Appendix B. MANUFACTURE AND TESTING OF RAILS.

Acid. Bensome	FURNESS. Beassmer Acid	GREAT EASTERN. Bessener	GREAT NORTHERN. Besserver Acid.	GREAT WESTERN. Ingets from which fails are made to be used of best Steel for the purpose, made from Ragists or Spanist larges.	LANCASHIRE AND YORKSHIRE,	LONDON, BRIGHTON, AND SOUTH COAST. Besseiner Acid.		LONDON AND SOUTH WESTERN.		MIDLAND.	NORTH EASTERN	SOUTH EASTERN	CALEDONIAN.	GLASGOW AND SOUTH WESTERN	HIGHLAND.	NORTH BETTISH	OREAT NORTHERN OF S	SOUTHERN AND
	Beassner Acid	Bessener	Besseeuer Acid.	be east of bost Stoul for the purpose,	Bussemer Acid.	Besseiner Acid.										AND DESCRIPTION OF THE PARTY OF		WESTERS.
	Bessetter Acid	Bessener	Bessener And.	be east of bost Stoul for the purpose,	Bossoner Acid.	Besseiner Acid.												
	****	-		be east of bost Stoul for the purpose,			Bessenser Acid.	Bessetter Asid.		Bessesser Anid.		Bessezour Acid.		Bossesser Ania.	Bosecous	Benesis tel	Newsper heri	Densemble Raid.
				ute ore and charecal spagelessen.			Eigmons Martin Acid.	95 pp	- By all processes.		Personner And with Hometito Iron Bossitor Basic procuse with Cleveland Iron.	lace to	Resource, Stronge or other opually approved pro-			Seemen told		
						****	erus *											
		•																
placed on sup- apart and shall a blow from a ton, falling for of 20 fort mittee and without a	on supports 3 feet we mad shall then reserve to trees a sweight of 1 mail along from a height to the support without a pectuaness at the less and the second state of	teight of 18 tors to be cooperaded from intra-deflection not be used it of an chafter weight has been on half-ar- sar, permanent see after removal not asceed \$40 ars not. The same all placed bull-hand uppermat on arting 3 feet 6 inches epart quist	solid frequences & leaf & factor clear agart, and factor clear agart, and shall then resolve successive belows from a weight of 1100 lbs. Salivog a resignt of 10 fact. Rails not to break before or under the third blow, not take a permeating after the first blow encoding I trollers.	bull bead upwards on two two supports being such formations, with centres if heat 6 inches apart, then subjected to blown from a follow from such control of the following or defination beyond the following in- First blow 7 feet, initial displaces given be 1 inch, second blow 20 feet, until defination 3 inches to 6 jinches, III he Fall affort	farm bearurs 3 feet 6 reclass repart must bear one blove fewer a weight of one too. Alling a height of 20 feet, without fracture, the permanent set not to be less than 25 raches nor to exceed four toches.	3 feet 6 inches spart to receive tom bless from a weight of 1 ton falling a height of 20 feet, without on using greater per- masent deflection at first blow than 14 feethes, or than 34 inches		Lear a blace trees a weight of 1 ton fallow from a height of 20 feet. Pertament set not to be less than 12 feeb or more than 12 feeb.	6 inches alear apart and shall then receive blows a from a weight of 10 cents, talling a height of 10 feet. It Radis and to break belows or under the third them, nor take a permanent set after the first blow exceeding 11 tenders.	at defined more their at a narrier of an ineit with a englet of 20 time approached on the courts. Rail placed on brossign fact is incline apart to course two blows from a	shall thin receive two below. from a bold weighter one. I from a bold weighter one. I from a bold weight of 6 feet. No to show any signs of 8 feeture, and permanent a federation not to exceed one. I inch.	tends to see a vegar of the factor at the factor of the factor at the second permanents are then factor at the factor of the fac	becomes these leadings without a preside deflection than from and without my personned deflection utary from hold has been on for one form. Also tan short from a count of 1 non-balling a beight of 12 hos.	Insur Aught of 45 term was approach undersor before these bearing within the primary and the primary and the primary and within any primary and within any primary and approach and the primary and the primar	of 25 tons collectly between the marriage without performance for his marriage without performance for his marriage and 36 tons without A. Sail placed on two napperforms as item half winghting I not failing upon 6 fines a binghing I not failing upon 6 fines a binghing of 35 feet without the binds of 35 feet without the supplier of 35 feet without threading, and without a greater personation set files 1§ 16 feet 2 feet 15 feet 18 feet 2 fee	of I was falling a beight of 15 feet wedpost selection in more than Eg Index, and without aboveling are alignet feetowns.	personal up, and ill book	A State without free land. A State placed up beauty S been adjust to most large the blacks from a base cought 1 year, daying a Sangle 1 year, and a particular is last a patient indices.
nation.	me specified	None specified	- None specified	Carbon from 40 to 50 per cent. Silicon 198 to 00 Merganete , 50 to 50 Merganete , 50 to 50 Merganete , 50 to 50 Repharete to		Nane specified	Bossener And Siemens Martin Steel Steel Steel Per east Steel Steel Per east Steel Steel Steel Steel Per east Steel Steel Steel S	Non-modified	Tarbon to be from 3 to 46 Silicon not to be more than 00 Phospheres ditto 00 sulphur ditto 50. The only metall shall be Iton and Manganese.		Builts not to contain fors than 0-45 per cents of Carbon.	Name specified.	None specified			Non-special	Ship ill tons	Name agentical
	*						20 to 35 to 8								30 four per square inch of systemal area.			
d toll-way arrage of				Not less than 40 nor more than 48 tons per square inch.							Non-resided		Harris and the				16 16 75.	
nides.				Not less than 20 per cent in 2 imbes. Not given,		100	About 15 per cent, on lengths of 10 inches. About 22 per cent. A rather note Seal is used to inverse.	We codesinour to senter	mid Small has liable to fracture		1	No data		We profes though for Hally to be of the hard wide.		1	Not taken Sale Sant Sale less India let inseless in the June	
of fault-way		one specified	Note specified.	one specified. Nano specified. Nano specified.	Note specified. None specified. None specified. Not lose than 10 nor some than 16 form per square both. Not lose than 20 per reals in 2 imbes. Not given.	None specified. None specified. None specified. Not lose than 40 nor more than 45 som per square leeb. Rot lose than 20 per resh in 2 surber. Not given.	None specified. Not less than 40 nor some than 49 some per square feels. Not less than 20 per conk in 2 imbes. Not given.	Note specified. Note s	Note specified. Note s	Note specified. Note less than 40 nor specified. Not less than 40 nor specified. Not less than 20 nor square leads. About 15 per cent on lengths of 10 inches. Not given. A rather finds Sinal is used to invare to greater squares of cafety. Land (to reside nor), are	Note specified. Note last than 40 nor score than 45 nor score tha	Note specified. Note less than 40 nor specified. Not less than 40 nor specified. Not less than 40 nor specified. Not less than 50 per square less. Not less than 50 per sent on lengths of 40 inches. Not given. A rather bott Steal in need to invare a greater pressure of eafur. Not less than 50 per sent. We endearmy us senter MiddSteather light of pressure and the first regions of eafur. Not less than 50 per sent.	Note specified. Note specified. Note less than 40 are specified. Not less than 20 per cords in 2 inshes. Not given. A rather note Six and in many of safety. Not dess than 20 per cords in 2 inshes. Not given. We confourney to senare Midd Stanthar being lard (to reside seeing lard). We confourney to senare Midd Stanthar lard. Not data.	None specified. None s	None specified. None s	Note specified. None s	None specified. None s	None specified. None s

Appendix B.

MANUFACTURI

ENGLAND

						LIN	GLANI)
QUESTIONS.	CAMBRIAN.	FURNESS.	GREAT EASTERN.	GREAT NORTHERN.	GREAT WESTERN.	LANCASHIRE AND YORKSHIRE.	LONDON, BRIGHTON, AND SOUTH COAST.	
By what process is the Steel for Rails manufactured?							SOULL COASI.	
(a) Bessemer Acid	Bessemer Acid.	Bessemer Acid.	Bessemer.	Bessemer Acid.	1	Bessemer Acid.	Bessemer Acid.	
(L) Sigmone Wentin Agid					Ingots from which Rails are made to be cast of best Steel for the purpose, made from English or Spanish hæma-			
(b) Siemens Martin Acid			*		tite ore and charcoal spiegeleisen,	******	*****	
	******	******	6	******			*****	
To what tests are Rails subjected before acceptance?								
(a) Bending	No Specification,	placed on supports 3 feet apart, and shall then receive a blow from a weight of 1 ton, falling from a height of 20 feet without breaking, and without a permanent	A Rail to be placed, bull-head uppermost, on bearings 3 feet 6 inches apart. Weight of 18 tons to be suspended from centre, deflection not to exceed \(\frac{3}{8} \) of an inch after weight has been on half-anhour, permanent set after removal not to exceed \(\frac{1}{8} \) of an inch. The same Rail placed bull-head uppermost on bearings 3 feet 6 inches apart must bear two blows from ball weighing 1800 lbs. from a height of 8 feet without breaking, and without deflecting more than 1 inch.	solid iron supports, having solid foundations 3 feet 6 inches clear apart, and shall then receive successive blows from a weight of 1120 lbs. falling a height of 10 feet. Rails not to break before or under the third blow, not take a permanent set after the first blow	bull head upwards on two iron supports having solid foundations, with centres 3 feet 6 inches apart, then subjected to blows from a falling iron weight of one ton without fracture or deflection beyond the following:—First blow 7 feet, initial deflection inches a falling iron weight of one ton without fracture or deflection beyond the following:—First blow 7 feet, initial deflection inches inches in the following inches in the followin	head uppermost on perfectly firm bearers 3 feet 6 inches apart must bear one blow from a weight of one ton, falling a height of 20 feet, without fracture, the per- manent set not to be less than 21 inches nor to exceed	uppermost on iron bearings 3 feet 6 inches apart to receive two blows from a weight of I ten falling a height of 20 feet, without causing greater per- manent deflection at first blow than 1½ inches, or than 3½ inches	we wh
(b) Chemical	No Specification.	None specified.	None specified.	None specified.	Carbon from '40 to '50 per cent. Silicon ,, '10 to '06 ,, Manganese ,, '95 to '85 ,, Sulphur as low as possible, not to exceed '08 per cent. Phosphorus as low as possible, not to exceed '08 per cent.		None specified.	CSSEAL
(c) Tension								
Breaking weight in tons per square inch.	100 tons placed half-way between bearings of 3 feet 6 inches.				Not less than 40 nor more than 48 tons per square inch.			
Extension - per cent					Not less than 20 per cent. in 2 inches.			A
Contraction of Area—per cent					Not given.	J)	
Particulars as to the relative merits of Hard and Soft Steel				*****		*****	*****	

B. MANUFACTURE AND TESTING OF RAILS.

ENGLAND AND WALES.

				TATE	** ** **	HU:				
	GREAT WESTERN.	LANCASHIRE AND YORKSHIRE.	LONDON, BRIGHTON, AND SOUTH COAST.	LONDON AND NORTH WESTERN.	LONDON AND SOUTH WESTERN.	MANCHESTER SHEFFIELD AND LINCOLNSHIRE.	MIDLAND.	NORTH EASTERN.	SOUTH EASTERN.	
	1	Bessemer Acid.	Bessemer Acid.	Bessemer Acid.	Bessemer Acid.	1	Bessemer Acid.	1	Bessemer Acid.	1
	Ingots from which Rails are made to be cast of best Steel for the purpose, made from English or Spanish hæma- tite ore and charcoal spiegeleisen.	*****		Siemens Martin Acid.	******	By all processes.		Bessemer Acid with Hematite Iron. Bessemer Basic process with Cleveland Iron.		1
		*****	*****				*****			1
e f f k d		head uppermost on perfectly firm bearers 3 feet 6 inches apart must bear one blow from a weight of one ton, falling a height of 20 feet, without fracture, the permanent set not to be less than 24 inches nor to exceed four inches.	uppermost on iron bearings 3 feet 6 inches apart to receive two blows from a weight of 1 ton falling a height of 20 feet, without causing greater permanent deflection at first blow than 12 inches, or than 34 inches		bearings 3 feet apart must bear a blow from a weight of 1 ton falling from a height of 20 feet. Permanent set not to be less than 1\frac{1}{8} inch or more than 1\frac{7}{8} inch.	solid iron bearings 3 feet 6 inches clear apart, and shall then receive blows from a weight of 10 ewts, falling a height of 10 feet. Rails not to break before or	3 feet 6 inches apart must not deflect more than a quarter of an inch with a weight of 20 tons suspended from the centre. Rail placed on bearings 3 feet 6 inches apart to receive two blows from a	bearings 3 feet apart, and shall then receive two blows from a ball weighing one ton, falling a height of 5 feet. Not to show any signs of fracture, and permanent deflection not to exceed one inch.		3 i of bei a g an de be tw
	Carbon from 40 to 50 per cent. Silicon , 10 to 06 , Manganese , 95 to 85 , Sulphur as low as possible, not to exceed 08 per cent. Phosphorus as low as possible, not to exceed 08 per cent.		None specified.	Bessemer Acid Siemens Martin Acid Steel. Per cent. Carbon '20 to '40 '25 to '50 SiliconTrace ,, '10 '01 ,, '25 Sulphur '01 ,, '10 '05 ,, '10 Phosphorus '01 ,, '10 '05 ,, '15 Manganese '25 ,, 1·25 '25 ,, 1·25 Iron99·53 ,, 98·05 99·39 ,, 97·75		Per cent. Carbon to be from '3 to '45 Silicon not to be more than '06 Phosphorus ditto '06 Sulphur ditto '06 The only metals shall be Iron and Manganese.		Rails not to contain less than 0.45 per cent. of Carbon	None specified.	1
	Not less than 40 nor more than 48 tons per square inch.			30 to 35 tons.		*****		None specified.		The second second
	Not less than 20 per cent. in 2 inches.			About 15 per cent. on lengths of 10 inches.				None specimea.		
1	Not given.	1		About 22 per cent.)					
	*****	*****		A rather Soft Steel is used to insure a greater measure of safety.	We endeavour to secure Rails which, while being hard (to resist wear), are not brittle.	Mild Steel less liable to fracture			No data.	
										9

OF RAILS.

-									
					SCOT	LAND.		IREL	AND.
	MIDLAND.	NORTH EASTERN.	SOUTH EASTERN.	CALEDONIAN.	GLASGOW AND SOUTH WESTERN.	HIGHLAND.	NORTH BRITISH.	GREAT NORTHERN OF IRELAND.	GREAT SOUTHERN AND WESTERN.
	Bessemer Acid.		Bessemer Acid.		Bessemer Acid.	Bessemer.	Bessemer Acid.	Bessemer Acid.	Bessemer Acid.
	*****	Bessemer Acid with Hematite Iron. Bessemer Basic process with Cleveland Iron.		Bessemer, Siemens, or other equally approved process.		******	Siemens Acid.		*****
						*****		*****	
3 fe not qua wei from R 3 f rece wei 12	rter of an inch with a ght of 20 tons suspended a the centre.	bearings 3 feet apart, and shall then receive two blows from a ball weighing one ton, falling a height of 5 feet. Not to show any signs of fracture, and permanent deflection not to exceed one inch.	on first blow from a weight of 1 ton falling 14 feet not have a greater permanent set than 2½ inches, or more than 3½ inches at the second blow. Each Test Rail must bear reversing and	3 feet apart, shall bear a weight of 40 tons suspended midway between those bearings without a greater deflection than sinch, and without any permanent deflection after the load has been on for one hour. Also two blows from a weight of 1 ton falling a height of 12 feet without breaking, or more	length of Rail, placed on bearings 3 feet apart, shall bear weight of 40 tons suspended midway between these bearings without greater deflection than inch, and without any permanent deflection after the load has been on for one hour. Also two blows from a weight of 1 ton falling a	A Rail to be placed bull-head uppermost on bearings 3 feet 6 inches apart, must bear a weight of 20 tons midway between the bearings without permanent deflection, and 36 tons without fracture. A Rail placed on two supports, 3 feet apart, must stand two blows from an iron ball weighing 1 ton, falling upon it from a height of 20 feet without breaking, and without a greater permanent set than 3½	A Rail placed on bearings, 3 feet 8 inches apart, must bear one blow from a weight of 1 ton falling a height of 15 feet without deflecting more than 2½ inches, and without showing any imper-	A Rail placed on bearings 3 feet apart must bear a weight midway between the bearings of 23 tons without permanent set, and 35 tons without breaking. A Rail placed on bearings 3 feet apart must bear three blows from a ball weighing 18 cwt., falling from a height of 9 feet, without deflecting more than 3 inches.	blows from a ball weighing 1 ton, falling a height of 9 feet without deflecting
t.] 66] 66] 6]	None specified.	Rails not to contain less than 0.45 per cent. of Carbon	None specified.	None specified.			None specified.	Detail not given.	None specified.
						30 tons per square inch of sectional area.		32 to 39 tons.	
1		None specified.						16 to 23.	
								Not taken.	,
tro		*****	No data.		We prefer Steel for Rails to be of the hard side.	•••••		Soft Steel Rails less liable to fracture in the line.	