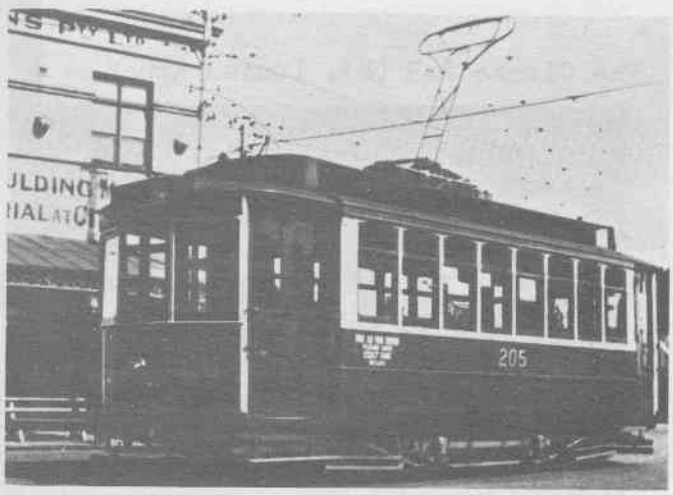
At the South Melbourne Cricket Ground Loop, a rail joint with a spring-loaded ramp with a fulcrum box at the side was installed on the city bound track from 1935 until about 1950.

"W3" class tram, No. 666. Note brake cylinder mounted on the No. 9 truck. T.M.S.V. archives.



M. & M. T. B. photo.

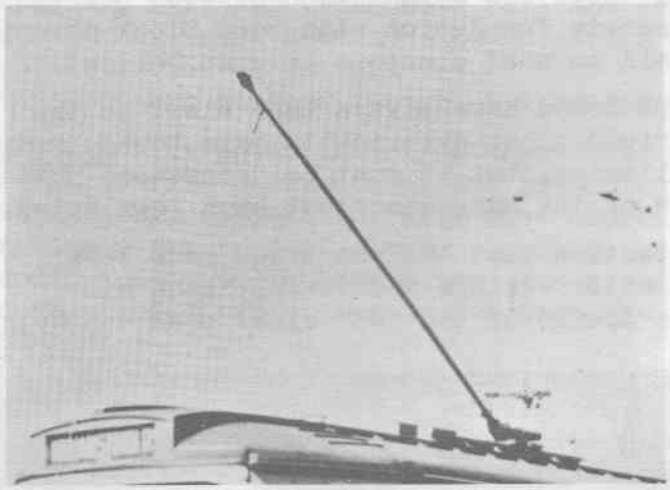
← LEFT.
Experiments with "bow" collectors in Power Street, Hawthorn.



→ RIGHT.
And in Holden Street, North Fitzroy.

By courtesy R. Pearson.

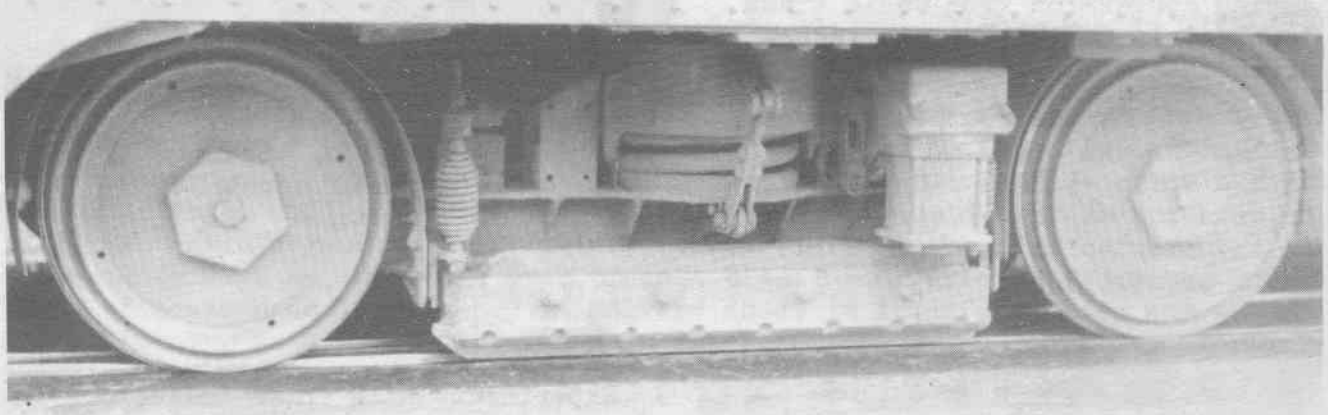
The testing of a sliding shoe at Footscray during the late 1930's.



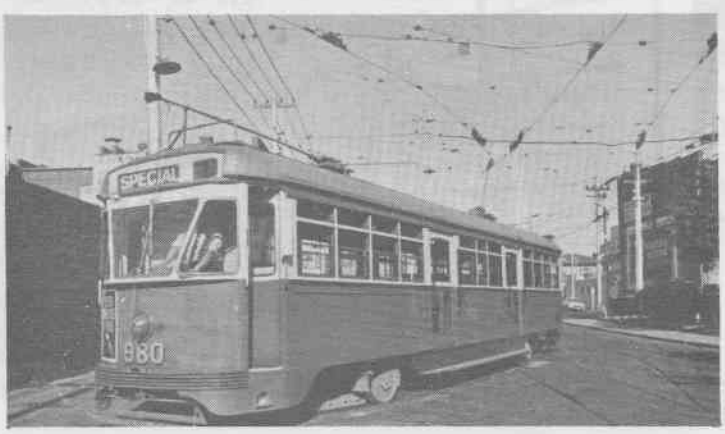
LEFT.
This 1939 photo shows a sliding shoe being tested on the then isolated Footscray system. The trolley pole is attached to the roof of "X2" class tram No. 680.

By courtesy of R. Pearson.

The importation of P.C.C. equipment as used on car No. 980:-



The Clarke B.3 (St. Louis) truck. M.L. Dunn photo.



LEFT.
P.C.C. equipped 980 is shown entering Malvern Depot on 6-2-65, the day before a T.M.S.V. outing.

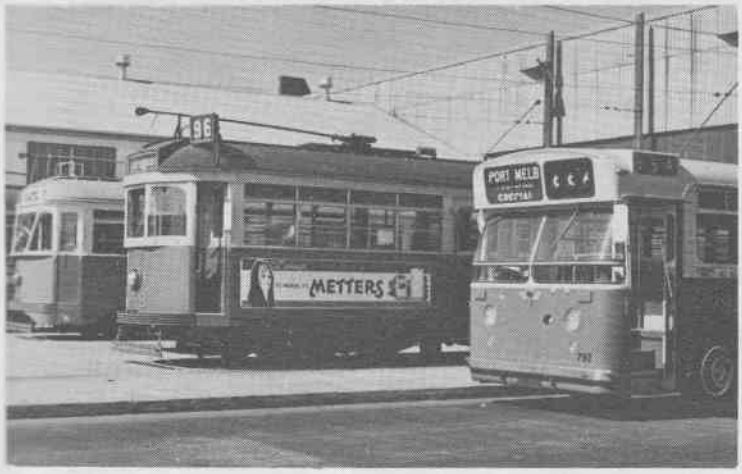
T.M.S.V. archives.

ABOVE. G.L. Turnbull Photo.

LEFT. D.J. Prosser Photo.

Doug Prosser's photo of the front of 980 was taken at the North Fitzroy Depot on 6-2-65. Inspector Dowel's son Peter, is shown inspecting the controls.

Graeme Turnbull photographed 980 at the city terminus of the Bourke Street lines on 11-8-67.



LEFT.
3 different fronts are depicted in this photo taken in 1965 at North Fitzroy Depot.

A resilient "H" crossing was installed in the South East quarter of the crossing at Chapel Street & Commercial Road intersection in 1953. The balance of the crossing was completed later.

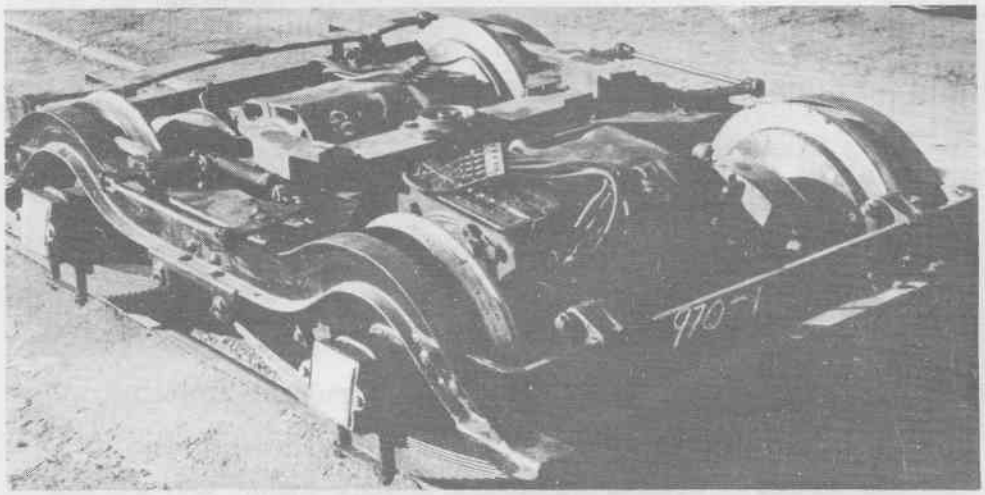
The conversion of the system from trolley wheel operation to shoe and Morganite current collection.

Installation of resilient crossings at certain intersections in Melbourne.

Continuous ramps are now being used at all "H" crossings. This type of crossing cuts down the crashing noise as the wheels pass through the installation.

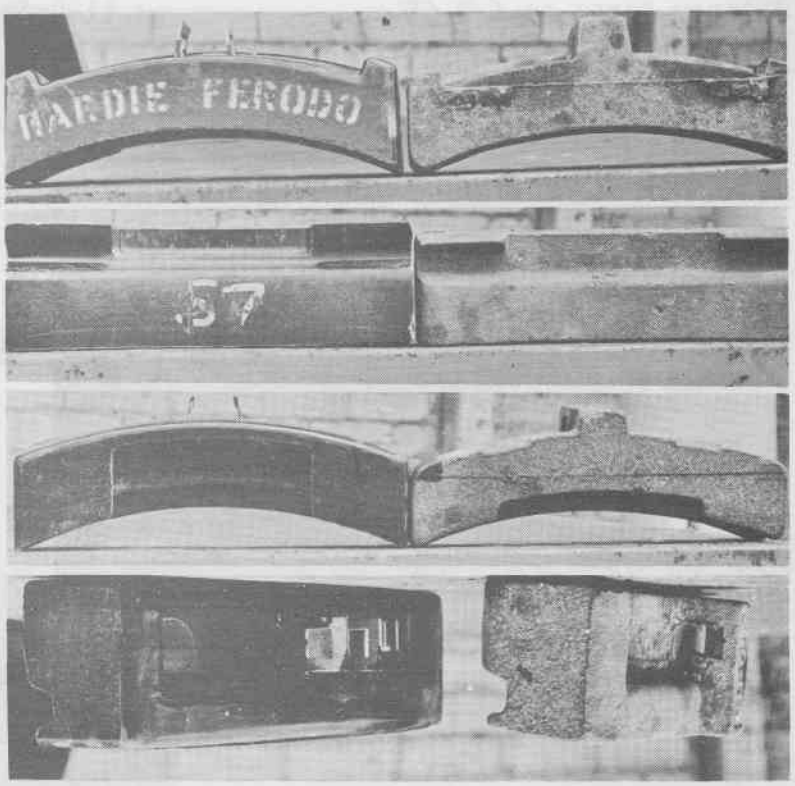
The two shunts at the Spencer Street end of Collins Street have silencers fitted into the fulcrum boxes.

In the last year or so, a composition "FERODO" type of brake shoe has replaced the iron shoe on the No. 15 trucks as used under the Bourke Street cars. One has only to stand in Bourke Street and listen as the trams glide past. How silent they are!



The M. & M. T. B. No. 15 truck fitted with resilient wheels.

M. & M. T. B. photo.



The set of 4 photos (right) quite clearly shows the difference between the "FERODO" and iron brake shoes. In all cases, the composition shoe is on the left.

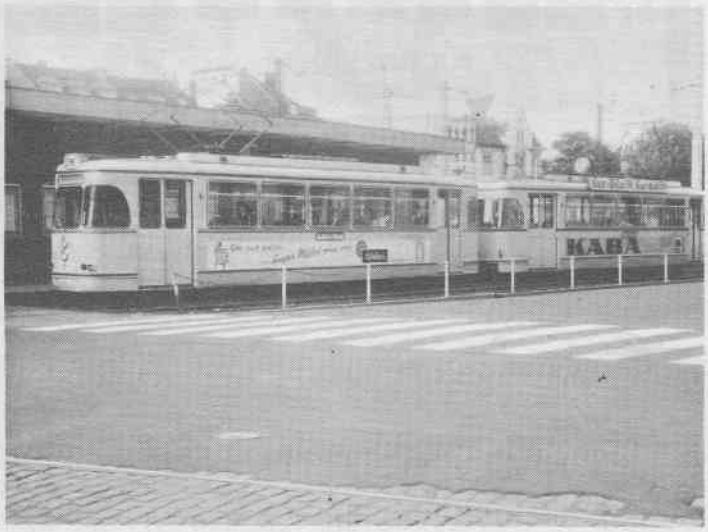
Photos : T.M.S.V. archives.

Another factor in the fall of the noise level is the now fairly extensive use of helical gears resulting in cleaner meshing of the gears with the pinions.

The Tramways Board and it's Officers are to be congratulated for pursuing such a policy of improvement to existing cars, for the results of their experiments and tests can now be seen and heard by all persons - who have only to ride a car in Bourke Street!

Further, it is to be hoped that the Tramways Board's request for new trams will be brought to fruition. To indicate the modern tramcar designs on the Continent, two photographs are printed below of the many different types available (lack of space precludes others). Possibly, certain features of these vehicles will be incorporated in the proposed 100 new trams for Melbourne.

P.C.C. tram No. 1013 on Route 3, Den-Haag, Holland.



Both photos by courtesy L. Reyke. Two cars, one motor and one trailer coupled together in Bonn, Germany, on 31-7-66.

CREDITS - Thanks are due to Messrs D. Tatam, K.V. Newman, K. Hall, H. Smith, H. Westrup, A. Cushing, all M.&M.T.B. and Mr. N.H. Gipps.

R.K. Prentice .. December, 1967.

PROVINCIAL PARAGRAPHS

OCTOBER, 1967. BENDIGO.

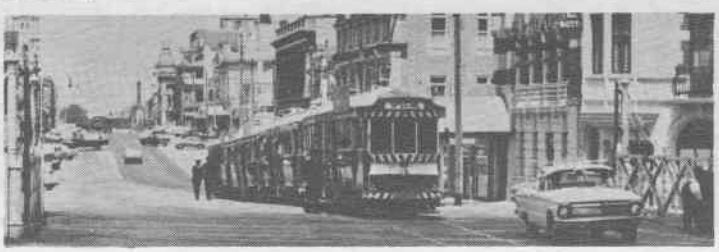
M. T. No. 3 has re-entered service after a repaint.
No. 26 has been re-wheeled and the brake gear overhauled.

NOVEMBER, 1967. BALLARAT.

5 bogie specials, Nos 35, 36, 39, 40 & 41, were run on Wed. 8-11-67, for the Geelong Teachers College Students, on account of Student Teachers sports, from Ballarat Station to City Oval.

Photo (right) T.M.S.V. archives.

Four of the specials are shown in the photo. The fifth remained clear of the railway track, on the north side of the crossing.



There are two "SANTA SPECIALS" in Ballarat this year. Myer's special car was single truck No. 32. (Picture on front cover).

The Bridge Street Trader's special car, No. 17.

T.M.S.V. archives.

M.T. No. 37 has been in the paint shop for general body repairs, clean up and repaint.

S.T. No. 30 was over the pits for a re-wheel.

The track maintenance gang was working in Victoria Street, between Queen and Otway Streets.

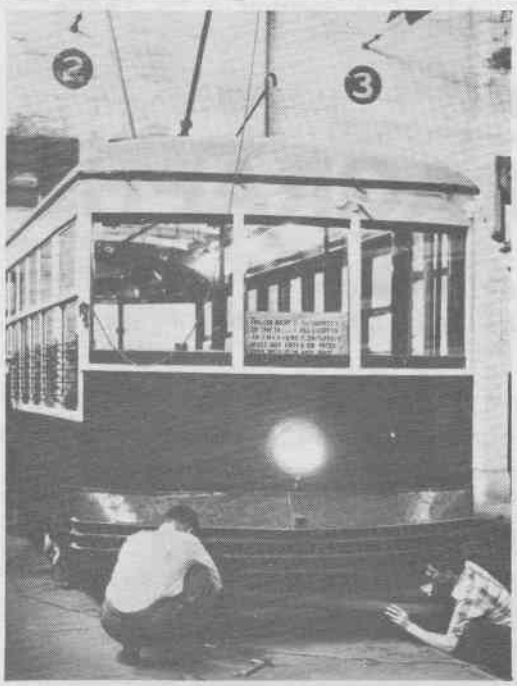
DECEMBER, 1967. BENDIGO.

Myer's also had s "SANTA SPECIAL" in Bendigo. Car used was Birney No. 28.

M.T. car No. 18 was having a re-truck and at the same time, a set of new slippers are being installed.

Frank McLoughlin, pitman, retired on 8-11-67 after many years of service with the S.E.C.

NOTE: More pictures of the "SANTAS SPECIALS" will appear in the next issue.



LEFT:
YOUR HELP IS REQUIRED to complete the restoration of Birney 217. Write Secretary for details.

RIGHT:
On Friday 27th. & Saturday 28th. October, 1967, Bob Wilson hired Y1 class tram No. 610 for an all night outing to celebrate his 21st birthday. Here Bob thanks Inspector J. Dowel for driving the special, whilst Jim congratulates Bob on reaching his majority.

Both photos:
T.M.S.V. archives.