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CANADA

DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

PUBLIC UTILITIES BRANCH

USE OF ELECTRIC POWER

IN

MANUFACTURING AND MINING INDUSTRIES

IN

CANADA

1938



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TRANSPORTATION AND PUBLIC UTILITIES BRANCH
OTTAWA

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USE OF ELECTRIC POWER
IN
MANUFACTURING AND MINING INDUSTRIES
IN CANADA
1 9 3 8

This report, issued during the past nine 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.

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 fifteen years between 1923 and 1938 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 not included as a manufacturing industry. Steam engines increased in capacity only 49.9 per cent. Internal combustion engines more than doubled, however they still constitute only a small percentage of the total, but electric motors trebled in capacity. Those operated on power purchased from central stations increased by 244.6 per cent, whereas electric motors operated by electricity generated by the industries increased only 84.7 per cent. In 1923 the motors operated by central station power were the major part of all power equipment and consequently, with the greater rate of increase than other modes of power, by 1938 they were almost double the capacity of all water wheels, steam engines and internal combustion engines used by manufacturing industries. The details of the capacities in 1923 and 1938 are as follows:

POWER EQUIPMENT IN MANUFACTURING INDUSTRIES

	Capacity (Horse Power)		Per Cent Increase
	1923	1938	
Water wheels	587,191	723,377	23.2
Steam engines	554,191	830,897	49.9
Internal combustion (gas and oil) engines	46,829	111,645	138.4
Total	1,188,211	1,665,919	40.2
Electric motors on purchased power	958,692	5,503,804	244.6
Total power	2,146,903	4,969,723	131.5
Total Electric Motors	1,315,828	3,963,545	201.2

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 probably direct hydraulic drive or steam or internal combustion engines always will be used in some plants in preference to electric motors. The increase in the ratio has been considerably less since 1929 than during the preceding six years, the increase being 5.1 points from 1929 to 1938 as against 13.4 points from 1923 to 1929. Commencing with 1935 reports data were gathered on spare or idle equipment. For each of the years 1935 - 1938 the percentage of total equipment not in regular use was approximately the same, around six per cent. 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. The power employed in the pulp and paper industry is by far the greatest of any industry, constituting 35 per cent of the total for all manufacturing industries in 1923 and 40 per cent in 1938, and the growth in the use of electric drive in this industry from 447,847 horse power in 1923 to (1)1,617,524 horse power in 1938 has been an important factor in the increase for the industries as a whole. Deducting this industry from the total shows an increase in electric drive from 62.2 per cent in 1923 to 73.3 per cent in 1938, as against 61.3 per cent to 79.8 per cent with the pulp and paper industry included.

The importance of the pulp and paper industry as a consumer of electricity is even greater than the power equipment data would indicate. This is due to the plants operating more or less continuously throughout each day of the year and to the use of secondary electric power for electric boilers. This industry accounted for 50 per cent of the electricity purchased for power and lighting, 59 per cent of the power purchased for other purposes, 72 per cent of the electricity produced by the industries and 57 per cent of the total electricity used by all manufacturing industries for all purposes and from all sources.

Table 4 shows the power equipment in regular use in manufacturing plants operating during 1938. The data in this table differ from those shown in reports prior to 1936 in that idle equipment is excluded here except for the group totals where totals 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 is also shown for each industry listed. This is broken down into "purchased from central stations" and "generated by the industries". The former is also divided between that used for lighting and power purposes and for other purposes, which includes electricity used in electric furnaces, electric boilers, electro-

(1) Including idle equipment.

chemical processes, etc. Electric boilers, particularly in pulp and paper mills, take the major portion of this class of electricity and in most cases it is surplus or off-peak power that is purchased for this purpose. The total consumption for these other purposes was 7,695,251,000 kilowatt hours of purchased power, or over half of the total quantity purchased. A portion of the power generated in the industries also is used for other than lighting and driving machines but a comprehensive break-down is not available.

The mining industries are almost as highly electrified as the manufacturing industries, the ratio increasing from 57.5 per cent in 1925 to 76.3 per cent in 1938. Data for the mining industries are shown in Tables 2 and 7.

It is not possible to accurately allocate line losses to the various uses of electricity but, ignoring these, manufacturing industries consumed 59 per cent of the total electric energy produced by central electric stations, mining accounted for 5.4 per cent, exports to the United States amounted to 7 per cent and the remaining 28.6 per cent was made up of domestic services, commercial lighting, street lighting, miscellaneous services such as municipal water works, and line losses.

Tables 8, 9, 10 show for the years 1925 and 1927 to 1938 for each of the nine groups of manufacturing industries the horse power of equipment installed, the number of employees in these same industries, and the average horse power per employee. This average increased steadily up to 1929 and with the reduction of employees from 1929 to 1933 the average increased more rapidly, due to idle equipment and to increasing use of mechanical power. In 1938, when only six per cent of the equipment was reported as idle or reserve equipment, the average horse power per employee was 7.7 compared with 4.2 in 1925. The significance of this increase is more apparent when horse power is converted to man power. One horse power hour of work is equivalent to approximately ten man hours of work.

A weakness in these comparisons is that no statistics are available on horse power hours worked by the power equipment nor man hours worked by the employees and undoubtedly there were more idle horse power hours than man hours. In years of approximately the same manufacturing activity the statistics, however, should indicate the relative use of mechanical power and man power.

The index numbers of these two series, using 1925 data as a base, are shown in tables 11 and 12, and table 13 shows the index numbers of volume of production. (2) The volume of production is not affected by the changes in price but is affected directly by the use of man power, mechanical power and improved methods of manufacture. These index numbers have been charted and are shown on pages 14, 15, 16 and 17. For each group the production curve followed closely the employee curve in form but for the majority of the groups it was considerably above the employee curve and the divergence since 1932 and 1933 is quite pronounced. There are probably two factors in this movement for the years 1933 - 1938, first, increase in the work week and second, greater use of mechanical power. The power curves clearly show that greater quantities of power were available and quite evidently they were used. The production index is very complex and should be considered as only approximate and used only to indicate trends. The power and employee data should be coupled with respective hours worked which are not available and consequently these curves should be used also to indicate trends only. The data for 1938 show increases over 1925 as follows: power 131.5 per cent, employees 24.9 per cent, and production 48.6 per cent, and compared with the peak year 1929, power 28.5 per cent, employees a decrease of 5.3 per cent, and production a decrease of 1.1 per cent.

(2) For detailed description of method of computation see "The Quantity of Manufacturing Production in Canada, 1925 - 1929" by A. Cohen, B. Comm., Chief, General Manufacturing Branch, Dominion Bureau of Statistics.

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 for 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 1936 and subsequent data contain some revisions which have not yet been carried back to previous years. "Laundering" was dropped from group 3, "Textiles and Textile Products", and "Shipbuilding and Repairs" and "Aircraft" were transferred from group 9, "Miscellaneous Industries" to group 5, "Iron and its Products", and "Aerated and Mineral Waters" was transferred from group 7, "Non-metallic Products" to group 1, "Vegetable Products." These transfers are undoubtedly the main factors in the decline in group 9, "Miscellaneous Industries" as compared with 1935 data.

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 Stn. 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
1936	4,461,867	2,977,714	528,501	3,506,215	78.6
1937	4,712,279	3,129,790	602,955	3,732,745	79.2
1938	4,969,723	3,303,804	659,741	3,963,545	79.8

[/] Excluding central electric stations and including idle and reserve equipment.

Table 2.

POWER EMPLOYED IN THE MINING INDUSTRY¹ 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	118,335	53,360	172,895	57.3
1924	314,173	125,725	71,376	197,191	62.7
1925	323,882	147,191	64,126	211,317	65.2
1926	336,830	167,241	64,277	231,518	68.7
1927	380,460	202,702	62,067	264,769	69.6
1928	419,464	223,686	66,121	291,787	69.6
1929	450,261	233,374	75,069	314,043	69.7
1930	509,007	297,826	83,585	366,411	75.9
1931	520,028	313,567	79,259	391,826	75.5
1932	482,544	287,130	76,826	363,756	75.4
1933	533,779	322,361	47,407	369,768	69.3
1934	621,071	400,035	66,847	466,682	75.1
1935	686,470	446,247	74,687	520,934	75.7
1936	724,689	474,000	73,140	553,140	76.3
1937	850,489	577,703	101,526	679,229	79.7
1938	874,943	582,510	82,368	671,878	76.8

¹ Excluding non-ferrous smelting, salt, cement, clay products and lime, included with "Manufacturing."

Table 3.

SUMMARY OF POWER EMPLOYED IN MANUFACTURING INDUSTRIES

Manufacturing Industries	1923		1929		1937		1938	
	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	347,002	76	356,923	79
2. Animal Products	80,895	72	101,266	72	123,647	76	139,899	76
3. Textile Products	107,250	83	168,614	81	211,729	89	217,081	93
4. Wood and Paper Products	1,146,571	50	2,032,339	39	2,470,436	74	2,529,799	73
5. Iron and its Products	213,705	89	529,162	100	719,265	86	751,614	82
6. Non-ferrous Metal Products	99,963	47	351,752	82	472,031	87	535,971	88
7. Non-metallic Mineral Products	151,780	83	210,304	33	239,898	32	253,682	32
8. Chemical and Allied Products	62,447	72	85,235	77	141,753	37	152,567	39
9. Miscellaneous	46,516	86	73,259	86	23,520	93	37,133	97
TOTAL	2,146,802	61	3,837,979	75	4,712,279	79	4,960,723	80

Table 4.

POWER EQUIPMENT OF MANUFACTURING INDUSTRIES IN CANADA, 1938

(Equipment in Regular Use)

	Total Power Employed	Electric Motors Operated			Electric Power Per Cent of Total 100D+A	Consumption of Electricity			
		By Central Electric Station Power	By Power Generated in the Industries	Total Motor Capacity		Purchased from		Generated By the Industries	Total
						Central Electric Stations for			
						Power and Lighting	Other Purposes		
A	B	C	D	E	F	G	H	I	
	H.P.	H.P.	H.P.	H.P.	P.C.	(Thousands of Kilowatt Hours)			
<u>GROUP 1. VEGETABLE PRODUCTS</u>	(x 556,955	249,550	31,215	280,765	78.7				
	(537,759	237,154	30,673	267,827	79.3	331,725	47,025	27,666	406,414
Biscuits, confectionery, etc.	22,164	19,623	309	19,932	89.9	22,989	...	...	22,989
Bread & bakery products	17,425	15,868	227	16,095	92.4	30,198	93	...	30,291
Breweries	23,809	18,868	623	19,491	81.9	22,100	8,843	...	23,943
Flour and feed mills	109,191	57,677	3,126	60,803	55.7	99,022	...	1,111	100,133
Fruit and vegetable products	20,418	11,789	1,668	13,457	65.9	6,746	2	208	6,956
Rubber goods, footwear, etc.	66,378	63,504	845	64,349	96.9	12,706	...	11,148	23,854
Sugar refineries	22,600	7,900	16,280	24,180	100.0				
<u>Group 2. ANIMAL PRODUCTS</u>	(x 139,899	103,475	2,977	106,452	76.1				
	(130,905	99,603	2,937	102,540	78.3	194,169	106	2,735	197,010
Butter and cheese	42,652	30,651	...	30,651	71.9	35,855	57	...	36,912
Fish curing and packing	13,197	3,459	959	4,418	33.5	7,162	...	1,081	8,243
Leather tanneries	14,771	12,514	766	13,280	89.9	13,445	...	...	13,445
Slaughtering and meat packing	39,671	35,937	400	36,337	91.3	108,348	7	391	108,746
<u>Group 3. TEXTILES</u>	(x 217,081	166,299	34,779	201,078	92.6				
	200,445	157,736	34,377	192,113	95.8	360,538	64,969	68,063	428,670
Cotton yarn and cloth	91,152	69,260	21,551	90,811	99.6	207,505	22,386	39,132	269,023
Hosiery and knitted goods	17,227	11,502	4,217	15,719	91.2	21,340	...	4,485	25,825
Silk and artificial silk	21,311	17,821	3,633	21,454	100.0	62,550	42,569	11,077	116,196
<u>Group 4. WOOD AND PAPER PRODUCTS</u>	(x 2,529,793	1,402,937	454,936	1,857,873	73.4				
	(2,401,870	1,354,232	436,685	1,790,917	74.6	3,990,480	4,530,006	1,553,219	10,193,705
Furniture	20,762	13,240	2,190	15,430	74.3	10,428	...	2,385	12,813
Planing mills, sash and door	49,757	28,299	3,784	32,083	64.5	17,381	100	2,663	20,144
Printing and publishing	28,166	27,288	1	27,289	96.9	36,838	421	28	34,287
Pulp and paper	1,886,944	1,185,365	370,234	1,555,649	82.4	3,852,146	4,550,360	1,576,046	9,953,852
Saw mills	321,145	28,607	56,051	84,658	26.4	18,801	1	70,672	89,474

<u>Group 5. IRON AND ITS</u>	(x	751,614	566,969	102,896	669,863	89.1				
<u>PRODUCTS</u>	(	689,228	549,228	98,093	647,321	93.9	522,973	212,911	67,856	803,745
Agricultural implements		20,188	17,418	...	17,418	86.3	17,177	...	36	17,213
Automobiles		51,356	21,197	27,123	48,320	94.1	17,359	...	32,174	49,533
Automobile supplies		38,304	36,700	...	36,700	95.8	38,582	...	...	38,582
Bridge and structural steel		28,668	27,084	982	28,066	97.9	15,590	...	...	15,590
Castings and forgings		49,213	46,801	445	47,246	96.0	37,005	...	605	37,610
Machinery		43,744	39,581	3,521	47,102	98.5	23,925	...	2,636	26,561
Primary iron and steel		220,417	153,221	46,874	200,095	90.8	200,403	...	22,293	222,701
Railway rolling stock		109,308	97,378	7,676	105,054	96.1	64,543	30,812	6,957	101,412
Ship building and repairs		39,871	31,497	5,250	36,747	92.6	12,337	...	92	12,429
<u>Group 6. NON FERROUS METAL</u>	(x	535,971	460,469	12,082	472,551	88.2				
<u>PRODUCTS</u>	(	492,828	422,910	11,674	434,584	88.2	1,252,127	1,837,957	275,492	3,365,576
Brass and copper products		25,630	24,385	358	24,743	96.5	18,833	6,257	...	25,090
Electrical apparatus & supplies		75,247	67,557	5,566	73,123	97.2	58,240	...	10,040	68,280
Non-ferrous metal, smelting and refining		376,557	315,574	5,750	321,324	85.3	1,156,889	1,827,993	265,452	3,250,334
<u>Group 7. NON METALLIC MINERAL</u>	(x	258,682	206,058	6,883	212,741	82.2				
<u>PRODUCTS</u>	(	230,328	188,078	6,463	194,541	84.5	323,869	261,333	12,262	597,464
Cement		75,844	74,893	756	75,649	98.4	40,535	...	...	40,535
Clay products from domestic clays		20,502	14,280	404	14,684	71.6	9,782	158	612	10,552
Coke and gas products		27,239	18,755	2,311	21,066	77.3	39,341	3,704	5,516	48,561
Petroleum products		42,714	23,250	...	23,250	54.4	54,261	...	134	54,395
<u>Group 8. CHEMICALS & CHEMICAL</u>	(x	152,567	124,049	11,752	135,801	89.0				
<u>PRODUCTS</u>	(	141,558	115,495	10,233	125,728	88.8	594,881	710,944	83,396	1,389,221
Acids, alkalies and salts		70,905	51,099	9,535	60,634	85.5	128,223	655,007	82,072	863,302
Fertilizers		25,692	25,882	...	25,682	100.0	412,470	80	...	412,550
<u>Group 9. MISCELLANEOUS</u>	(x	27,183	25,998	2,421	26,419	97.2				
<u>INDUSTRIES</u>	(	24,941	22,916	2,049	24,965	100.0	37,678	...	3,043	40,721
Ice, manufactured		11,046	10,996	...	10,996	99.5	25,241	...	...	25,241
<u>TOTAL ALL INDUSTRIES 1938</u>	(x	4,969,723	3,305,804	659,741	3,963,545	79.8				
	(	4,649,862	3,147,352	633,184	3,780,536	81.3	7,598,543	7,695,251	2,198,732	17,492,526
	(x	4,712,279	3,129,790	602,955	3,732,745	79.2				
	(	4,440,729	3,004,840	581,583	3,586,423	80.8	8,612,212	8,480,588	2,328,676	19,421,476

x Including equipment held idle or in reserve. These totals are comparable with data in reports prior to 1936.

∅ Exclusive of Quebec.

Table 5.

POWER EMPLOYED IN MANUFACTURING INDUSTRIES, BY PROVINCES, 1938.

(In Regular Use)

Provinces	Total Power Employed	Electric Motors Operated			Electric Power Per Cent of Total	Consumption of Electricity			Total
		By Central Electric Station Power	By Power Generated in the Industries	Total Motor Capacity		Purchased from Central Electric Stations		Generated By the Industries	
						For Power & Lighting	For Other Purposes		
	H.P.	H.P.	H.P.	H.P.	P.G.	(Thousands of Kilowatt Hours)			
Prince Edward Island	3,710	703	2	705	19.0	472	...	4	476
Nova Scotia	178,930	104,005	13,122	117,127	65.5	211,112	1,318	66,269	278,699
New Brunswick	193,433	104,716	47,986	152,702	76.8	291,667	80,408	128,047	500,122
Quebec	1,743,137	1,248,877	156,456	1,405,333	80.6	2,195,606	5,440,251	393,554	3,519,411
Ontario	1,766,115	1,224,462	285,177	1,509,639	85.5	2,446,453	1,904,956	757,666	3,109,075
Manitoba	151,473	137,510	1,299	138,809	91.6	222,769	217,944	1,736	437,449
Saskatchewan	46,594	33,352	124	34,076	73.1	42,274	50,865	202	93,341
Alberta	70,381	42,092	4,254	46,346	65.9	44,649	315	4,323	49,537
B.C. and Yukon	491,089	251,435	114,764	366,199	76.6	1,153,540	4,194	346,621	1,504,365
CANADA	4,649,862	3,147,352	623,184	3,770,536	81.3	7,506,543	7,695,251	2,199,732	17,432,525
<u>INCLUDING IDLE AND RESERVE EQUIPMENT</u>									
Prince Edward Island	3,979	772	2	774	19.5				
Nova Scotia	184,680	104,707	13,372	118,079	34.1				
New Brunswick	230,966	111,899	48,418	160,317	69.4				
Quebec	1,840,891	1,303,120	156,463	1,459,583	79.8				
Ontario	1,901,624	1,292,737	299,832	1,592,600	83.7				
Manitoba	156,242	141,041	1,554	142,595	91.3				
Saskatchewan	49,149	35,223	124	35,347	71.9				
Alberta	76,968	45,923	4,254	50,177	65.2				
British Columbia and Yukon	525,224	268,382	125,391	393,773	75.0				
CANADA	4,969,723	3,303,204	659,741	3,963,545	79.8				

Table 6.

POWER EQUIPMENT - IN REGULAR USE AND INCLUDING IDLE AND RESERVE EQUIPMENT, 1938.

MANUFACTURING INDUSTRIES

	TOTAL POWER EMPLOYED		ELECTRIC MOTORS OPERATED BY						ELECTRIC POWER		CONSUMPTION OF ELECTRICITY			
	In Regular Use	Including Reserve Equipment	Central Station Power		Power Generated in the Industries		T o t a l		Per Cent of Total		Purchased from Central Electric Stations		Generated By The Industries	Total
			In Regular Use	Including Reserve	In Regular Use	Including Reserve	In Regular Use	Including Reserve	In Regular Use	Including Reserve	For Power & Lighting	For Other Purposes		
	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	337,759	356,933	237,154	249,550	30,673	31,215	267,827	280,765	79.5	78.7	331,723	47,025	27,666	406,414
2. Animal Products	130,905	139,899	99,603	103,475	2,937	2,977	102,540	106,452	78.5	76.1	194,169	106	2,735	197,010
3. Textiles and Textile Products	200,445	217,081	157,736	166,299	34,377	34,779	192,113	201,078	95.8	92.6	360,638	64,969	68,063	493,670
4. Wood and Paper Products	2,401,870	2,529,793	1,354,232	1,402,937	456,685	454,936	1,790,917	1,857,873	74.6	73.4	3,980,480	4,560,006	1,658,219	10,198,705
5. Iron and its Products	689,228	751,614	549,228	566,969	98,093	102,896	647,321	669,865	93.9	89.1	522,978	212,911	67,856	803,745
6. Non-ferrous Metal Products	432,823	535,971	422,910	460,469	11,674	12,082	434,584	472,551	88.2	88.2	1,252,127	1,837,957	275,492	3,365,576
7. Non-metallic Mineral Products	230,328	258,682	188,078	206,058	6,463	6,683	194,541	212,741	64.5	82.2	323,869	261,333	12,262	597,464
8. Chemicals and Chemical Products	141,558	152,567	115,495	124,049	10,233	11,752	125,723	135,801	88.8	89.0	594,891	710,944	82,396	1,399,221
9. Miscellaneous Industries	24,941	27,183	22,916	23,998	2,049	2,421	24,965	26,413	100.0	97.2	37,678	...	3,043	40,721
TOTAL	4,649,862	4,969,723	3,147,352	3,303,804	633,184	659,741	3,780,536	3,963,545	81.3	79.8	7,598,543	7,695,251	2,198,732	17,492,526

Table 7.

MINING INDUSTRIES

Metal Mining	459,459	509,157	361,142	390,126	48,663	52,506	409,805	442,632	89.4	86.9	1,135,342	4,813	190,706	1,330,861
Non-metal mining	72,123	79,377	61,931	67,131	2,437	2,437	64,418	69,618	89.3	87.7	116,442	...	3,810	120,252
Sand, Gravel & Stone	42,950	48,872	26,704	30,657	833	833	27,537	31,490	84.1	64.4	19,681	...	179	19,860
Fuels	221,755	237,537	93,573	94,595	32,425	33,542	125,998	128,138	56.8	53.9	119,532	...	45,393	164,915
TOTAL	796,297	874,943	543,350	582,510	84,408	89,368	627,758	671,878	78.9	76.6	1,390,937	4,913	240,078	1,635,893
Total Tables 6 and 7														
1938	5,445,149	5,844,666	3,690,702	3,806,314	717,532	749,109	4,403,294	4,635,423	81.0	79.3	9,989,540	7,700,054	2,438,610	13,128,414
1937	5,224,902	5,582,768	3,552,936	3,707,433	674,412	704,481	4,227,343	4,410,974	80.9	79.3	9,876,950	8,512,424	2,535,051	20,924,425

Table 8.

MANUFACTURING INDUSTRIES

POWER EMPLOYED

H.P.

	1923	1924	1928	1929	1930	1931
1. Vegetable Products	257,176	280,170	309,611	326,346	313,527	322,401
2. Animal Products	80,895	101,650	104,166	101,268	105,833	98,892
3. Textiles & textile products	107,850	157,055	163,779	168,614	171,324	186,952
4. Wood and paper products	1,146,571	1,770,909	1,908,738	2,022,839	2,126,515	2,126,396
5. Iron and its products	213,705	451,576	488,521	529,162	576,609	589,261
6. Non-ferrous metal products	99,963	237,520	294,642	351,752	401,817	424,738
7. Non-metallic Mineral pdts.	131,780	160,196	181,666	210,804	213,917	212,179
8. Chemical & allied products	62,447	65,898	71,401	83,935	87,382	96,893
9. Miscellaneous Industries	46,515	62,608	69,660	73,259	54,820	56,963
TOTAL	2,146,903	3,287,582	3,532,184	3,867,979	4,051,744	4,114,677

Table 9.

EMPLOYEES

No.

	1923	1924	1928	1929	1930	1931
1. Vegetable Products	65,395	78,300	83,764	88,858	84,162	77,706
2. Animal Products	61,517	68,381	67,777	67,670	57,657	51,297
3. Textiles & Textile products	92,669	107,519	113,724	115,620	109,576	105,473
4. Wood and paper products	128,404	150,550	158,005	164,800	156,724	121,672
5. Iron and its products	88,071	106,293	119,199	132,281	119,937	96,927
6. Non-ferrous metal products	21,409	33,443	35,568	39,867	38,756	34,414
7. Non-metallic mineral pdts.	24,978	26,662	28,650	31,431	29,866	24,895
8. Chemical & allied products	15,149	14,559	16,130	16,694	15,503	15,207
9. Miscellaneous Industries	16,581	18,518	19,351	21,049	14,328	12,821
TOTAL	514,173	604,225	642,168	678,270	626,531	540,412

Table 10

AVERAGE HORSE POWER OF EQUIPMENT PER EMPLOYEE IN MANUFACTURING INDUSTRIES

	1923	1925	1926	1927	1928	1929
1. Vegetable Products	3.9	3.7	3.6	3.6	3.7	3.7
2. Animal Products	1.3	1.4	1.4	1.5	1.5	1.5
3. Textiles and Textile products	1.2	1.5	1.5	1.5	1.4	1.5
4. Wood and Paper Products	8.9	10.3	11.6	11.7	12.1	12.3
5. Iron and its products	2.4	5.1	4.1	4.2	4.1	4.0
6. Non-ferrous metal products	4.7	8.0	7.6	7.1	8.3	8.8
7. Non-metallic mineral products	5.3	5.2	5.8	6.0	6.4	6.7
8. Chemical and Allied products	4.1	4.2	4.4	4.5	4.4	5.0
9. Miscellaneous Industries	2.8	2.7	2.5	3.4	3.6	3.5
TOTAL	4.2	5.1	5.2	5.4	5.6	5.7

MANUFACTURING INDUSTRIES

POWER EMPLOYED

H.P.

	1932	1933	1934	1935	1936	1937	1938
	326,829	326,666	332,052	331,361	342,123	347,002	356,933
	100,069	112,035	117,843	122,560	126,807	133,647	139,899
	189,915	215,907	219,938	240,549	221,830	211,729	217,081
	2,094,010	2,035,112	2,115,205	2,160,083	2,227,328	2,420,436	2,529,793
	623,888	626,730	637,718	660,491	681,038	719,265	751,614
	450,271	434,581	405,248	416,927	461,129	472,031	535,971
	209,484	219,612	231,586	222,555	237,163	239,898	258,682
	105,671	110,873	115,082	130,464	137,442	141,755	152,567
	57,283	66,315	70,024	61,785	27,007	26,520	27,183
	4,157,420	4,147,831	4,244,636	4,346,775	4,461,867	4,712,279	4,969,723

EMPLOYEES

No.

	1932	1933	1934	1935	1936	1937	1938
	72,390	73,095	77,464	79,285	87,071	94,258	95,541
	49,953	53,111	57,199	60,124	63,609	67,996	66,660
	102,116	106,235	115,695	120,699	114,966	121,677	115,745
	107,834	105,471	116,691	123,724	132,374	147,254	141,974
	74,214	70,947	81,782	95,426	107,203	127,148	121,235
	26,704	25,273	30,177	33,613	36,935	44,614	44,440
	20,342	19,296	21,959	23,342	21,974	23,837	22,799
	15,295	15,397	17,130	18,933	19,910	21,968	21,896
	11,155	10,361	12,091	12,270	10,317	11,699	11,728
	480,003	479,186	530,188	567,416	594,359	660,451	642,016

AVERAGE HORSE POWER OF EQUIPMENT PER EMPLOYEE IN MANUFACTURING INDUSTRIES

	1930	1931	1932	1933	1934	1935	1936	1937	1938
	3.7	4.1	4.5	4.5	4.3	4.2	3.9	3.7	3.7
	1.8	1.9	2.0	2.1	2.1	2.0	2.0	2.0	2.1
	1.6	1.8	1.9	2.0	1.9	2.0	1.9	1.7	1.9
	13.6	17.5	19.4	19.3	18.1	17.4	16.8	16.4	17.8
	4.8	6.1	8.4	8.8	7.8	6.9	6.3	5.7	6.2
	10.4	12.3	16.9	17.2	13.4	12.4	12.5	10.6	12.1
	7.2	8.5	10.3	11.4	10.5	9.6	10.8	10.1	11.3
	5.6	6.4	6.9	7.2	6.5	6.9	6.9	6.5	7.0
	3.8	4.4	5.1	6.4	5.8	5.0	2.8	2.3	2.3
	6.5	7.6	8.7	8.7	8.0	7.7	7.5	7.1	7.7

Table 11.

MANUFACTURING INDUSTRIES

INDEX NUMBERS
(1923 = 100)

FOUR EMPLOYED

	1925	1926	1927	1928	1929	1930
1. Vegetable Products	107.7	104.1	108.9	120.4	136.9	121.2
2. Animal Products	111.0	118.9	135.7	128.2	135.2	130.8
3. Textiles and textile products	134.0	142.1	145.6	151.9	136.5	150.9
4. Wood and paper products	114.9	135.4	154.5	166.5	176.4	165.5
5. Iron and its products	216.2	197.6	211.3	229.6	247.6	269.8
6. Non-ferrous metal products	222.8	229.0	237.6	294.7	351.9	402.0
7. Non-metallic mineral products	95.9	114.5	121.6	137.9	130.9	162.5
8. Chemical and allied products	93.7	101.9	105.3	114.3	134.4	179.9
9. Miscellaneous industries	97.3	94.9	124.6	149.7	167.5	117.9
TOTAL	127.3	133.8	156.1	167.3	189.2	183.7

Table 12.

EMPLOYEES

1. Vegetable products	110.2	113.0	119.7	128.1	125.9	128.7
2. Animal products	103.5	110.3	111.1	110.2	110.0	93.7
3. Textiles and textile products	102.0	108.5	113.0	122.7	124.2	116.2
4. Wood and paper products	99.6	104.5	117.2	123.1	128.5	122.1
5. Iron and its products	102.3	117.5	120.7	125.3	130.2	126.2
6. Non-ferrous metal products	129.5	140.6	156.2	166.1	166.2	181.0
7. Non-metallic mineral products	98.0	104.3	106.7	114.7	125.8	119.6
8. Chemical and allied products	92.1	94.7	96.1	106.6	110.2	102.3
9. Miscellaneous industries	100.0	106.3	111.7	116.7	126.9	86.4
TOTAL	103.2	110.5	117.5	124.9	131.9	121.9

Table 13.

INDEX OF VOLUME OF MANUFACTURING PRODUCTION

1. Vegetable Products	120.8	127.7	137.5	151.1	135.3	146.6
2. Animal Products	113.0	122.9	120.0	123.8	117.2	113.0
3. Textiles and textile products	103.4	117.8	126.5	125.3	123.8	124.4
4. Wood and paper products	106.0	119.9	129.1	142.0	152.9	141.5
5. Iron and its products	95.1	121.7	125.2	138.1	157.8	126.9
6. Non-ferrous metal products	122.8	137.2	158.3	176.1	190.3	179.7
7. Non-metallic mineral products	98.3	112.5	122.5	128.9	163.1	149.5
8. Chemical and allied products	109.5	119.0	127.0	129.6	143.3	126.5
9. Miscellaneous industries	106.0	124.8	138.0	126.5	127.3	116.6
TOTAL	107.5	122.2	130.2	141.9	150.2	126.2

MANUFACTURING INDUSTRIES

INDEX NUMBERS

(1923 = 100)

POWER EMPLOYED

	1931	1932	1933	1934	1935	1936	1937	1938
	125.4	127.1	127.0	129.1	128.8	(1)133.0	134.9	138.8
	122.2	123.7	138.5	145.7	151.5	156.8	165.2	172.9
	173.3	176.1	200.3	203.9	223.0	(1)205.7	196.3	201.3
	185.5	182.6	177.5	184.5	188.4	194.3	211.1	220.6
	275.7	291.9	293.3	296.4	309.1	318.7	336.6	351.7
	424.9	450.4	434.7	405.4	417.1	(1)461.3	472.2	536.2
	161.0	159.0	166.7	175.7	168.9	180.0	182.0	196.3
	155.2	169.2	177.6	184.3	208.9	220.1	227.0	244.3
	122.4	123.1	142.6	150.5	132.8	(1) 58.1	57.0	58.4
	191.7	193.6	193.2	197.7	202.5	207.8	219.5	231.5

EMPLOYEES

	118.8	110.7	111.8	118.5	121.2	(1)133.1	144.1	146.1
	83.4	81.2	86.3	93.0	97.7	103.4	110.5	108.4
	113.8	110.2	114.6	124.8	130.2	(1)124.1	131.3	124.9
	94.8	84.0	82.1	90.0	96.4	103.1	114.7	110.6
	110.0	84.3	80.6	92.2	108.4	121.7	144.4	137.7
	160.7	124.7	112.0	141.0	157.0	(1)172.5	208.4	207.6
	99.7	81.4	77.3	87.9	93.5	88.0	95.4	91.3
	100.4	101.0	101.6	113.1	125.0	131.4	145.0	144.5
	77.3	67.3	62.5	72.9	74.0	(1) 62.2	70.6	70.7
	105.1	93.4	93.2	103.1	110.4	115.6	128.4	124.9

INDEX OF VOLUME OF MANUFACTURING PRODUCTION

	133.0	116.1	116.1	131.9	138.7	151.0	134.4	161.2
	103.2	102.2	106.1	115.4	121.7	131.6	133.9	133.7
	121.6	116.0	113.9	129.1	147.0	155.4	164.8	146.8
	117.9	104.6	107.1	125.3	137.9	151.4	168.6	147.8
	96.2	65.0	61.4	82.8	102.8	114.7	145.0	126.2
	171.1	137.7	134.8	165.7	190.0	214.1	257.3	256.1
	130.4	94.9	87.5	103.4	111.5	126.8	145.7	133.1
	116.9	111.5	118.1	135.9	147.4	158.1	181.3	173.9
	101.0	82.5	73.5	88.4	95.6	102.0	118.6	117.2
	118.3	100.1	100.2	119.0	130.2	142.5	161.4	143.6

(1) Affected by reclassification. See page 4.

MANUFACTURING INDUSTRIES

1923=100

Chart 1

POWER EMPLOYED.....
 EMPLOYEES.....
 VOLUME OF MANUFACTURING PRODUCTION.....

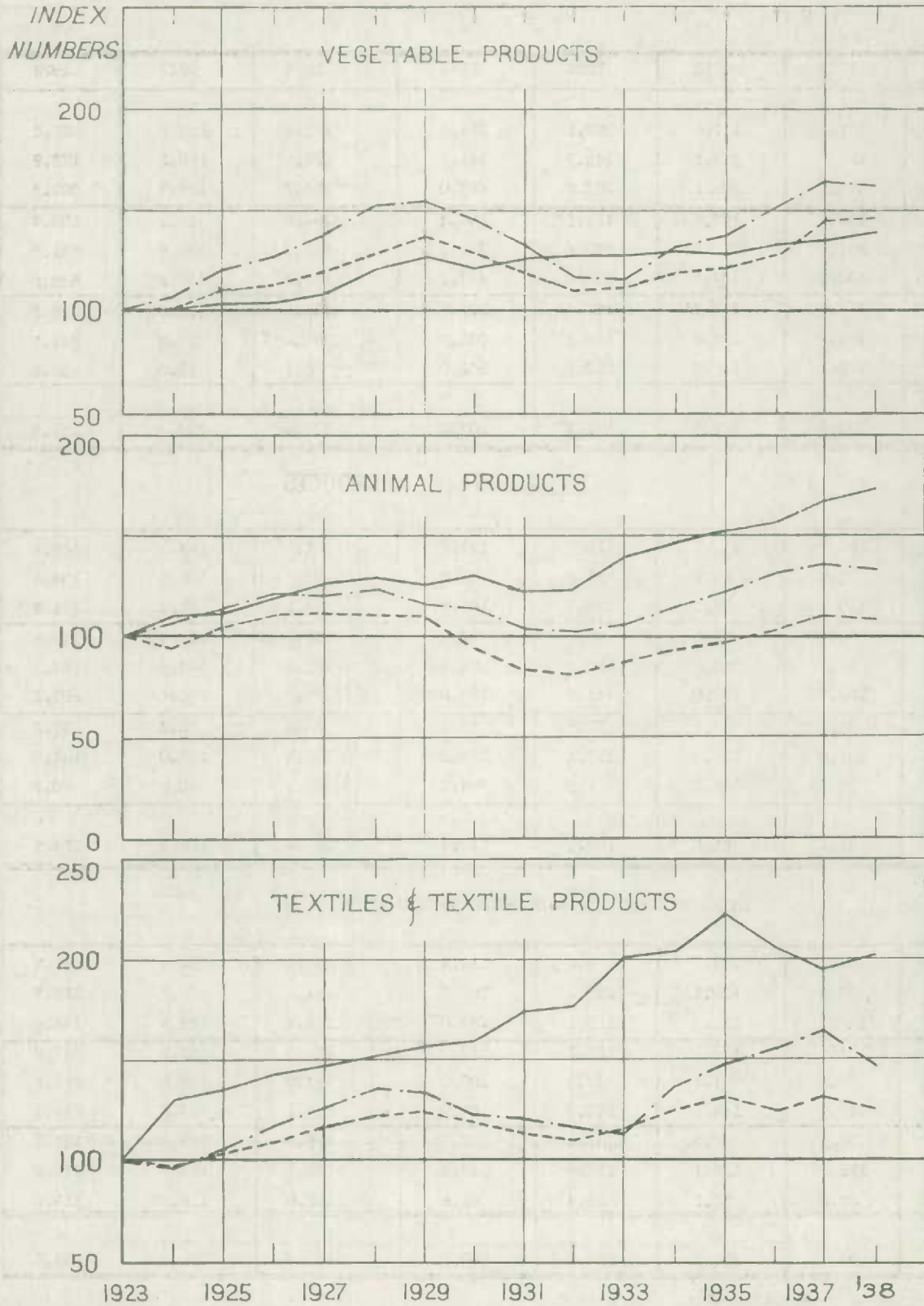


Chart 2

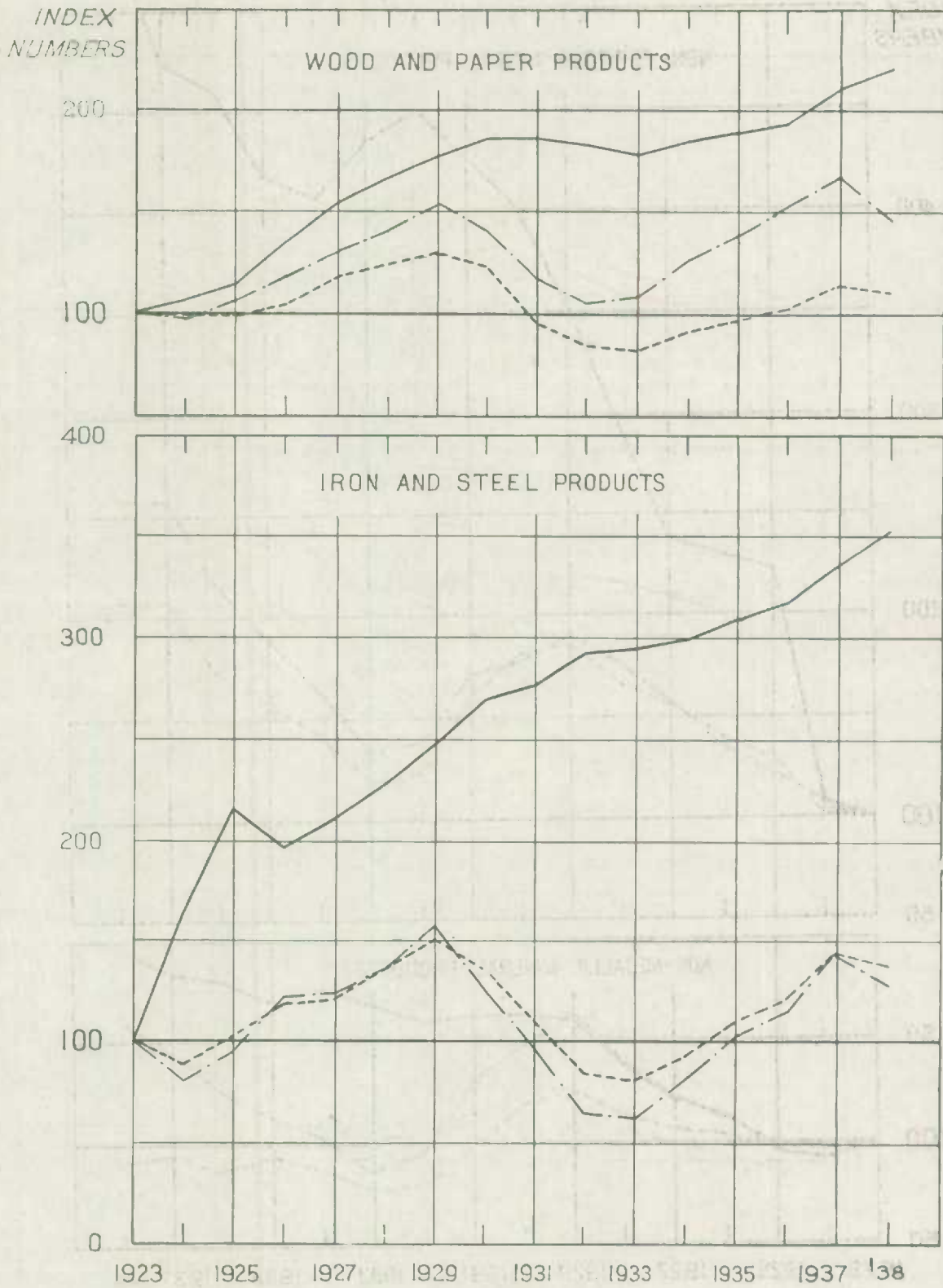


Chart 3

INDEX
NUMBERS

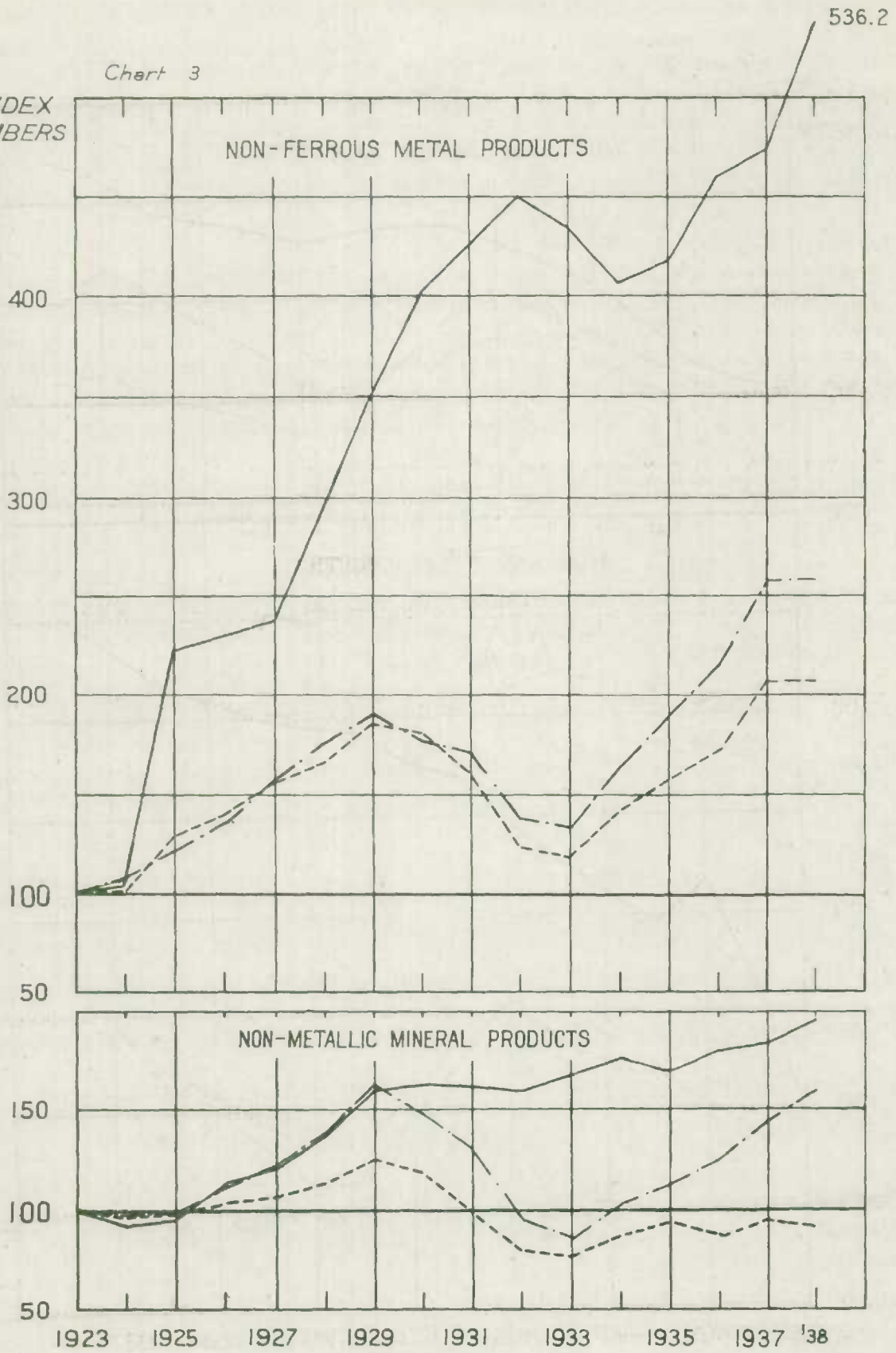
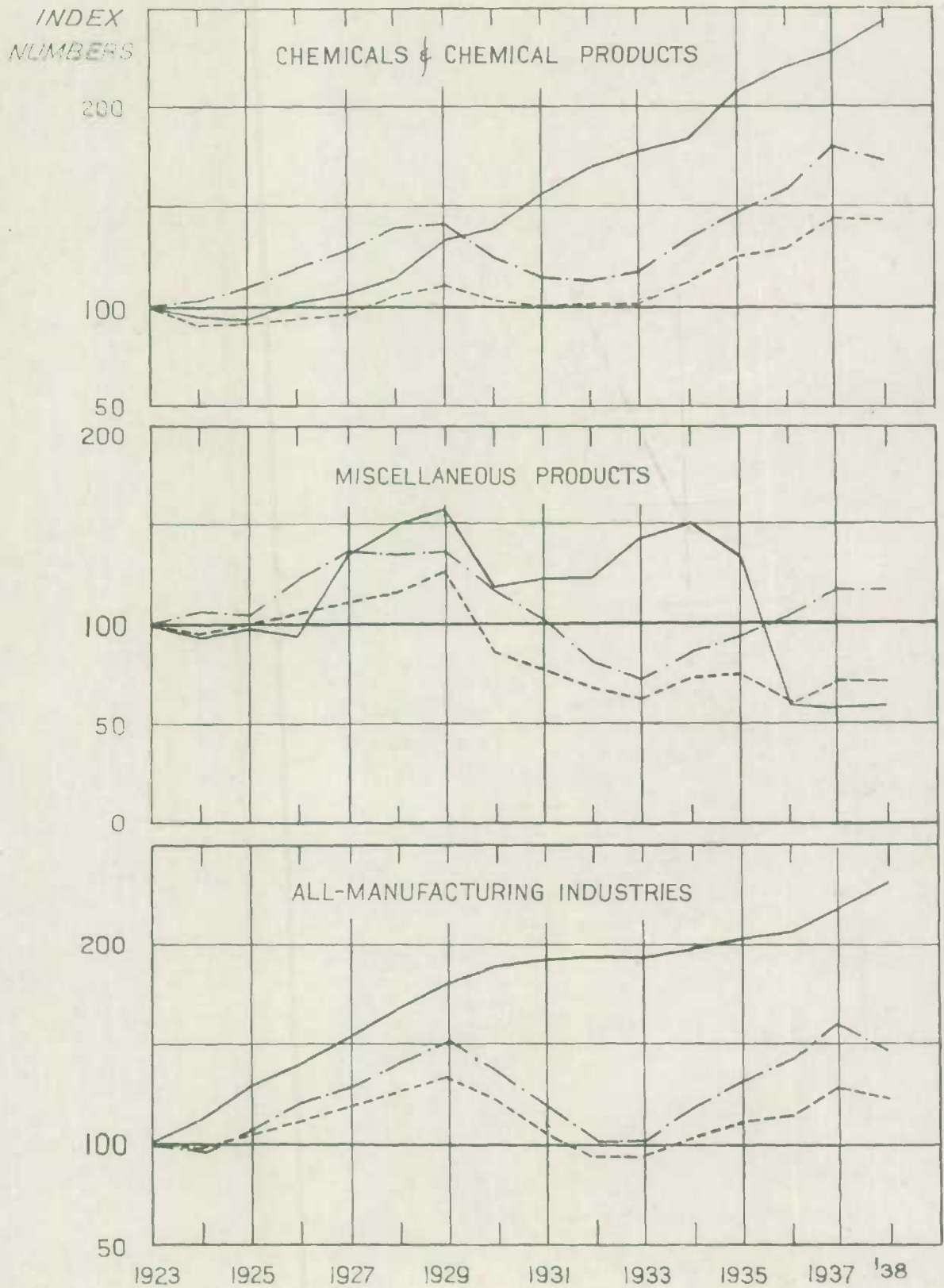


Chart 4



1.3

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