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USE OF ELECTRIC POWER

IN

MANUFACTURING AND MINING INDUSTRIES

IN

CANADA

1935

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Dominion Statistician, R.H. COATS, L.L. D., F.R.S.C., F.S.S. (Hon.)

Chief, Transportation and Public Utilities Branch, G.S. Wrong, B.Sc.

USE OF ELECTRIC POWER IN MANUFACTURING AND MINING INDUSTRIES IN CANADA 1935

This report, issued during the past six years, has attempted to show the evolution of power machinery in manufacturing and mining industries in Canada toward electric drive and particularly toward electric motors driven by power generated in central stations. With no coal mined in the chief manufacturing provinces of Ontario and Quebec and with a large supply of water power within economic transmission distance of manufacturing and mining centres in these and in most of the other provinces, this trend has been more pronounced than in many countries. The trend has been measured by the ratio of electric motor capacity to total power equipment installed in these industries, the central electric station industry being excluded as one of the manufacturing industries.

The report for the first four years also contained data on the production of electric power as reported monthly, but these data are now published monthly in a separate report.

This ratio of electric motor rating to total power equipment indicates this evolution, but the movement towards electric drive is slightly exaggerated because of the practice in mills, factories, etc., of installing motors at each machine or group of machines with a total capacity greater than would be necessary if only one large motor were used or if a steam engine and belts and shafting were used. In the early annual industrial censuses no segregation was made of electric motors operated on power purchased from central electric stations and on power produced within the establishment making the report. Consequently, 1923 is the first year for which total power employed can be compiled without duplication.

During the twelve years between 1923 and 1935 there has been very little net increase in the use of water power in manufacturing industries outside of the central electric station industry which is excluded here. Steam engines increased by 40.7 per cent and internal combustion engines increased by 88.7 per cent, but the use of this latter type is still a very small part (2 p.c.) of the total. Electric motors operated

on central station power, however, increased by almost 200 per cent and all electric motors increased by 157.4 per cent in capacity. The details are as follows:

POWER EQUIPMENT IN MANUFACTURING INDUSTRIES

	Capacity		Per cent of Increase
	1923	1935	
	H.P.	H.P.	P.C.
Water wheels	587,191	603,754	2.8
Steam engines	554,191	779,983	40.7
Internal combustion (gas & oil) engines	46,829	88,345	88.7
Total	1,188,211	1,472,082	23.9
Electric motors on purchased power	958,692	2,874,693	199.9
Total power	2,146,903	4,346,775	102.5
Electric motors on power produced in the industries	357,136	512,396	43.5
Total Electric Motors	1,315,828	3,387,098	157.4

The ratio of electric motor capacity to total power employed has increased steadily, the recessions being few and small. The saturation point will be reached somewhere below 100 per cent because direct hydraulic drive or steam or internal combustion engines always will be used in preference to electric motors in some plants. The rate of increase has been considerably less since 1929 than during the preceding six years, the increase being 3.2 points from 1929 to 1935 as against 13.4 points from 1923 to 1929. For 1935 data on spare or reserve equipment were collected and compiled for the first time and for all industries 5.9 per cent of the total capacity was reported not in use during the year. The equipment in regular use is more informative than total figures and when data for several years are available these tables will be compiled on the basis of equipment in regular use. In the meantime comparisons are possible only for total equipment in the operating plants. Although equipment in idle plants might be considered as idle or spare equipment in the industry or group of industries it is not included in these tables as reports are received only from plants in operation during the year. With increased business the idle equipment would probably be reduced but the bringing into operation of idle plants will not necessarily affect the proportion of equipment in regular use and the proportion idle.

Table 3 indicates that while the transfer to electric drive from other forms of power has been taking place in all groups of industries many of them were highly electrified in 1923 and the chief factor in increasing the ratio of electric power to total power in the total for all industries has been the development of the pulp and paper industry which is included with the "Wood and Paper Products" group and accounted for 79 per cent of the power equipment and 87 per cent of the electric motor capacity of that group in 1935. Eliminating this group from table 3 would give ratios of 74.6 per cent in 1923 and 84.6 per cent in 1935, or an increase of 10 points instead of an increase of 17 points with this group included. The lowering of the ratio of electric motors to total power from 84.6 to 77.9 per cent when the wood and paper group is included in the total is due to the direct hydraulic drive in pulp mills and the use of steam engines in saw mills, many of which use wood as fuel, and in planing mills, furniture factories, etc.

Table 4 shows the power equipment in regular use in manufacturing plants operating during 1935. The data in this table differ from those shown in previous reports in that idle equipment is excluded here except for the groups where total including and excluding idle equipment are shown. Under each group are shown only the industries having large power installations. Many other industries not listed use electric drive almost exclusively. The consumption of electricity for all purposes is also shown for each industry listed. This is not all used to drive machinery, large quantities being used in electric boilers in the pulp and paper mills, in electric furnaces, electric ovens, electro-chemical processes, etc., in other industries. As yet comprehensive statistics showing the break-down of these consumption data are not available.

The mining industries in Canada are nearly as completely electrified as the manufacturing industries with the exception of the fuel group and the increase in the ratio of electric motors to total power equipment during these twelve years has been even greater, rising from 57.3 per cent in 1923 to 75.7 per cent in 1935. Data for the mining industries are shown in Tables 2 and 7.

Tables 8, 9 and 10 show for the nine groups of manufacturing industries and the totals, (1) the horse power ratings of the power equipment, (2) the number of employees, and (3) the net value of production for the years 1923-1935, and the index numbers of these are charted on pages 14-17.

While the power equipment in all manufacturing industries more than doubled in capacity between 1923 and 1935, the net value of production rose to a peak in 1929 and then declined rapidly to 1932 and rose again in 1934 and in 1935. The two curves were approximately parallel from 1924 to 1929, but with the decline in business the net value of production naturally fell off while the equipment retained its position, although probably some of it was idle, and it also showed small net increases each year throughout the depression. The employees also increased in number from 1924 to 1929, but at a much lower rate than the power and net value of production and declined in somewhat the same way as the net value of production in 1930-1933 and rose in 1934 and again in 1935. The peak reached by the employee curve in 1929 was only 32 points above the 1923 level, whereas the power curve rose 80 points and by 1935 had reached 102.5 points above the 1923 level.

These curves show the steadily increasing spread between power and employees employed in manufacturing industries. The charts for some of the nine groups show much greater spreads than the curves for the totals and quite probably curves for individual industries would show even greater differences.

A change in method of computing the number of employees for the years 1925-1930, inclusive, tended to increase the number for these years so that the peaks in 1929 are higher than if this change had not been made and the divergence from the power curves is consequently less. For the years 1923 and 1924 and again 1931 onwards the number of employees was computed by dividing the sum of the monthly counts by 12. Thus it represented the average man year positions. For the years 1925-1930, inclusive, the sum of the monthly counts for each plant was divided by the number of months the plant operated which would give the average monthly employment. This second method produced a much higher figure for seasonal industries, such as fruit, vegetable and fish canneries, and was probably an important factor in raising the employee curve above the power curve for Group 1, "Vegetable Products", and for the sharp rise in 1925 for Group 2, "Animal Products", and some of the other groups. The change in method of computing employees would only cause breaks in the curves upward in 1925 and downward

in 1931 and would not affect the slopes of the curves except at these points. It is impossible, however, to calculate the exact effect of the change.

The three sets of data for these tables (8-9-10) and graphs were compiled from the same reports and consequently the curves indicate change in manufacturing technique, largely a substitution of mechanical power for man power.

The non-ferrous metal products industries showed an increase in power of 250 per cent from 1923 to 1929 and another 65 per cent to 1935, whereas the number of employees increased by only 86 per cent to 1929 and then declined to 1933. This group showed only 47 per cent electric drive in 1923 and 93 per cent in 1935. It is quite probable that this large increase in electric motors was a factor in this enormous spread between the power and employee curves. As stated above, over-installation is a characteristic of electric drive where individual motors are installed for each machine or groups of machines, but allowing half of the increase in electric motors in this group as excess capacity reduces the increase in power to 132 per cent between 1923 and 1929 for an increase in employees of only 86 per cent, 28 points of which were made in 1925 when the change in method of computation was made. This feature of electric drive probably affected the power curve of the "Wood and Paper Products" group which showed an increase in the ratio of electric motors to total power from 50 per cent in 1923 to 69 per cent in 1929 and to 72 per cent in 1935. The same adjustment for excess power in this group produced an increase in power between 1923 and 1929 of 46 per cent for an increase in employees of only 28 per cent. The increase in electric motor ratio to total power in the other groups did not exceed 11 points and, consequently, any excess motor capacity installed in these groups would have little effect on the spread between the power and employee curves.

It is not contended that the foregoing adjustment for excess motor capacity installed during these years is correct, but it is liberal. Even with it, a large difference existed between the rate at which the rated capacity of power equipment was being increased during the boom years up to 1929 and the rate at which the number of employees was being increased. With the revival of business in 1934 the employee curves moved upward farther than the power curves for all groups except the "Animal Products" group and in 1935 for all groups except the "Animal Products", "Textiles and Textile Products", and "Chemicals and Allied Products." For "Textiles and Textile Products" the index number for power rose from 203.9 in 1934 to 223.0 in 1935, or by 19.1 points, but the index number for employees advanced from 124.8 to 130.2, or by only 5.4 points. The reductions of the spread between the power and employee curves during these years were undoubtedly due to the re-employment of employees laid off during the depression and the bringing back into operation of equipment which had been idle but which had been included in data of previous years. Quite probably when all idle equipment in excess of what is necessary for emergencies, etc., is brought into service, the power curves will again rise more quickly than the employee curves, as was the case between 1923 and 1929 when the majority of industries were expanding and were fairly active.

Table 1. POWER EQUIPMENT OF ALL MANUFACTURING† INDUSTRIES IN CANADA

SUMMARY					
Year	Total power employed	Electric Motors Operated			Electric Power Per cent of total
		By central electric station power	By power generated in the industries	Total motor capacity	
	H.P.	H.P.	H.P.	H.P.	P.C.
1923	2,146,903	958,692	357,136	1,315,828	61.3
1924	2,538,535	1,256,183	398,001	1,654,184	65.2
1925	2,888,164	1,547,754	434,678	1,982,432	68.6
1926	3,134,248	1,770,334	392,322	2,162,656	69.0
1927	3,287,582	1,924,687	386,555	2,311,242	70.3
1928	3,592,184	2,139,129	457,565	2,596,694	72.3
1929	3,867,979	2,393,684	496,036	2,889,720	74.7
1930	4,051,744	2,518,853	478,548	2,997,401	74.0
1931	4,114,677	2,587,411	539,800	3,127,211	76.0
1932	4,157,420	2,694,164	516,157	3,210,321	77.2
1933	4,147,831	2,671,440	502,706	3,174,147	76.5
1934	4,244,696	2,779,913	550,500	3,330,413	78.5
1935	4,346,775	2,874,693	512,396	3,387,089	77.9

† Excluding central electric stations.

Table 2. POWER EMPLOYED IN THE MINING INDUSTRY† IN CANADA

Year	Total power employed	Electric Motors			Electric Power Per cent of total
		Operated by central electric station power	Operated by power generated in the industry	Total motor capacity	
	H.P.	H.P.	H.P.	H.P.	P.C.
1923	301,316	118,835	53,860	172,695	57.3
1924	314,173	125,725	71,376	197,101	62.7
1925	323,882	147,191	64,126	211,317	65.2
1926	336,880	167,241	64,277	231,518	68.7
1927	380,460	202,702	62,067	264,769	69.6
1928	419,464	223,666	68,121	291,787	69.6
1929	450,261	238,974	75,069	314,043	69.7
1930	509,007	297,826	88,585	386,411	75.9
1931	520,638	313,567	79,259	392,826	75.5
1932	482,344	287,130	76,626	363,756	75.4
1933	533,779	322,361	47,407	369,768	69.3
1934	621,071	400,035	66,647	466,682	75.1
1935	688,470	446,247	71,439	520,934	75.7

† Excluding non-ferrous smelting, salt, cement, clay products and lime, included with "Manufacturing."

Table 3. Manufacturing Industries	1923		1929		1934		1935	
	Power		Power		Power		Power	
	Total H.P.	Per cent electric motor	Total H.P.	Per cent electric motor	Total H.P.	Per cent electric motor	Total H.P.	Per cent electric motor
1. Vegetable Products ...	257,176	65	326,346	74	332,052	72	331,361	74
2. Animal Products ...	80,895	72	101,268	72	117,843	73	122,560	74
3. Textile Products ...	107,850	83	168,614	81	219,938	85	240,549	85
4. Wood and Paper Products ...	1,146,571	50	2,022,839	69	2,115,205	72	2,160,083	72
5. Iron and its Products...	213,705	89	529,162	100	637,718	86	660,491	82
6. Non-ferrous Metal Pdts.	99,963	47	351,752	82	405,248	94	416,927	93
7. Non-metallic Mineral Pdts.	131,780	83	210,804	88	231,586	87	222,555	84
8. Chemical and Allied Pdts.	62,447	72	83,935	77	115,082	85	130,464	86
9. Miscellaneous	46,516	86	73,259	86	70,024	84	61,785	89
TOTAL	2,146,903	61	3,867,979	75	4,244,696	78	4,346,775	78

Table 4. POWER EQUIPMENT OF MANUFACTURING INDUSTRIES IN CANADA, 1935

(Equipment in Regular Use)

Industries	Total Power Employed	Electric Motors Operated			Electric Power	Consumption of Electricity		
		By central electric station power	By power generated in the industries	Total motor capacity	Per cent of total	Purchased from cent. elec. stations	Generated by the industries	Total
	H.P.	H.P.	H.P.	H.P.	P.C.	(Thousands of Kilowatt Hours)		
Group 1. VEGETABLE PRODUCTS.. (X	331,361	223,051	23,088	246,139	74.3			
(	316,682	213,577	22,965	236,542	72.8	377,412	21,590	399,002
Biscuits, confectionery, etc..	20,656	18,055	121	18,176	88.0	38,354	...	38,354
Bread & bakery products	14,896	13,514	4	13,518	90.7	26,594	...	26,594
Breweries	23,212	17,284	648	17,932	77.3	25,580	144	25,724
Flour and feed mills	113,316	56,672	2,871	59,543	52.5	99,503	587	100,090
Rubber goods, footwear, etc..	62,177	59,303	900	60,203	96.8	126,101	1,865	127,966
Sugar refineries	19,745	6,565	14,247	20,812	100.0	12,118	11,130	23,248
Group 2. ANIMAL PRODUCTS ..... (X	122,560	87,930	2,988	90,918	74.2			
(	118,171	85,904	2,930	88,834	75.2	124,451	844	125,295
Butter and cheese	39,847	26,683	...	26,683	67.0	22,394	...	22,394
Leather tanneries	14,187	11,889	766	12,655	89.2	13,429	...	13,429
Slaughtering & meat packing..	34,571	29,831	415	30,246	87.5	64,012	...	64,012
Group 3. TEXTILES AND TEXTILE (X	240,549	182,186	22,463	204,649	85.1			
PRODUCTS ..... (	219,387	177,038	22,058	199,096	90.8	446,801	57,656	504,457
Cotton yarn and cloth	96,255	81,803	13,875	95,678	99.4	242,949	36,128	279,077
Dyeing, cleaning & laundering	14,323	9,147	219	9,366	65.4	14,205	575	14,780
Hosiery and knitted goods ...	17,067	9,706	1,715	11,421	66.9	17,453	2,170	19,623
Silk and artificial silk	20,163	16,733	2,264	18,997	94.2	104,280	6,548	110,828
Woollen cloth	14,397	11,204	500	11,704	81.3	16,013	614	16,627
Group 4. WOOD AND PAPER (X	2,160,083	1,202,403	355,691	1,558,094	72.1			
PRODUCTS..... (	2,078,032	1,171,787	350,904	1,522,691	73.3	9,499,549	1,260,893	10,760,442
Furniture	20,240	11,761	1,563	13,324	65.8	9,600	...	9,600
Planing mills, sash & door ..	44,034	26,072	1,172	27,244	61.9	12,675	372	13,047
Printing and publishing	23,962	22,735	646	23,381	97.6	27,571	45	27,616
Pulp and paper	1,631,112	1,025,771	300,857	1,326,628	81.3	9,379,312	1,212,952	10,592,264
Saw mills	276,975	24,789	42,910	67,699	24.4	14,457	47,200	61,657

Group 5. IRON AND ITS PRODUCTS	X	660,491	473,584	69,395	542,979	82.2		
	†	615,772	459,013	64,915	523,928	85.1	610,447	41,632	652,079
Agricultural implements		22,041	18,604	72	18,676	84.7	15,141	1	15,142
Automobiles		29,554	12,886	19,333	32,219	100.0	14,365	28,894	43,259
Automobile supplies		33,606	31,976	...	31,976	95.1	30,694	...	30,694
Bridge and structural steel		26,258	25,008	1,056	6,064	23.1	6,190	...	6,190
Castings and forgings		57,103	54,672	838	55,510	97.2	57,982	805	58,787
Machinery		41,539	36,821	3,029	39,850	95.9	17,282	4,358	21,640
Primary iron and steel		231,776	125,706	32,147	157,853	68.1	318,650	1,573	320,223
Railway rolling stock		103,993	90,072	6,460	96,532	92.8	78,397	5,753	84,150
Group 6. NON FERROUS METAL PRODUCTS	X	416,927	367,123	22,467	389,590	93.4		
	†	360,338	324,426	21,810	346,236	96.1	1,148,653	29,474	1,178,127
Brass and copper		24,854	23,431	340	23,771	95.6	22,659	...	22,659
Electrical apparatus and supplies		73,309	65,484	4,978	70,462	96.1	51,141	...	51,141
Non-ferrous metal smelting		249,815	223,161	16,492	239,653	95.9	1,054,483	18,601	1,073,084
Group 7. NON-METALLIC MINERAL PRODUCTS	X	222,555	181,293	6,147	187,440	84.2		
	†	205,477	171,870	5,989	177,859	86.6	526,546	5,788	532,334
Abrasive products		7,253	7,253	...	7,253	100.0	286,388	...	286,388
Cement		58,676	56,833	756	57,589	98.0	51,959	86	52,045
Clay products from domestic clay		23,847	17,683	119	17,802	74.7	6,628	210	6,838
Coke and gas products		26,711	20,163	2,244	22,407	83.9	47,940	...	47,940
Glass products		11,965	11,756	...	11,756	98.3	25,210	...	25,210
Miscellaneous non-metallic products		13,128	12,800	58	12,858	97.9	38,124	...	38,124
Petroleum products		35,039	21,549	...	21,549	61.5	49,154	...	49,154
Group 8. CHEMICALS AND CHEMICAL PRODUCTS	X	130,464	104,671	7,600	112,271	86.1		
	†	117,500	95,092	7,001	102,093	86.9	1,119,890	78,773	1,198,663
Acids, alkalies and salts		61,570	45,358	6,170	51,528	83.7	774,594	77,672	852,266
Fertilizers		18,097	18,002	...	18,002	99.5	221,067	...	221,067
Soaps and washing compounds		5,989	5,169	...	5,169	86.3	6,350	...	6,350
Group 9. MISC. INDUSTRIES	X	61,785	52,452	2,557	55,009	89.0		
	†	60,069	51,046	2,557	53,603	89.2	39,039	124	39,163
Ice, artificial		10,404	10,354	...	10,354	99.5	21,140	...	21,140
Ship building and repairs		35,908	28,904	2,442	31,346	87.3	7,723	...	7,723
TOTAL ALL INDUSTRIES	X	4,346,775	2,874,693	512,396	3,387,089	77.9			
	†	4,091,428	2,749,753	501,129	3,250,882	79.5	13,892,788	1,496,774	15,389,562

X - Including equipment held idle or in reserve, which is comparable with totals in previous reports.
† Excluding central electric stations.

Table 5. POWER EMPLOYED IN MANUFACTURING[f] INDUSTRIES, BY PROVINCES, 1935.

IN REGULAR USE

Provinces	Total power employed	Electric Motors Operated			Electric Power	Consumption of Electricity		
		By central electric station power	By power generated in the industries	Total motor capacity	Per cent of total	Purchased from central electric stations	Generated by the industries	Total
	H.P.	H.P.	H.P.	H.P.	P.C.	(Thousands of Kilowatt Hours)		
P.E. Island	3,899	665	1	666	17.0	378	2	380
Nova Scotia	201,049	95,566	11,027	106,593	53.0	200,711	30,475	231,186
New Brunswick ...	188,204	95,544	45,793	141,337	75.1	302,040	121,312	423,352
Quebec	1,425,233	1,090,806	98,499	1,189,305	83.4	7,751,525	269,652	8,021,177
Ontario	1,584,534	1,080,203	221,320	1,301,523	82.1	4,435,051	704,439	5,139,490
Manitoba	119,692	104,922	1,060	105,982	88.5	248,438	1,818	250,256
Saskatchewan	34,714	20,549	96	20,645	59.5	32,748	140	32,888
Alberta	67,286	40,118	2,343	42,461	63.1	36,114	1,971	38,085
British Columbia and Yukon	466,817	221,380	120,990	342,370	73.3	885,783	366,965	1,252,748
CANADA[X]	4,091,428	2,749,753	501,129	3,250,882	79.5	13,892,788	1,496,774	15,389,562
INCLUDING IDLE AND RESERVE EQUIPMENT								
P.E. Island	4,047	705	1	706	17.4			
Nova Scotia	209,719	97,100	11,027	108,127	51.6			
New Brunswick ...	196,821	96,958	46,875	143,833	73.1			
Quebec	1,506,717	1,127,225	101,428	1,228,653	81.5			
Ontario	1,706,352	1,146,297	228,408	1,374,705	80.6			
Manitoba	127,820	107,683	1,060	108,743	85.1			
Saskatchewan	37,070	21,000	96	21,096	56.9			
Alberta	70,128	41,433	2,343	43,776	62.4			
British Columbia and Yukon	488,101	236,292	121,158	357,450	73.2			
CANADA	4,346,775	2,874,693	512,396	3,387,089	77.9			

f Excluding central electric stations.

POWER EQUIPMENT - IN REGULAR USE AND TOTAL INCLUDING STAND AND RESERVE, 1935

Table 6. MANUFACTURING INDUSTRIES

	TOTAL POWER EMPLOYED		ELECTRIC MOTORS OPERATED BY						ELECTRIC POWER Per Cent of Total		CONSUMPTION OF ELECTRICITY		
			Central Station Power		Power Generated in the Industries		Total						
	In Regular Use	Including Reserve Equipment	In Regular Use	Including Reserve	In Regular Use	Including Reserve	In Regular Use	Including Reserve	Regular	Including Reserve	Purchased from Cent. Elec. Stations	Generated by the Industries	Total
	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.	P.C.	P.C.	(Thousands of Kilowatt Hours)		
1. Vegetable Products	316,682	331,361	213,577	223,051	22,965	23,088	236,542	246,139	72.8	74.3	377,412	21,590	399,002
2. Animal Products	118,171	122,560	85,904	87,930	2,930	2,988	88,834	90,918	75.2	74.2	124,451	844	125,295
3. Textiles and Textile Products	219,387	240,549	177,038	182,186	22,058	22,463	199,096	204,349	90.8	85.1	446,801	57,656	504,457
4. Wood and Paper Products	2,078,032	2,160,083	1,171,787	1,202,403	350,904	355,691	1,522,691	1,558,094	73.3	72.1	9,499,549	1,260,893	10,760,442
5. Iron and its Products	815,772	660,491	459,013	473,584	64,915	69,395	523,928	542,979	85.1	82.2	610,447	41,632	652,079
6. Non-ferrous Metal Products	360,338	416,927	324,426	367,123	21,810	22,467	346,236	389,590	96.1	93.4	1,148,653	29,474	1,178,127
7. Non-metallic Mineral Pdts..	205,477	222,555	171,870	181,293	5,989	6,147	177,859	187,440	86.6	84.2	526,546	5,788	532,334
8. Chemicals and Chemical Pdts.	117,500	130,464	95,092	104,671	7,001	7,600	102,093	112,271	86.9	86.1	1,119,890	78,773	1,198,663
9. Miscellaneous Industries ...	60,069	61,785	51,046	52,452	2,557	2,557	53,603	55,009	89.2	89.0	39,039	124	39,163
TOTAL	4,091,428	4,346,775	2,749,753	2,874,693	501,129	512,396	3,250,882	3,387,089	79.5	77.9	13,892,788	1,496,774	15,389,562

Table 7. MINING INDUSTRIES

Metal mining	317,621	365,334	248,350	267,862	36,865	39,336	285,215	307,198	89.9	86.5	687,958	91,553	779,511
Non-metal mining....	59,420	64,129	51,430	55,067	2,904	3,179	54,334	58,246	91.4	90.8	78,308	5,532	83,840
Sand, Gravel & Stone	39,209	44,577	28,114	31,496	763	890	28,877	32,386	73.6	72.7	19,186	339	19,525
Fuels	204,947	214,430	82,339	91,822	30,907	31,282	113,246	123,104	55.3	57.4	105,437	39,264	144,701
TOTAL	621,197	688,470	410,233	446,247	71,439	74,687	481,672	520,934	77.6	75.7	890,889	136,688	1,027,577

MANUFACTURING INDUSTRIES

Table 8. POWER EMPLOYED
H.P.

	1923	1924	1925	1926	1927	1928
1. Vegetable products	257,176	258,719	266,709	267,643	280,170	309,611
2. Animal products	80,895	89,491	89,823	96,151	101,650	104,166
3. Textiles & textile products	107,850	139,482	144,579	153,295	157,055	163,779
4. Wood and paper products	1,146,571	1,215,688	1,317,502	1,552,885	1,770,909	1,908,738
5. Iron and its products	213,705	350,955	461,961	422,356	451,576	488,521
6. Non-ferrous metal products	99,963	104,010	222,737	228,870	237,520	294,642
7. Non-metallic mineral pdts.	131,780	121,386	126,190	150,915	160,196	181,666
8. Chemical & allied products	62,447	59,870	58,502	63,635	65,898	71,401
9. Miscellaneous industries	46,516	44,050	45,277	44,148	62,608	69,660
TOTAL	2,146,903	2,383,651	2,733,280	2,979,898	3,287,582	3,592,184

Table 9. EMPLOYEES
No.

1. Vegetable products	65,395	66,183	72,035	73,908	78,300	83,764
2. Animal products	61,517	57,779	63,675	67,843	68,381	67,777
3. Textiles & textile products	92,669	90,254	94,531	100,572	107,519	113,724
4. Wood and paper products	128,404	127,551	127,859	134,187	150,550	158,005
5. Iron and its products	88,071	78,314	90,125	103,510	106,293	119,199
6. Non-ferrous metal products	21,409	21,670	27,735	30,095	33,443	35,568
7. Non-metallic mineral pdts.	24,978	24,186	24,468	26,045	26,662	28,650
8. Chemical & allied products	15,149	13,796	13,951	14,345	14,559	16,130
9. Miscellaneous industries	16,581	15,814	16,583	17,628	18,518	19,351
TOTAL	514,173	495,547	530,962	568,133	604,225	642,168

Table 10. NET VALUE OF PRODUCTION
(Thousands of dollars)

1. Vegetable products	209,884	220,331	227,526	244,004	283,375	317,073
2. Animal products	110,090	109,784	115,863	122,921	132,261	133,697
3. Textiles & textile products	157,994	141,804	143,950	163,502	183,137	191,672
4. Wood and paper products	319,216	300,425	310,643	339,063	357,787	389,390
5. Iron and its products	209,542	174,107	205,041	247,168	264,819	300,015
6. Non-ferrous metal products	45,424	50,968	85,702	92,889	112,757	139,221
7. Non-metallic mineral pdts.	74,673	76,833	78,970	91,863	89,434	112,398
8. Chemical & allied products	56,606	53,905	56,608	62,465	63,854	72,813
9. Miscellaneous industries	36,455	33,317	33,989	39,836	44,467	50,440
TOTAL	1,219,884	1,161,474	1,258,292	1,403,711	1,531,891	1,706,719

MANUFACTURING INDUSTRIES

POWER EMPLOYED
H.P.

	1929	1930	1931	1932	1933	1934	1935
	326,346	313,527	322,401	326,829	326,666	332,052	331,361
	101,268	105,833	98,892	100,069	112,035	117,843	122,560
	168,614	171,324	186,952	189,915	215,907	219,938	240,549
	2,022,839	2,126,515	2,126,398	2,094,010	2,035,112	2,115,205	2,160,083
	529,162	576,609	589,261	623,888	626,730	637,718	660,491
	351,752	401,817	424,738	450,271	434,581	405,248	416,927
	210,804	213,917	212,179	209,484	219,612	231,586	222,555
	83,935	87,382	96,893	105,671	110,873	115,082	130,464
	73,259	54,820	56,963	57,283	66,315	70,024	61,785
	3,867,979	4,051,744	4,114,677	4,157,420	4,147,831	4,244,696	4,346,775

EMPLOYEES
No.

	88,858	84,182	77,706	72,390	73,095	77,464	79,285
	67,670	57,657	51,297	49,953	53,111	57,199	60,124
	115,620	109,576	105,473	102,116	106,235	115,695	120,699
	164,800	156,724	121,672	107,834	105,471	116,691	123,724
	132,281	119,987	96,927	74,214	70,947	81,782	95,426
	39,867	38,756	34,414	26,704	25,273	30,177	33,613
	31,431	29,868	24,895	20,342	19,296	21,959	23,342
	16,694	15,503	15,207	15,295	15,397	17,130	18,933
	21,049	14,328	12,821	11,155	10,361	12,091	12,270
	678,270	626,581	540,412	480,003	479,186	530,188	567,416

NET VALUE OF PRODUCTION
(Thousands of dollars)

	344,438	314,513	274,475	211,601	197,607	210,899	226,140
	132,410	132,212	106,060	95,623	91,638	94,998	104,268
	205,943	177,251	163,967	144,943	150,131	160,723	173,186
	411,616	368,351	291,858	227,252	207,175	223,241	266,120
	353,087	288,032	203,970	123,542	114,256	143,370	186,247
	158,645	138,720	116,520	84,176	92,775	112,156	113,616
	124,874	109,606	102,486	73,407	70,077	71,357	87,215
	83,361	71,805	64,745	60,003	58,549	62,216	70,257
	60,092	35,458	28,190	21,258	17,919	21,522	22,287
	1,874,466	1,635,948	1,352,271	1,041,805	1,000,127	1,100,482	1,249,336

MANUFACTURING INDUSTRIES

INDEX NUMBERS
(1923 = 100)

Table 11. POWER EMPLOYED

	1923	1924	1925	1926	1927
1. Vegetable products	100	100.6	103.7	104.1	108.9
2. Animal products	100	110.6	111.0	118.9	125.7
3. Textiles and textile products	100	129.3	134.0	142.1	145.6
4. Wood and paper products	100	106.0	114.9	135.4	154.5
5. Iron and its products	100	164.2	216.2	197.6	211.3
6. Non-ferrous metal products	100	104.0	222.8	229.0	237.6
7. Non-metallic mineral products	100	92.0	95.8	114.5	121.6
8. Chemical & allied products	100	95.9	93.7	101.9	105.5
9. Miscellaneous industries	100	94.7	97.3	94.9	134.6
Total	100	111.0	127.3	138.8	153.1

Table 12. EMPLOYEES

1. Vegetable products	100	101.2	110.2	113.0	119.7
2. Animal products	100	93.9	103.5	110.3	111.1
3. Textiles and textile products	100	97.4	102.0	108.5	116.0
4. Wood and paper products	100	99.3	99.6	104.5	117.2
5. Iron and its products	100	88.9	102.3	117.5	120.7
6. Non-ferrous metal products	100	101.2	129.5	140.6	156.2
7. Non-metallic mineral products	100	96.8	98.0	104.3	106.7
8. Chemical & allied products	100	91.1	92.1	94.7	96.1
9. Miscellaneous industries	100	95.4	100.0	106.3	111.7
Total	100	96.4	103.2	110.5	117.5

Table 13. NET VALUE OF PRODUCTION

1. Vegetable products	100	105.0	108.4	116.3	135.0
2. Animal products	100	99.7	105.2	111.7	120.1
3. Textiles and textile products	100	89.8	91.1	103.5	115.9
4. Wood and paper products	100	94.1	97.3	106.2	112.1
5. Iron and its products	100	83.1	97.9	118.0	126.4
6. Non-ferrous metal products	100	112.2	188.7	204.5	248.2
7. Non-metallic mineral products	100	102.9	105.8	123.0	119.8
8. Chemical & allied products	100	95.2	100.0	110.4	112.8
9. Miscellaneous industries	100	91.4	93.2	109.3	122.0
Total	100	95.2	103.1	115.1	125.6

MANUFACTURING INDUSTRIES

INDEX NUMBERS
(1923 = 100)

POWER EMPLOYED

	1928	1929	1930	1931	1932	1933	1934	1935
	120.4	126.9	121.9	125.4	127.1	127.0	129.1	128.8
	128.8	125.2	130.8	122.2	123.7	138.5	145.7	151.5
	151.9	156.3	158.8	173.3	176.1	200.2	203.9	223.0
	166.5	176.4	185.5	185.5	182.6	177.5	184.5	188.4
	228.6	247.6	269.8	275.7	291.9	293.3	298.4	309.1
	294.7	351.9	402.0	424.9	450.4	434.7	405.4	417.1
	137.9	160.0	162.3	161.0	159.0	166.7	175.7	168.9
	114.3	134.4	139.9	155.2	169.2	177.6	184.3	208.9
	149.7	157.5	117.9	122.4	123.1	142.6	150.5	132.8
	167.3	180.2	188.7	191.7	193.6	193.2	197.7	202.5

EMPLOYEES

	128.1	135.9	128.7	118.8	110.7	111.8	118.5	121.2
	110.2	110.0	93.7	83.4	81.2	86.3	93.0	97.7
	122.7	124.8	118.2	113.8	110.2	114.6	124.8	130.2
	123.1	128.3	122.1	94.8	84.0	82.1	90.9	96.4
	135.3	150.2	136.2	110.0	84.3	80.6	92.9	108.4
	166.1	186.2	181.0	160.7	124.7	118.0	141.0	157.0
	114.7	125.8	119.6	99.7	81.4	77.3	87.9	93.5
	106.6	110.2	102.3	100.4	101.0	101.6	113.1	125.0
	116.7	126.9	86.4	77.3	67.3	62.5	72.9	74.0
	124.9	131.9	121.9	105.1	93.4	93.2	103.1	110.4

NET VALUE OF PRODUCTION

	151.1	164.1	149.9	130.8	100.8	94.2	100.5	107.7
	121.4	120.3	120.1	96.3	86.8	83.2	86.3	94.7
	121.3	130.3	112.2	103.8	91.7	95.0	101.7	109.6
	122.0	128.9	115.4	91.4	71.2	64.9	69.9	83.4
	143.2	168.5	137.5	97.3	59.0	54.5	68.4	88.9
	306.5	349.3	305.4	256.5	185.3	204.2	246.9	250.1
	150.5	167.2	146.8	137.2	98.3	93.8	95.5	116.8
	128.6	147.3	126.9	114.4	106.0	103.4	109.9	124.1
	138.3	164.8	97.3	77.3	58.3	49.2	59.0	61.1
	139.9	153.7	134.1	110.9	85.4	82.0	90.2	102.4

MANUFACTURING INDUSTRIES

1923=100

Chart 1

POWER EMPLOYED
EMPLOYEES
NET VALUE OF PRODUCTION

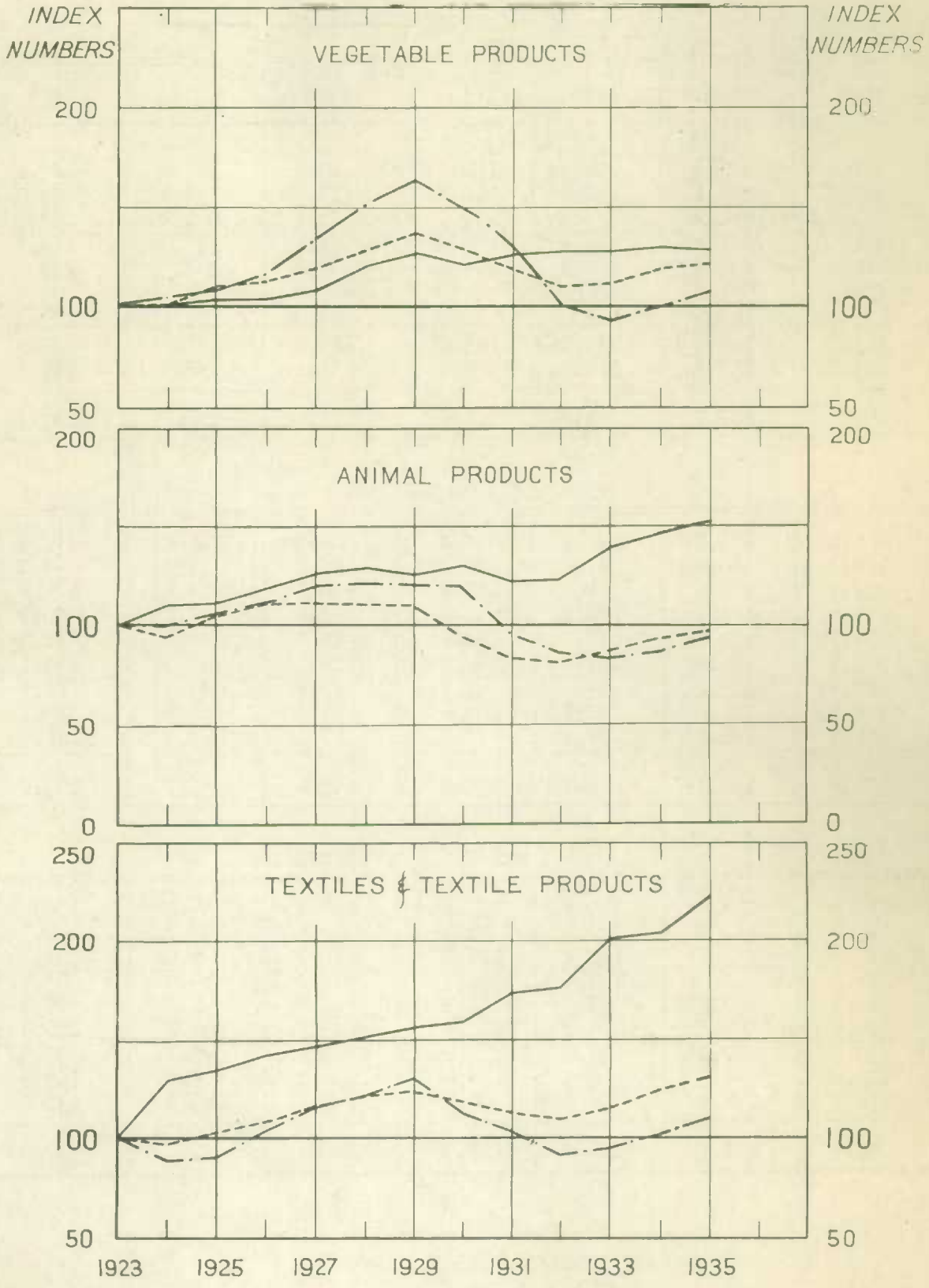
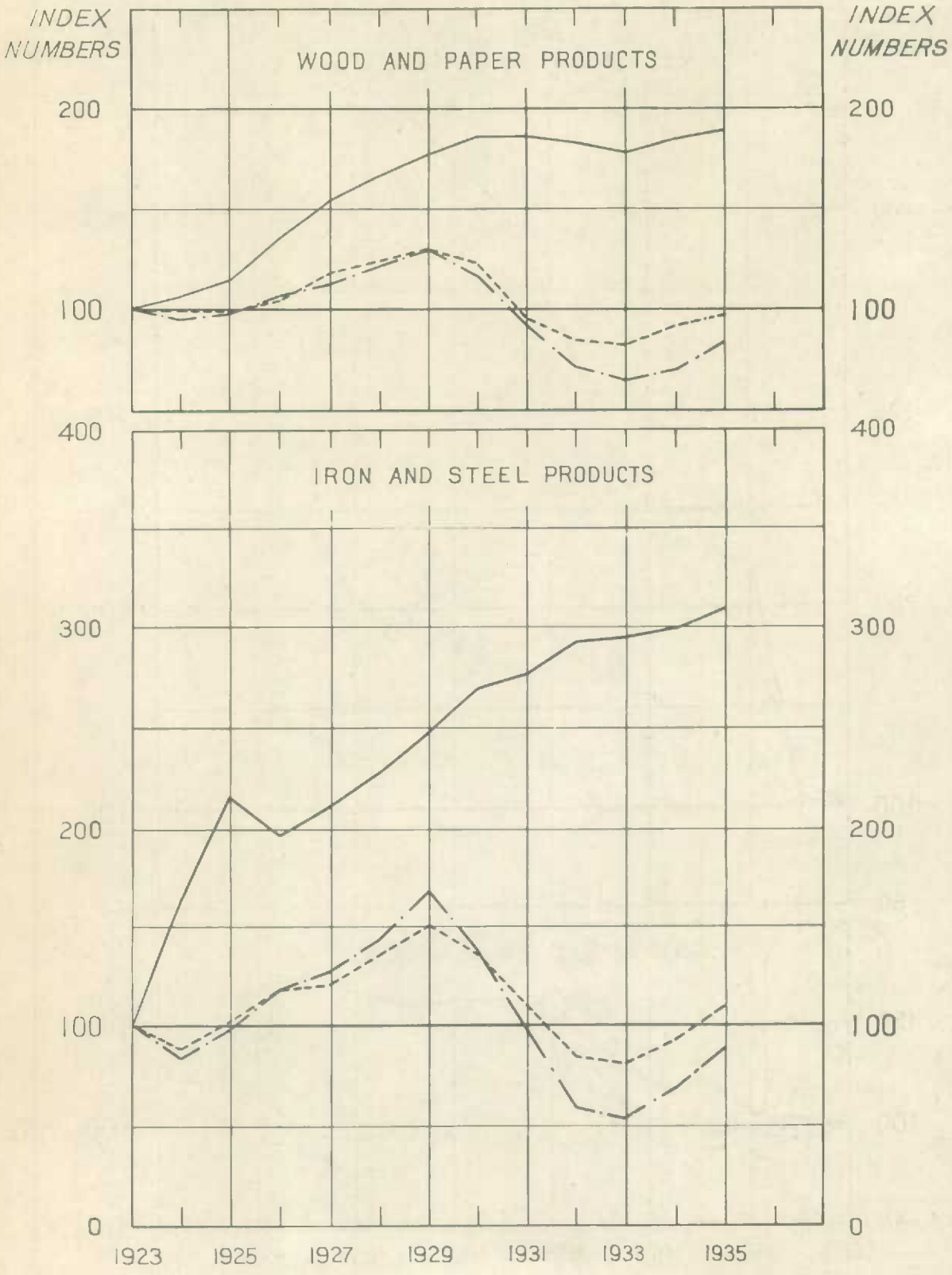


Chart 2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400
IRON AND STEEL PRODUCTS
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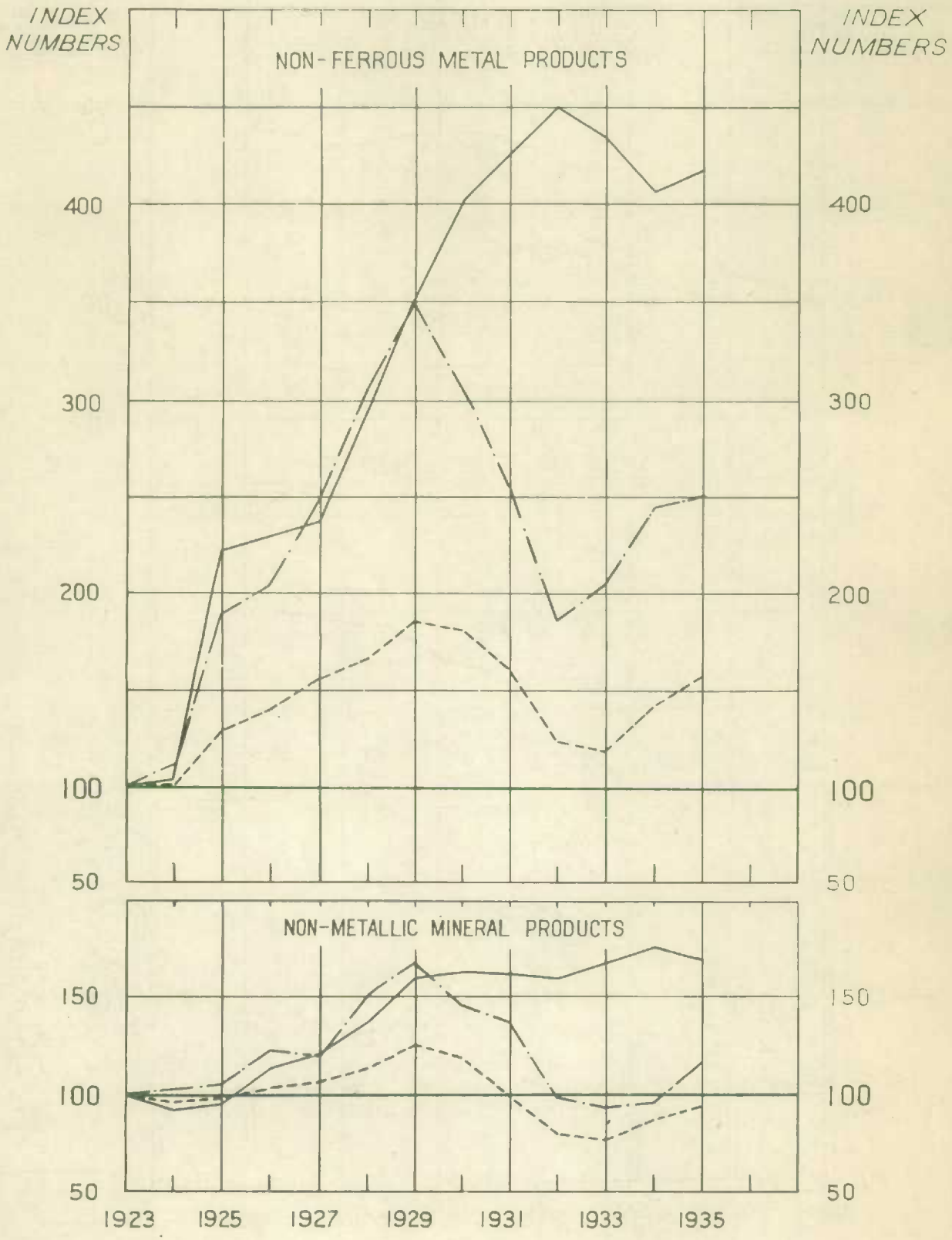
1923
1925
1927
1929
1931
1933
1935
INDEX NUMBERS

Chart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NON-FERROUS METAL PRODUCTS
INDEX NUMBERS
400
300
200
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50
NON-METALLIC MINERAL PRODUCTS
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100
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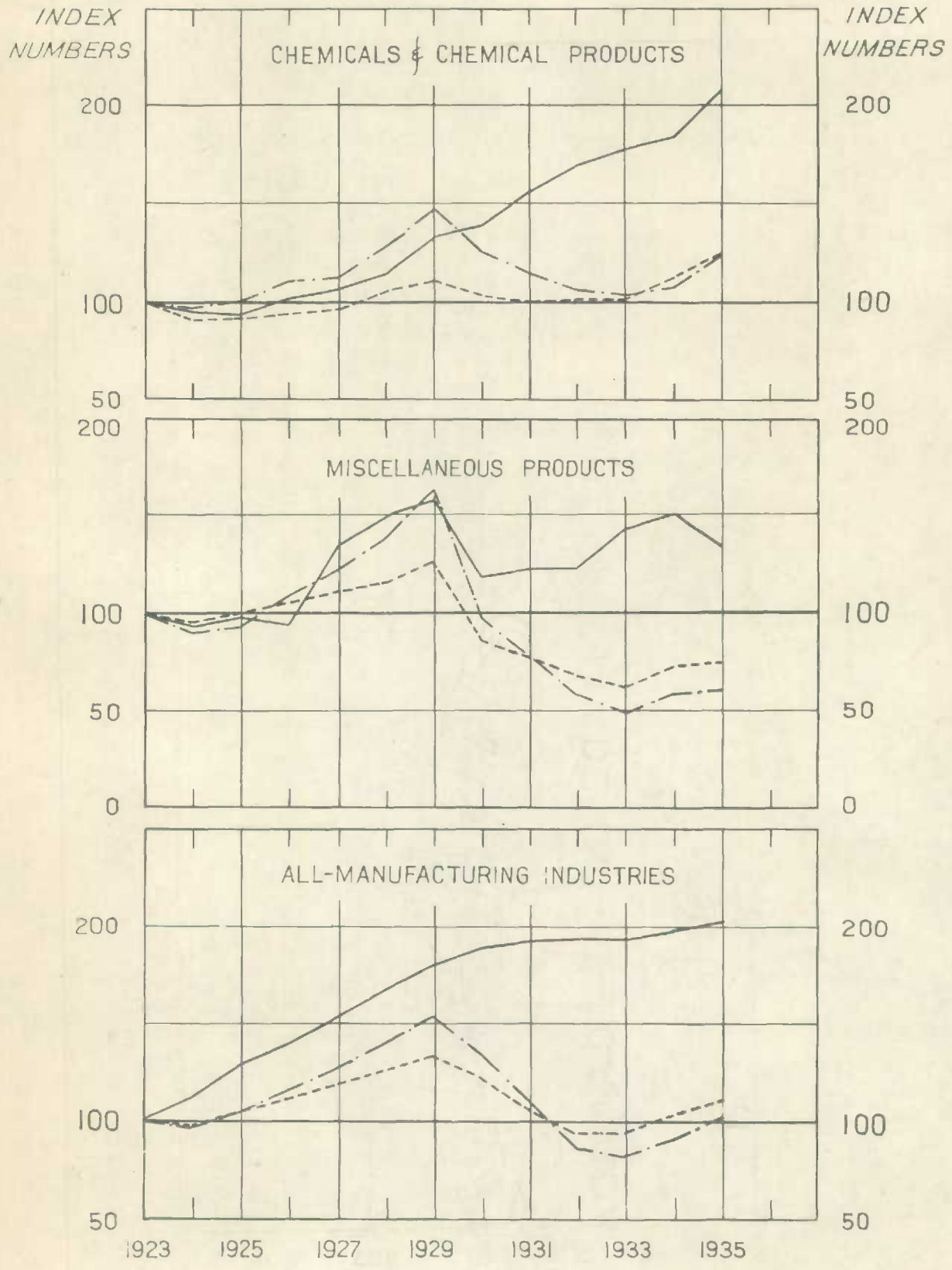
1923
1925
1927
1929
1931
1933
1935

Chart 4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MISCELLANEOUS PRODUCTS
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ALL-MANUFACTURING INDUSTRIES
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100
50
1923
1925
1927
1929
1931
1933
1935