APPENDIX II.

TABLE CIX.—Showing Relation of Percentage of Carbon to Tensile Stress.

It is extremely difficult to give the tensile stress corresponding to different percentages of Carbon in commercial steels, as the strength of the material for the same Carbon content will vary according to the process of manufacture, the size of the finished section, and the percentages of other impurities present. The following table gives, approximately, what may be expected from steel of good quality in which the Manganese does not exceed ·8 per cent. When Manganese is above ·8, the tensile stress will be considerably higher. The table has been compiled from a large number of published results, and from the author's private records. The tensile stress for basic steels above ·5 is not given, as so little high Carbon basic steel is made in this country that a sufficient number of samples have not been available to obtain a fair average.

Acid Bessemer and basic Bessemer steels will not differ greatly from open hearth steel in tensile strength, especially in the low Carbon steels, and comparatively little high Carbon steel is made by these processes, except for rails.

Acid Open Hearth Steel.			Basic Open Hearth Steel.		
Carbon per cent.	Tensile Stress.		Carbon per cent.	Tensile Stress.	
	Tons per Square Inch.	Lbs. per Square Inch.		Tons per Square Inch.	Lbs. per Square Inch.
·05 to ·10	21 to 27	47,040 to 60,480	·05 to ·10	20 to 25	44,800 to 56,000
·10 ,, ·15	24 ,, 29	53,760 ,, 64,960	·10 ,, ·15	23 ,, 27	51,520 ,, 60,480
·15 ,, ·20	27 ,, 32	60,480 ,, 71,680	·15 ,, ·20	25 ,, 29	56,000 ,, 64,960
·20 ,, ·25	29 ,, 34	64,960 ,, 76,160	·20 ,, ·25	26 ,, 30	58,240 ,, 67,200
·25 ,, ·30	30 ,, 35	67,200 ,, 78,400	·25 ,, ·30	28 ,, 32	62,720 ,, 71,680
·30 ,, ·35	31 ,, 37	69,440 ,, 82,880	·30 ,, ·35	29 ,, 33	64,960 ,, 73,920
·35 ,, ·40	35 ,, 41	78,400 ,, 91,840	·35 ,, ·40	31 ,, 35	69,440 ,, 78,400
·40 ,, ·45	39 ,, 45	87,360 ,, 100,800	·40 ,, ·45	34 ,, 40	76,160 ,, 89,600
·45 ,, ·50	43 ,, 48	96,320 ,, 107,520	·45 ,, ·50	38 ,, 43	85,120 ,, 96,320
·50 ,, ·55	47 ,, 53	105,280 ,, 118,920			
·55 ,, ·60	50 ,, 55	112,000 ,, 123,200			
·60 ,, ·65	52 ,, 57	116,480 ,, 127,680			
·65 ,, ·70	55 ,, 60	123,200 ,, 134,400			
·70 ,, ·75	58 ,, 62	129,920 ,, 138,880			
·75 ,, ·80	60 ,, 64	134,400 ,, 143,360			
·80 ,, ·85	61 ,, 65	136,640 ,, 145,600			
·85 ,, ·90	63 ,, 67	141,120 ,, 150,800			

Note to Table C. (pp. 517-521).

To obtain the relation of stresses over 50 tons on the square inch, multiply or add two of the lines of figures given in the table. For instance, to find the number of kilos. per square mm. answering to 60 or 65 tons on the square inch:—

Multiplication.

30 tons per square inch = 47·25 kilos. per square millimetre.
2 2
60 ,, ,, = 94·50 ,, ,,

Addition.

50 tons per square inch = 78·75 kilos. per square millimetre.
15 ,, ,, = 23·62 ,, ,,
65 ,, ,, = 102·37 ,, ,,

APPENDIX III.

TABLE CX.—Showing how Tons per Square Inch and Lbs. per Square Inch compare with Kilogrammes per Square Millimetre.

(Calculated by John W. Hall.)

Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.
10·00	22,400	15·75	12·55	28,112	19·77	15·05	33,712	23·70
10·05	22,512	15·83	12·60	28,224	19·84	15·10	33,824	23·78
10·10	22,624	15·91	12·65	28,336	19·92	15·15	33,936	23·86
10·15	22,736	15·99	12·70	28,448	20·00	15·20	34,048	23·94
10·20	22,848	16·06	12·75	28,560	20·08	15·25	34,160	24·02
10·25	22,960	16·14	12·80	28,672	20·16	15·30	34,272	24·10
10·30	23,072	16·22	12·85	28,784	20·24	15·35	34,384	24·18
10·35	23,184	16·30	12·90	28,896	20·32	15·40	34,496	24·25
10·40	23,296	16·38	12·95	29,008	20·40	15·45	34,608	24·33
10·45	23,408	16·46				15·50	34,720	24·41
10·50	23,520	16·54	13·00	29,120	20·47	15·55	34,832	24·49
10·55	23,632	16·62	13·05	29,232	20·55	15·60	34,944	24·57
10·60	23,744	16·69	13·10	29,344	20·63	15·65	35,056	24·65
10·65	23,856	16·77	13·15	29,456	20·71	15·70	35,168	24·73
10·70	23,968	16·85	13·20	29,568	20·79	15·75	35,280	24·81
10·75	24,080	16·93	13·25	29,680	20·87	15·80	35,392	24·88
10·80	24,192	17·01	13·30	29,792	20·95	15·85	35,504	24·96
10·85	24,304	17·09	13·35	29,904	21·03	15·90	35,616	25·04
10·90	24,416	17·17	13·40	30,016	21·10	15·95	35,728	25·12
10·95	24,528	17·25	13·45	30,128	21·18			
			13·50	30,240	21·26	16·00	35,840	25·20
11·00	24,640	17·32	13·55	30,352	21·34	16·05	35,952	25·28
11·05	24,752	17·40	13·60	30,464	21·42	16·10	36,064	25·36
11·10	24,864	17·48	13·65	30,576	21·50	16·15	36,176	25·44
11·15	24,976	17·56	13·70	30,688	21·58	16·20	36,288	25·51
11·20	25,088	17·64	13·75	30,800	21·66	16·25	36,400	25·59
11·25	25,200	17·72	13·80	30,912	21·73	16·30	36,512	25·67
11·30	25,312	17·80	13·85	31,024	21·81	16·35	36,624	25·75
11·35	25,424	17·88	13·90	31,136	21·89	16·40	36,736	25·83
11·40	25,536	17·95	13·95	31,248	21·97	16·45	36,848	25·91
11·45	25,648	18·03				16·50	36,960	25·99
11·50	25,760	18·11	14·00	31,360	22·05	16·55	37,072	26·07
11·55	25,872	18·19	14·05	31,472	22·13	16·60	37,184	26·14
11·60	25,984	18·27	14·10	31,584	22·21	16·65	37,296	26·22
11·65	26,096	18·35	14·15	31,696	22·29	16·70	37,408	26·30
11·70	26,208	18·43	14·20	31,808	22·36	16·75	37,520	26·38
11·75	26,320	18·51	14·25	31,920	22·44	16·80	37,632	26·46
11·80	26,432	18·58	14·30	32,032	22·52	16·85	37,744	26·54
11·85	26,544	18·66	14·35	32,144	22·60	16·90	37,856	26·62
11·90	26,656	18·74	14·40	32,256	22·68	16·95	37,968	26·70
11·95	26,768	18·82	14·45	32,368	22·76			
			14·50	32,480	22·84	17·00	38,080	26·77
12·00	26,880	18·90	14·55	32,592	22·92	17·05	38,192	26·85
12·05	26,992	18·98	14·60	32,704	22·99	17·10	38,304	26·93
12·10	27,104	19·06	14·65	32,816	23·07	17·15	38,416	27·01
12·15	27,216	19·14	14·70	32,928	23·15	17·20	38,528	27·09
12·20	27,328	19·21	14·75	33,040	23·23	17·25	38,640	27·17
12·25	27,440	19·29	14·80	33,152	23·31	17·30	38,752	27·25
12·30	27,552	19·37	14·85	33,264	23·39	17·35	38,864	27·33
12·35	27,664	19·45	14·90	33,376	23·47	17·40	38,976	27·40
12·40	27,776	19·53	14·95	33,488	23·55	17·45	39,088	27·48
12·45	27,888	19·61				17·50	39,200	27·56
12·50	28,000	19·69	15·00	33,600	23·62	17·55	39,312	27·64

TABLE CX.—*Continued.*

Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.
17·60	39,424	27·72	20·30	45,472	31·97	23·00	51,520	36·22
17·65	39,536	27·80	20·35	45,584	32·05	23·05	51,632	36·30
17·70	39,648	27·88	20·40	45,696	32·13	23·10	51,744	36·38
17·75	39,760	27·96	20·45	45,808	32·21	23·15	51,856	36·46
17·80	39,872	28·03	20·50	45,920	32·29	23·20	51,968	36·54
17·85	39,984	28·11	20·55	46,032	32·37	23·25	52,080	36·62
17·90	40,096	28·19	20·60	46,144	32·44	23·30	52,192	36·70
17·95	40,208	28·27	20·65	46,256	32·52	23·35	52,304	36·78
			20·70	46,368	32·60	23·40	52,416	36·85
18·00	40,320	28·35	20·75	46,480	32·68	23·45	52,528	36·93
18·05	40,432	28·43	20·80	46,592	32·76	23 50	52,640	37·01
18·10	40,544	28·51	20·85	46,704	32 84	23·55	52,752	37·09
18·15	40,656	28·59	20·90	46,816	32·92	23·60	52,864	37·17
18·20	40,768	28·66	20·95	46,928	32·99	23·65	52,976	37·25
18·25	40,880	28·74				23·70	53,088	37·33
18·30	40,992	28·82				23·75	53,200	37·41
18·35	41,104	28·90	21·00	47,040	33·07	23·80	53,312	37·48
18·40	41,216	28·98	21·05	47,152	33·15	23·85	53,424	37·56
18·45	41,328	29·06	21·10	47,264	33·23	23·90	53,536	37·64
18·50	41,440	29·14	21·15	47,376	33·31	23·95	53,648	37·72
18·55	41,552	29·22	21·20	47,488	33·39			
18·60	41,664	29·29	21·25	47,600	33·47	24·00	53,760	37·80
18·65	41,776	29·37	21·30	47,712	33·55	24·05	53,872	37·88
18·70	41,888	29·45	21·35	47,824	33·63	24·10	53,984	37·96
18·75	42,000	29·53	21·40	47,936	33·70	24·15	54,096	38·04
18·80	42,112	29·61	21·45	48,048	33·78	24·20	54,208	38·11
18·85	42,224	29·69	21·50	48,160	33·86	24·25	54,320	38·19
18·90	42,336	29·77	21·55	48,272	33·94	24·30	54,432	38·27
18·95	42,448	29·85	21·60	48,384	34·02	24·35	54,544	38·35
			21·65	48,496	34·10	24·40	54,656	38·43
19·00	42,560	29·92	21·70	48,608	34·18	24·45	54,768	38·51
19·05	42,672	30·00	21·75	48,720	34·26	24·50	54,880	38·59
19·10	42,784	30·08	21·80	48,832	34 33	24·55	54,992	38·67
19·15	42,896	30·16	21·85	48,944	34·41	24·60	55,104	38·74
19·20	43,008	30·24	21·90	49,056	34·49	24·65	55,216	38·82
19·25	43,120	30·32	21·95	49,168	34·57	24·70	55,328	38·90
19·30	43,232	30·40				24·75	55,440	38·98
19·35	43,344	30·48	22·00	49,280	34·65	24·80	55,552	39·06
19·40	43,456	30·55	22·05	49,392	34·73	24·85	55,664	39·14
19·45	43,568	30·63	22·10	49,504	34·81	24·90	55,776	39·22
19·50	43,680	30·71	22·15	49,616	34·89	24·95	55,888	39·30
19·55	43,792	30·79	22·20	49,728	34·96			
19·60	43,904	30·87	22·25	49,840	35·04	25·00	56,000	39·37
19·65	44,016	30·95	22·30	49,952	35·12	25·05	56,112	39·45
19·70	44,128	31·03	22·35	50,064	35·20	25·10	56,224	39·53
19·75	44,240	31·11	22·40	50,176	35·28	25·15	56,336	39·61
19·80	44,352	31·18	22·45	50,288	35·36	25·20	56,448	39·69
19·85	44,464	31·26	22·50	50,400	35·44	25·25	56,560	39·77
19·90	44,576	31·34	22·55	50,512	35·52	25·30	56,672	39·85
19·95	44,688	31·42	22·60	50,624	35·59	25·35	56,784	39·93
			22·65	50,736	35·67	25·40	56,896	40·00
20·00	44,800	31·50	22·70	50,848	35·75	25·45	57,008	40·08
20·05	44,912	31·58	22·75	50,960	35·83	25·50	57,120	40·16
20·10	45,024	31·66	22·80	51,072	35·91	25·55	57,232	40·24
20·15	45,136	31·74	22·85	51,184	35·99	25·60	57,344	40·32
20·20	45,248	31·81	22·90	51,296	36·07	25·65	57,456	40·40
20·25	45,360	31·89	22·95	51,408	36·15	25·70	57,568	40·48

TABLE CX.—*Continued.*

Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.
25·75	57,680	40·56	28·45	63,728	44·81	31·15	69,776	49·06
25·80	57,792	40·63	28·50	63,840	44·89	31·20	69,888	49·14
25·85	57,904	40·71	28·55	63,952	44·97	31·25	70,000	49·22
25·90	58,016	40·79	28·60	64,064	45·04	31·30	70,112	49·30
25·95	58,128	40·87	28·65	64,176	45·12	31·35	70,224	49·38
			28·70	64,288	45·20	31·40	70,336	49·45
26·00	58,240	40·95	28·75	64,400	45·28	31·45	70,448	49·53
26·05	58,352	41·03	28·80	64,512	45·36	31·50	70,560	49·61
26·10	58,464	41·11	28·85	64,624	45·44	31·55	70,672	49·69
26·15	58,576	41·19	28·90	64,736	45·52	31·60	70,784	49·77
26·20	58,688	41·26	28·95	64.848	45·60	31·65	70,896	49·85
26·25	58,800	41·34				31·70	71,008	49·93
26·30	58,912	41·42	29·00	64,960	45·67	31·75	71,120	50·01
26·35	59,024	41·50	29·05	65,072	45·75	31·80	71,232	50·08
26·40	59,136	41·58	29·10	65,184	45·83	31·85	71,344	50·16
26·45	59,248	41·66	29·15	65,296	45·91	31·90	71,456	50·24
26·50	59,360	41·74	29·20	65,408	45·99	31·95	71,568	50·32
26·55	59,472	41·82	29·25	65,520	46·07			
26·60	59,584	41·89	29·30	65,632	46·15	32·00	71,680	50·40
26·65	59,696	41·97	29·35	65,744	46·23	32·05	71,792	50·48
26·70	59,808	42·05	29·40	65,856	46·30	32·10	71,904	50·56
26·75	59,920	42·13	29·45	65,968	46·38	32·15	72,016	50·64
26 80	60,032	42·21	29·50	66,080	46·46	32·20	72,128	50·71
26·85	60,144	42·29	29·55	66,192	46·54	32·25	72,240	50·79
26·90	60,256	42·37	29·60	66,304	46·62	32·30	72,352	50·87
26·95	60,368	42·45	29·65	66,416	46·70	32·35	72,464	50·95
			29·70	66,528	46·78	32·40	72,576	51·03
27·00	60,480	42·52	29·75	66,640	46·86	32·45	72,688	51·11
27·05	60,592	42·60	29·80	66,752	46·93	32·50	72,800	51·19
27·10	60,704	42·68	29·85	66,864	47·01	32·55	72,912	51·27
27·15	60,816	42·76	29·90	66,976	47·09	32·60	73,024	51·34
27·20	60,928	42·84	29·95	67,088	47·17	32·65	73,136	51·42
27·25	61,040	42·92				32·70	73,248	51·50
27·30	61,152	43·00	30·00	67,200	47·25	32·75	73,360	51·58
27·35	61,264	43·08	30·05	67,312	47 33	32·80	73,472	51·66
27·40	61,376	43·15	30·10	67,424	47·41	32·85	73,584	51·74
27·45	61,488	43·23	30·15	67,536	47·49	32·90	73,696	51·82
27·50	61,600	43·31	30·20	67,648	47 56	32·95	73,808	51·90
27·55	61,712	43·39	30·25	67,760	47·64			
27·60	61,824	43·47	30·30	67,872	47·72	33·00	73,920	51·97
27·65	61,936	43·55	30·35	67,984	47·80	33·05	74,032	52·05
27·70	62,048	43·63	30·40	68,096	47·88	33·10	74,144	52·13
27·75	62,160	43·71	30·45	68,208	47·96	33·15	74,256	52·21
27·80	62,272	43·78	30·50	68,320	48·04	33·20	74,368	52·29
27·85	62,384	43·86	30·55	68,432	48·12	33·25	74,480	52·37
27·90	62,496	43·94	30·60	68,544	48·19	33·30	74,592	52·45
27·95	62,608	44·02	30·65	68,656	48·27	33·35	74,704	52·53
			30·70	68,768	48 35	33·40	74,816	52·60
28·00	62,720	44·10	30·75	68,880	48·43	33·45	74,928	52·68
28·05	62,832	44·18	30·80	68,992	48·51	33·50	75,040	52·76
28·10	62,944	44·26	30·85	69,104	48·59	33·55	75,152	52·84
28·15	63,056	44·34	30·90	69,216	48·67	33·60	75,264	52·92
28·20	63,168	44·41	30·95	69,328	48·75	33·65	75,376	53·00
28·25	63,280	44·49				33·70	75,488	53·08
28·30	63,392	44·57	31·00	69,440	48·82	33·75	75,600	53·16
28·35	63,504	44·65	31·05	69,552	48·90	33·80	75,712	53·23
28·40	63,616	44·73	31·10	69,664	48·98	33·85	75,824	53·31

TABLE CX.—*Continued.*

Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.
33·90	75,936	53·39	36·60	81,984	57·64	39·30	88,032	61·90
33·95	76,048	53·47	36·65	82,096	57·72	39·35	88,144	61·98
			36·70	82,208	57·80	39·40	88,256	62·05
34·00	76,160	53·55	36·75	82,320	57·88	39·45	88,368	62·13
34·05	76,272	53·63	36·80	82,432	57·96	39·50	88,480	62·21
34·10	76,384	53·71	36·85	82,544	58·04	39·55	88,592	62·29
34·15	76,496	53·79	36·90	82,656	58·12	39·60	88,704	62·37
34·20	76,608	53·86	36·95	82,768	58·20	39·65	88,816	62·45
34·25	76,720	53·94				39·70	88,928	62·53
34·30	76,832	54·02	37·00	82,880	58·27	39·75	89,040	62·61
34·35	76,944	54·10	37·05	82,992	58·35	39·80	89,152	62·68
34·40	77,056	54·18	37·10	83,104	58·43	39·85	89,264	62·76
34·45	77,168	54·26	37·15	83,216	58·51	39·90	89,376	62·84
34·50	77,280	54·34	37·20	83,328	58·59	39·95	89,488	62·92
34·55	77,392	54·42	37·25	83,440	58·67			
34·60	77,504	54·49	37·30	83,552	58·75	40·00	89,600	63·00
34·65	77,616	54·57	37·35	83,664	58·83	40·05	89,712	63·08
34·70	77,728	54·65	37·40	83,776	58·90	40·10	89,824	63·16
34·75	77,840	54·73	37·45	83,888	58·98	40·15	89,936	63·24
34·80	77,952	54·81	37·50	84,000	59·06	40·20	90,048	63·31
34·85	78,064	54·89	37·55	84,112	59·14	40·25	90,160	63·39
34·90	78,176	54·97	37·60	84,224	59·22	40·30	90,272	63·47
34·95	78,288	55·05	37·65	84,336	59·30	40·35	90,384	63·55
			37·70	84,448	59·38	40·40	90,496	63·63
35·00	78,400	55·12	37·75	84,560	59·46	40·45	90,608	63·71
35·05	78,512	55·20	37·80	84,672	59·53	40·50	90,720	63·79
35·10	78,624	55·28	37·85	84,784	59·61	40·55	90,832	63·87
35·15	78,736	55·36	37·90	84,896	59·69	40·60	90,944	63·94
35·20	78,848	55·44	37·95	85,008	59·77	40·65	91,056	64·02
35·25	78,960	55·52				40·70	91,168	64·10
35·30	79,072	55·60	38·00	85,120	59·85	40·75	91,280	64·18
35·35	79,184	55·68	38·05	85,232	59·93	40·80	91,392	64·26
35·40	79,296	55·75	38·10	85,344	60·01	40·85	91,504	64·34
35·45	79,408	55·83	38·15	85,456	60·09	40·90	91,616	64·42
35·50	79,520	55·91	38·20	85,568	60·16	40·95	91,728	64·50
35·55	79,632	55·99	38·25	85,680	60·24			
35·60	79,744	56·07	38·30	85,792	60·32			
35·65	79,856	56·15	38·35	85,904	60·40	41·00	91,840	64·57
35·70	79,968	56·23	38·40	86,016	60·48	41·05	91,952	64·65
35·75	80,080	56·31	38·45	86,128	60·56	41·10	92,064	64·73
35·80	80,192	56·38	38·50	86,240	60·64	41·15	92,176	64·81
35·85	80,304	56·46	38·55	86,352	60·72	41·20	92,288	64·89
35·90	80,416	56·54	38·60	86,464	60·79	41·25	92,400	64·96
35·95	80,528	56·62	38·65	86,576	60·87	41·30	92,512	65·05
			38·70	86,688	60·95	41·35	92,624	65·13
36·00	80,640	56·7	38·75	86,800	61·03	41·40	92,736	65·20
36·05	80,752	56·78	38·80	86,912	61·11	41·45	92,848	65·28
36·10	80,864	56·86	38·85	87,024	61·19	41·50	92,960	65·36
36·15	80,976	56·94	38·90	87,136	61·27	41·55	93,072	65·44
36·20	81,088	57·01	38·95	87,248	61·35	41·60	93,184	65·52
36·25	81,200	57·09				41·65	93,296	65·60
36·30	81,312	57·17	39·00	87,360	61·42	41·70	93,408	65·68
36·35	81,424	57·25	39·05	87,472	61·50	41·75	93,520	65·76
36·40	81,536	57·33	39·10	87,584	61·58	41·80	93,632	65·83
36·45	81,648	57·41	39·15	87,696	61·66	41·85	93,744	65·91
36·50	81,760	57·49	39·20	87,808	61·74	41·90	93,856	65·99
36·55	81,872	57·57	39·25	87,920	61·82	41·95	93,968	66·07

TABLE CX.—*Continued.*

Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.	Tons per Sq. In.	Lbs. per Sq. In.	Kilos. per Sq. Mm.
42·00	94,080	66·15	44·75	100,240	70·48	47·40	106,176	74·65
42·05	94,192	66·23	44·80	100,352	70·56	47·45	106,288	74·73
42·10	94,304	66·31	44·85	100,464	70·64	47·50	106,400	74·81
42·15	94,416	66·39	44·90	100,576	70·72	47·55	106,512	74·89
42·20	94,528	66·46	44·95	100,688	70·80	47·60	106,624	74·97
42·25	94,640	66·54				47·65	106,736	75·05
42·30	94,752	66·62	45·00	100,800	70·87	47·70	106,848	75·13
42·35	94,864	66·70	45·05	100,912	70·95	47·75	106,960	75·21
42·40	94,976	66·78	45·10	101,024	71·03	47·80	107,072	75·28
42·45	95,088	66·86	45·15	101,136	71·11	47·85	107,184	75·36
42·50	95,200	66·94	45·20	101,248	71·19	47·90	107,296	75·44
42·55	95,312	67·02	45·25	101,360	71·27	47·95	107,408	75·52
42·60	95,424	67·09	45·30	101,472	71·35			
42·65	95,536	67·17	45·35	101,584	71·43	48·00	107,520	75·60
42·70	95,648	67·25	45·40	101,696	71·50	48·05	107,632	75·68
42·75	95,760	67·33	45·45	101,808	71·58	48·10	107,744	75·76
42·80	95,872	67·41	45·50	101,920	71·66	48·15	107,856	75·84
42·85	95,984	67·49	45·55	102,032	71·74	48·20	107,968	75·91
42·90	96,096	67·57	45·60	102,144	71·82	48·25	108,080	75·99
42·95	96,208	67·65	45·65	102,256	71·90	48·30	108,192	76·07
43·00	96,320	67·72	45·70	102,368	71·98	48·35	108,304	76·15
43·05	96,432	67·80	45·75	102,480	72·06	48·40	108,416	76·23
43·10	96,544	67·88	45·80	102,592	72·13	48·45	108,528	76·31
43·15	96,656	67·96	45·85	102,704	72·21	48·50	108,640	76·39
43·20	96,768	68·04	45·90	102,816	72·29	48·55	108,752	76·47
43·25	96,880	68·12	45·95	102,928	72·37	48·60	108,864	76·54
43·30	96,992	68·20				48·65	108,976	76·62
43·35	97,104	68·28	46·00	103,040	72·45	48·70	109,088	76·70
43·40	97,216	68·35	46·05	103,152	72·53	48·75	109,200	76·78
43·45	97,328	68·43	46·10	103,264	72·61	48·80	109,312	76·86
43·50	97,440	68·51	46·15	103,376	72·69	48·85	109,424	76·94
43·55	97,552	68·59	46·20	103,488	72·76	48·90	109,536	77·02
43·60	97,664	68·67	46·25	103,600	72·84	48·95	109,648	77·10
43·65	97,776	68·75	46·30	103,712	72·92			
43·70	97,888	68·83	46·35	103,824	73·00	49·00	109,760	77·17
43·75	98,000	68·91	46·40	103,936	73·08	49·05	109,872	77·25
43·80	98,112	68·98	46·45	104,048	73·16	49·10	109,984	77·33
43·85	98,224	69·06	46·50	104,160	73·24	49·15	110,096	77·41
43·90	98,336	69·14	46·55	104,272	73·32	49·20	110,208	77·49
43·95	98,448	69·22	46·60	104,384	73·39	49·25	110,320	77·57
			46·65	104,496	73·47	49·30	110,432	77·65
44·00	98,560	69·30	46·70	104,608	73·55	49·35	110,544	77·73
44·05	98,672	69·38	46·75	104,720	73·63	49·40	110,656	77·80
44·10	98,784	69·46	46·80	104,832	73·71	49·45	110,768	77·88
44·15	98,896	69·54	46·85	104,944	73·79	49·50	110,880	77·96
44·20	99,008	69·61	46·90	105,056	73·87	49·55	110,992	78·04
44·25	99,120	69·69	46·95	105,168	73·95	49·60	111,104	78·12
44·30	99,232	69·77				49·65	111,216	78·20
44·35	99,344	69·85	47·00	105,280	74·02	49·70	111,328	78·28
44·40	99,456	69·93	47·05	105,392	74·10	49·75	111,440	78·36
44·45	99,568	70·01	47·10	105,504	74·18	49·80	111,552	78·43
44·50	99,680	70·09	47·15	105,616	74·26	49·85	111,664	78·51
44·55	99,792	70·17	47·20	105,728	74 34	49·90	111,776	78·59
44·60	99,904	70·24	47·25	105,840	74·42	49·95	111,888	78·67
44·65	100,016	70·32	47·30	105,952	74·50			
44·70	100,128	70·40	47·35	106,064	74·58	50·00	112,000	78·75

APPENDIX IV.

RAPID DETERMINATION OF PHOSPHORUS AND MANGANESE.

THE following rapid methods of determining Phosphorus and Manganese may be found useful. The method for Phosphorus only gives comparative and very approximate results, but is useful for determining whether this constituent is above or below a certain limit in the bath of a basic Siemens furnace previous to tapping. The Manganese method gives excellent results, even as compared with the gravometric method.

PHOSPHORUS.—Solutions required—

No. 1, 400 grms. of Ammonium Nitrate + 500 c.c. Nitric Acid made up to 1,000 c.c.

No. 2, 50 grms. of Ammonium Molybdate + 100 grms. Ammonium Nitrate made up to 1,000 c.c.

·2 grm. of the steel is dissolved in 4 c.c. of No. 1 solution in a 6-inch test tube 1 inch in diameter, and is warmed; when dissolved, 4 c.c. of No. 2 solution are added, and the liquid heated to just the boiling point, diluted with hot water to a mark to fill tube one-third full, well agitated, and compared for turbidity with two standard steels, treated under identical conditions. Assuming it is necessary that the steel should contain less than ·08 per cent. Phosphorus, but not less than ·05 per cent., two standards of these percentages, respectively, are used. The comparison can be made in a few minutes, and enables the sample passer to say if the Phosphorus is well under ·08 per cent., and if the bath is ready to be tapped.

MANGANESE, WALTER'S METHOD.—Solutions—

Nitric Acid, specific gravity 1·2.

Nitrate of Silver, 1·33 grms. in 1,000 c.c. of water.

Ammonium Persulphate, 10 grms. dissolved in 30 c.c. of cold water *immediately before use.*

Dissolve ·1 grm. of steel in 5 c.c. of the acid, and heat in a water-bath until all nitrous fumes are expelled. Add 7½ c.c. of Nitrate of Silver solution and 3 c.c. of Ammonium Persulphate solution, well mix by pouring solution to and from a clean test tube, place in water-bath (not allowing water to boil), and warm for about two minutes after oxidation commences. Cool in cold water, and compare with standard steels containing known percentages of Manganese treated under identical conditions. It is absolutely necessary that fresh Ammonium Persulphate solution should be prepared every time.

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