

al it is desired to investigate, but those shown are the ones that have been considered important. The elimination of wheels slid flat, worn flanges and removed from tenders, leaves a balance, that while not corresponding to the classification of manufacturers and operating defects, is broadly affected by the quality of wheels turned out, so that the statement, fig. 2, is a record of the foundry output in this respect.

made or purchased for renewals. The former will evidently not be placed under foreign equipment to the same extent, but as this number has been under 10% of the total number placed in service each year its effect can be allowed for.

The reliability of the statement as a whole is confirmed by the fact that since 1908 it shows a decreased percentage of wheels removed and that the average life of the

An important point in this statement is the general agreement of the results shown throughout the life of any series of wheels with those shown in the first year or two. It appears almost certain that if the wheels are of good quality and carefully inspected there will be less poor wheels to fail in the first year or so, and this result will persist throughout their life. This result is certainly true in the case of 1904 and 1908 wheels and if it is confirmed by further experience, this form of statement furnishes a simple method of determining within a comparatively short time the service that may be expected from any group of wheels without the necessity for complicated records.

Figs. 3 and 4 are also interesting statements. Wheels slid flat, or worn flanges are not chargeable against the foundry, but they may be largely affected by the shops. Careless tapping and mating, cars down on side bearings and sundry other causes for worn flanges are all avoidable and results may be followed by means of this report. Slid flat wheels are also caused by improper maintenance and operation and may be

FIG. 2—STATEMENT OF C. P. R. 600 & 645 LBS. WHEELS REMOVED EXCEPT ACCOUNT OF WORN FLANGES, SLID FLAT AND TENDERS

Percentage Removed each year

Year Cast	No. Wheels Cast	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	Lbs.
1912	15384	.06												645
1911	42105	.04	.25											..
1910	35710	.04	.27	.85										..
1909	53390	.03	.38	1.11	2.28									..
1908	36165	.11	.56	1.09	1.98	3.16								600 & 645
1907	66730	.30	1.52	3.69	5.85	8.78	12.03	10.						..
1906	63819	.13	1.05	2.36	4.37	6.19	8.39	10.76						..
1905	49239	.13	.83	2.40	4.53	7.10	8.98	11.01	13.50					600
1904	32852	.07	.67	1.60	2.84	4.94	7.18	8.62	9.92	10.99				..
1903	35108	.16	1.38	3.45	5.84	8.16	10.96	13.61	15.29	16.54	17.33			..
1902	30288	.07	1.29	2.64	6.33	9.09	11.47	13.96	15.79	17.19	18.19	18.81		..
1901	27749	.16	1.10	3.45	6.30	9.15	11.92	14.1	16.6	19.0	20.38	21.60	22.78	..

FIG. 3—C. P. R. WHEELS REMOVED ON ACCOUNT OF WORN FLANGE AND SLID FLATS

Year Cast	No. Wheels Cast	1st Year			2nd Year			3rd Year			4th Year			5th Year			6th Year			7th Year			8th Year			9th Year			10th Year			lbs
		W	F	S	W	F	S	W	F	S	W	F	S	W	F	S	W	F	S	W	F	S	W	F	S	W	F	S	W	F	S	
1912	15384	.07	.62																											645		
1911	42105	.01	.26	.04	1.50																									..		
1910	35710	.01	.21	.07	1.95	.16	3.33																							..		
1909	53390	.01	.47	.05	2.25	.14	4.50	.36	5.47																					600 & 64.5		
1908	36165	.02	.53	.10	2.31	.33	3.83	.71	5.13	1.42	6.09																		..			
1907	66730	.02	.56	.20	2.41	.84	4.84	1.97	6.52	3.70	8.19	5.67	9.44																..			
1906	63819	.03	.73	.19	3.52	.81	6.13	2.34	8.53	4.39	9.98	6.43	11.27	8.29	12.16														..			
1905	49239	.04	.60	.42	2.67	1.89	4.72	4.28	6.39	7.69	7.97	10.79	8.99	31.41	9.64	15.32	10.14												600			
1904	32852	.06	.27	.40	2.57	2.01	4.58	5.44	6.35	9.36	7.74	13.87	8.88	17.36	9.49	19.86	9.81	10.14	21.30	10.0									..			
1903	35108	.03	.33	.44	1.99	2.46	3.61	6.01	4.93	9.84	5.80	13.31	6.64	16.40	7.35	18.51	7.70	19.72	7.96	20.55	8.13								..			

FIG. 4—C. P. R. WHEELS REMOVED ON ACCOUNT OF BROKEN FLANGE OR WHEEL

Year Cast	No. Wheels Cast	1st Year			2nd Year			3rd Year			4th Year			5th Year			6th Year			7th Year			8th Year			9th Year			10th Year			&
		B	F	W	B	F	W	B	F	W	B	F	W	B	F	W	B	F	W	B	F	W	B	F	W	B	F	W	B	F	W	
1912	15384	.02																												600 645 lbs.		
1911	42105	.01		.04	.002																									..		
1910	35710	.01		.04		.07																								..		
1909	53390	.01		.06	.003	.10		.19	.005																					..		
1908	36165	.02		.08		.14		.21	.005	.28	.02																			..		
1907	66730	.07		.18		.34		.53	.005	.68	.01	.85	.02																	..		
1906	63819	.05		.37		.61		.87	1.13	.005	1.35	.005	1.52	.011	1.31	.016														..		
1905	49239	.03		.17		.46		.65	.80	.005	1.04	.004	1.19	.01	1.31	.016														..		
1904	32852	.04		.12		.29		.48	.62	.005	.71	.003	.82	.003	.87	.003														..		
1903	35108	.03		.16		.29		.46	.64	.005	.77	.003	.87	.003	.96	.003	1.04	.006	1.11											..		
1902	30288	.03		.16		.30		.42	.49	.005	.64	.003	.71	.003	.76	.003	.79	.01	.81											..		
1901	27749	.02		.11		.19		.31	.46	.005	.54	.003	.63	.003	.67	.003	.70	.01	.76											..		
1900	31060	.02		.13		.29		.40	.53	.005	.61	.003	.67	.003	.74	.003	.79	.01	.83											..		

FIG. 5—MANUFACTURER. A. Percentage Removed Each Year

Year Cast	No. Wheels Cast	1st	2nd	3rd	4th	5th	6th	7th	Lbs.
1912	24975	.04							645
1911	19527	.05	.47						..
1910	8950	.08	.53	1.51					..
1909	8614	.14	.60	1.49	2.62				..
1908	23018	.04	.61	1.38	2.92	4.54			..
1907	14000	.04	.35	1.02	1.98	3.20	4.61		600
1906	1800	.16	.55	1.05	3.00	4.11	5.61	6.78	..
1907	4000		.22	1.90	4.32	7.36	11.36		600
1907	4000	.10	1.12	2.60	4.48	6.23	10.21		600

This statement shows several interesting features. There is evidently a decided variation in the percentage of the wheels removed of different years make, and it is only reasonable to suppose that where a larger percentage is removed in a given time, say 6 or 7 years, the life of the wheel is less. If this be granted some years makes are evidently considerably superior to others, for instance those made in 1904 were far better than the average, while those made since 1908 have been uniformly good.

If all wheels made were accounted for, there would of course be no assumption involved, but by an inspection of fig. 1 it will be seen that of the wheels made in 1902, only 51% have been accounted for in 1912. It is improbable that 49% are still in service and the difference is therefore to be accounted for by wheels placed under foreign cars or removed on foreign roads and not reported. This discrepancy might be reduced if the number of wheels of any make placed under foreign cars were deducted from the number made before calculating the percentage, but it would introduce a complication of doubtful advantages. The chief effect of this factor is in comparing wheels received under new cars with those

wheels removed has since that time increased as follows

Year	Manufacturers' Defects.		Operating Defects.		TOTAL	
	5 Yrs.	2 Ms.	4 Yrs.	5 Ms.	4 Yrs.	8 Ms.
1908	5	2	4	7	4	9
1909	5	7	4	9	5	11
1910	5	4	4	9	5	11
1911	5	9	5	0	5	4
1912	5	11	5	5	5	7

largely reduced by care.

It will be seen from this statement that there is comparatively little difference between the wheels removed for being slid flat of the various years make. There is, however, a most decided difference in the number removed for worn flange, the wheels made in 1906 being considerably better than those of previous years, while there is a still greater reduction in 1908. The percentage of 1908 wheels removed in 5 years