ADDENDA

TO THE 2nd REPORT (FOR ENGLISH SPEAKING COUNTRIES) ON THE QUESTION OF STRENGTHENING OF PERMANENT WAY IN VIEW OF INCREASED SPEED OF TRAINS (SUBJECT I OF THE LIST OF QUESTIONS FOR DISCUSSION AT THE FIFTH SESSION OF THE CONGRESS)

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APPENDIX *A*. — **Rails.**

QUESTIONS.	**England.** London Tilbury and Southend Railway. (Pl. 32.)	**America.** Atchison Topeka and Santa Fe. (Pl. 33 and 34.)	**Australia.** South Australian Railways. (Pl. 35.)
Weight of rail . . { Per yard .	72 lbs.	52, 56, 66, 67 and 71 lbs.	80 lbs.
Weight of rail . . { Per metre.	(35 1/2 kilog.)	(26, 28, 32 1/2, 33 et 35 kilog.)	(39 1/2 kilog.)
Length	24 feet (7m31).	30 feet (9m14).	30 feet (9m14).
Holes for fish bolts :			
a) Number	Four.	Some four some six.	Four.
b) Shape	Slotted.	Oval.	Oval.
c) Distance apart from centre to centre of holes. . .	4 1/2 inches (114 mill.).	5 inches (127 mill.).	5 1/2 inches (140 mill.).
d) Distance from end of rail to centre of nearest hole.	2 1/4 inches (57 mill.).	2 3/8 inches (60 mill.).	2 5/8 inches (67 mill.).
Is the line relaid when the rails wear down to minimum weight per yard ?.	No.	No special rules for renewal. — They are made as required by circumstances. — Traffic and load being considered.	No definite rule.
If so, give weight	"		
Is line relaid when rails wear down to minimum thickness of top flange or minimum depth over all?	Minimum depth over all.		
If so, give thickness or depth . .	From 5 3/16 to 4 11/16 inches (132 to 119 mill.)		
Have you made use of rails of unusual length, 60 feet or upwards ?	No.	No.	No.
If so, state object and what result.	"	"	"

APPENDIX *B.* — Manufacture and testing of rails.

QUESTIONS.	England. London Tilbury and Southend Railway. (Pl. 32.)	America. Atchison Topeka and Santa Fe. (Pl. 33 and 34.)	Australia. South Australian Railways. (Pl. 35.)
By what process is the steel for rails manufactured ?			
a) Bessemer acid	Bessemer.	Bessemer acid.	Bessemer acid.
b) Siemens Martin acid. . .	"	"	"
c) Basic in Siemens Martin hearths	"	"	"
To what tests are rails subjected to before acceptance ?			
a) Bending	5 feet (1^{m}524) length placed on solid iron bearings 3 feet 6 inches (1^{m}067) apart shall then receive successive blows from a weight of 1,800 lbs (816 kilog.) falling a height of 6 feet (1^{m}83). Rails not to break before or under third blow nor take a permanent set after first blow exceeding 1 5/8 inches (41 mill.).	No special tests. Rely or reputation of manufacturer.	Rail placed on supports 3 feet (0^{m}918) apart and to receive from blows from a weight of 13 cwt (660 kilog.) falling from a height of 10 to 16 feet (3^{m}05 à 4^{m}88) without fracture. Also to bear a weight of 15 tons (15,250 kil.) for 10 minutes without permanent deflection.
b) Chemical	"	"	"
c) Tension :			
Breaking weight in tons, per square inch.	"	"	"
Extension per cent. . . .	"	"	"
Contraction of area, per cent.	"	"	"
Particulars as to the relative merits of hard and soft steel. .	"	No experience with hard steel.	"

APPENDIX *C.* — **Rail connections.**

QUESTIONS.	**England.** London Tilbury and Southend Railway. (Pl. 32.)	**America.** Atchison Topeka and Santa Fe. (Pl. 33 and 34.)	**Australia.** South Australian Railways. (Pl 35.)
Is the rail suspended or supported in a joint chair or on sleepers? .	Suspended.	Mainly supported	Suspended.
Fish plate :			
Length	18 inches (457 mill.).	4 hole plates 23 inches (584 mill). 6 hole plates 38 inches (965 mill.).	21 1/2 inches (546 mill.).
Depth	4 1/2 inches (114 mill.).	3 1/8 inches (79 mill.).	6 3/4 inches (172 mill.).
Thickness	7/8 inch (22 mill.).	3/4 of an inch (19 mill.).	7/8 inches (22 mill.).
Weight of each.	18 lbs (8.16 kilog.).	38 inches (965 mill.) plates 34 3/4 lbs (15.75 kilog.). 23 inches (584 mill.) plates. 21 lbs (9.53 kil.)	24.87 (11.28).
Fish bolts :			
Number.	Four.	Four and six.	Four.
Size	4 inches × 7/8 inch. (102 × 22 millimetres).	4 inches × 3/4 inch. (102 × 19 millimetres).	4 1/4 inches × 7/8 inches. (108 × 22 millimetres)
Weight including nut and washer (where used) . .	1 1/2 lb. (0.68 kilog.).	1 lb (0.45 kilog.).	1 1/2 lb (0.68 kilog.).
Description of fish bolt. . . .	Cup headed with square shoulder.	Cup headed with rounded shoulder.	Cup headed with square shoulder.
Description of nut (and washer if any)	Ordinary square nut. No washers.	Ordinary hexagonal nut next fish plate with square nut outside.	Ordinary hexagon nut and Grovers washer.
Are holes in fish plates square or circular, punched or drilled? .	Square in one plate circulare in the other.	Square in one plate and elliptical in the other.	Oblong, punched.

QUESTIONS.	England. London Tilbury and Southend Railway. (Pl. 32.)	America. Atchison Topeka and Santa Fe. (Pl. 33 and 34.)	Australia. South Australian Railways. (Pl 35)
Does the form of joint used give satisfaction?	Yes.	Partial.	Yes. The special form of deep flange to fish plates insures the necessary strength to the plates while allowing the adjoining sleepers to be brought near enough together to give the required support.
If not, in what respect is improvement required with a view to securing uniform strength of road throughout?	"	This problem has not yet been solved.	"
How are rails secured to sleepers?			
With chairs on wood sleepers	Yes.		
Weight of chair?	43 lbs (19.5 kilog.).		
Base of chair area in square inches	98 square inches		
Base of chair area in centimetres square.	(632.3 square cent.).		
Is felt or other material placed between chair and sleeper?	No.	None used.	None used.
Are the chairs on each side of the joint of the same pattern as the rest? If not, give particulars	Yes.		
Full particulars of mode of attachment of each chair to sleeper	3. Wrot iron spikes 5 1/8 inches (130 mill.) long under the head 3/4 inch (19 mill.) diameter.		
Full particulars of mode of attachment of flat-bottomed rail to sleeper.	"	By spikes detail not given.	By 12 fang bolts and 12 spikes on the outsides of the rails and by 24 spikes on the inside of the rails.

APPENDIX *D.* — Keys and sleepers.

QUESTIONS.	England. London Tilbury and Southend Railway. (Pl. 32.)	America. Atchison Topeka and Santa Fe. (Pl. 33 and 34.)	Australia. South Australian Railways. (Pl. 35)
Keys.			
What wood is used?	Oak.	None used.	None used.
Is it compressed?	Yes.		
Particulars of metal keys, if used	"		
Are rails keyed on inside or outside?	Outside.		
Sleepers-wood.			
What kind of wood is used?	Baltic redwood.	Oak. Pine and cedar.	Red gum, sugar gum, Jarrah and Karri hardwoods.
Are sleepers creosoted, or treated with other antiseptic?	Some.	Pine is treated with chloride of zinc, tannin and glue. Others not treated.	No.
Dimensions :			
Length	9 feet (2^m743).	8 feet (2^m438).	8 feet 6 inches (2^m591).
Breadth	10 inches (254 mill.).	8 inches (203 mill.).	10 inches (254 mill.).
Thickness	5 inches (127 mill.).	7 inches (178 mill.).	5 inches (127 mill.).
Are they placed in the road heart side or waney side upwards?	Creosoted sleepers waney side upwards. Un creosoted sleepers some one side and some the other.	No special care in this respect.	No distinction made. It is not necessary with Australian hardwoods.

APPENDIX *E.* — Ballast.

QUESTIONS.	England. London Tilbury and Southend Railway. (Pl. 32)	America. Atchison Topeka and Santa Fe. (Pl. 33 and 34.)	Australia. South Australian Railways. (Pl. 35.)
Material adopted for bottom ballast.	Burnt clay chalk, brick and stone rubble.	Stone.	Broken limestone or quarry stone generally, river gravel occasionally.
If stone, what mesh ?	No restriction.	2 inches ring (51 mill).	2 1/2 inches (63 mill.) ring.
Depth of bottom ballast	9 inches (229 mill.).	10 inches (254 mill.).	6 inches (152 mill.) in level districts, 9 inches (229 mill.) hilly districts.
If cinders, whether screened or not?	"	"	"
Material used for top ballast . .	Pit gravel-chalk always covered with gravel or clinkers.	Cinders, gravel slag burned clay and stone.	Same as for bottom ballast.
Thickness of top ballast	Average 21 inches (534 mill.).	6 inches (152 mill.).	7 inches to 8 1/2 inches (178 to 216 mill.).
Is the top ballast laid above the top of the sleeper, and if so, to what extent ?.	Yes. 4 inches (102 mill.).	No.	Yes. 3 inches (76 mill.).
What advantages are found to result from the use of the material selected for ballast? . . .	The materials adopted for bottom ballast both acts as drain and keeps clay from getting soft and squeezing up into top gravel rendering it dirty and wet. Clinkers are most efficient at ends of sleepers to let water escape freely from sides of top ballast, chalk for top ballast is used principaly at outside ends of sleepers.	Cinders and burned clay give easiest riding track. Slag and rock more durable.	Good drainage and a good elastic bed.

PLATES