SOME HISTORICAL AND DESCRIPTIVE ASPECTS OF THE CANADIAN STEEL INDUSTRY

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CHAPTER I

INTRODUCTION

Steel is truly the basic ingredient of our machine economy. We have only to look about us, at the common every-day articles we use to see the extensive utilisation made of steel in the realm of consumers' goods. In producers' goods, its importance is only more evident for all of our heavy machinery is of steel. And yet, this all-important metal can find few uses unless combined in some way with other elements. Hence arises the problem of supplies of the stategic metals which impart to steel its desirable qualities.

No nation aspiring to a position of world prominence can afford to neglect securing a steady and adequate supply. The great world powers of the past and present have always been its greatest producers. It is beyond the scope of this study which aims maily at emphasizing the extreme flexibility of steel production, especially in Canada; to delve into the intricacies of the technique of production, although a certain knowledge of the processes involved is requisite to an understanding of the economic aspects of the industry.

Before a nation can be a producer of steel, there are certain fundamental requirements. The most basic are iron ore, coal and limestone. The first contains the

Table 1

WORLD PRODUCTION OF STEEL
(Thousands of Metric Tons)

	1937	1938	1939
AFRICA, Union of South Africa	284	300	314
NORTH AMERICA	52,805	29,979	49,304
Canada	1,425	1,174	1,407
United States	51,380	28,805	47,897
CENTRAL AMERICA, Mexico	...	74	77
SOUTH AMERICA, Brazil	76	92	114
ASIA	7,200	...	...
China	...	...	...
Manchuria	427	...	...
Korea	...	...	...
India	910	952	1,035
Japan	5,811	...	...
U.S.S.R.	17,730	18,000	18,796
EUROPE	55,749	52,007	...
Germany (and Saar)	19,356	23,208	...
Austria	657	...	...
Belgium	3,863	2,279	3,104
Spain	167	574	584
Finland	48	77	77
France	7,893	6,137	7,822
Hungary	665	648	733
Italy	2,099	2,307	2,321
Latvia	3	3	3
Luxembourg	2,510	1,437	1,829
Poland	1,467	1,542	...
Roumania	239	277	267
United Kingdom	13,192	10,565	...
Sweden	1,106	972	1,152
Czechoslovakia	2,315	1,761	...
Yugoslavia	169	220	...
OCEANIA, Australia	1,097	1,210	1,224
TOTAL	135,700	109,000	136,000

Source:
Statistical Year-Book of the League of Nations, 1943; Table 68, Page 147.

metal desired, the second in the form of coke provides the heat to break up the ore and the third provides a flux to precipitate the reaction between the ore and coke. In addition, consideration must be made of scrap iron and steel as a source of raw material supply which has become increasingly important.

Three methods are commonly used in steel production: (1) Bessemer Converter: This method is the oldest method now in use. -(invented in 1856.) It is a method to make steel without using fuel - purification by a blast of air being driven through the molten mass. This revolutionised the indsutry, and gave a much cheaper product, but could only use ore that is low in phosphorus. The process is very rapid and does not allow for control of quality. (2) Open Hearth: This method invented soon after, made much closer control possible. Dolomitic lining was introduced which would remove phosphorus, hence ores could be used that were high in that impurity. Most standard-grade steel is produced by this method to-day, cheaply and in large, easily controllable batches.

(3) Electric Furnace: This is the most costly method, but exclusively the one used to make high-grade steels because of the precise controllability of procedure. The widespread use of the method become possible where there are abundant supplies of cheap hydro-electric powere.

Canada, has its primary steel industry catering to the bulk (about two thirds) of the requirements of

Canadian fabricators of the metal. For the remaining one-third of our raw steel needs we draw on sources of supply in the United States. When compared with the largest world producers, our position is an insignificant one. Table 1 shows world production of steel for three pre-war years. During the period 1936-38, production in this country averaged about 1% of the world total.

Table 2
Production of Steel Ingots and Castings in Canada and the United States, 1938-42.
Short Tons
(Source: See Appendix D)

Year	United States	Canada	Canada Per cent of U.S.
1938	31,751,990	1,293,812	4.1
1939	52,798,714	1,551,054	2.9
1940	66,782,686	2,253, 769	3.4
1941	82,839,259	2,712,151	3.3
1942	86,031,931	3,109,851	3.5

We have indicated that Canada possesses a steel industry, but of what does this industry consist? The very nature of the technical prosesses involved demands high capital expenditure which limits operation to very large concerns. Blast furnaces, open hearths, rolling mills, forges, require large and costly installations of equipment. The limited extent of the Canadian market for steel restricts the number of such concerns that can operate and sell within the market. Hence we have three concerns producing about three-quarters of our steel.[2]

1. As it will be used here, the term "primary steel industry" will include the manufacture of pig iron, ferro-alloys, steel ingots and castings and rolled iron and steel products.

THE STEEL COMPANY OF CANADA

Stelco is by far the most important producer in Canada. One third of all steel ingots and castings made in Canada are produced within its plants. Among products manufactured are, pig iron, open hearth steel, billets, wire rods, bar iron and steel, shapes, forgings, steel sheets, track spikes, bolts, nuts, rivets, nails and many other kinds of goods. It is this diversity of output that has contributed to the stability of the company.

The company itself was the product of a merger in 1910 of ten iron foundries and steel plants comprising almost all the important hardware producing firms in Canada and the Hamilton Iron andSteel Co. Stelco acquired the business and undertakings of outstanding bonds and stocks of the Hamilton Iron and Steel Co., the Montreal Rolling Mills Co., the Canada Screw Co., and the Canada Bolt and Nut Co., each of which was itself the product of a merger.

Operations are only partially integrated at the raw material level. In 1917, the company acquired ore properties in the Mesabi and Cogebic ranges sufficient to supply about half requirements. The remaining ore required is obtained in the open market. In 1918, coal lands were purchased in Pennsylvania under the name, Mather Collieries. At present, the company owns 2,894 acres of coal land. Sources of limestone are controlled in Michigan.

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2. For further information on this point, see Chapter Five.

The finding of adequate markets for its produce has never been difficult for the Steel Company of Canada, since its plants are located in the heart of the greatest market in Canada. The most recent development has been the construction of a new strip mill - a tin-plate coating mill, a 110 inch universal plate mill, and a six-stand 56" hot strip mill have been completed and the addition of cold production mills is planned. More recently, plans were announced for the construction of new by-product coke-ovens at a cost of six million.

ALGOMA STEEL CORPORATION

The Algoma Steel Corporation, as a subsidiary of the old Lake Superior Corporation, was the brain-child of an American promoter, Mr. F. H. Clergue. The Lake Superior Corp. was a holding company, but the companies controlled were not at all competitors. They embraced many lines of endeavour, including a railway, pulp and paper mill and power. Mr. Clergue was the promoter of several iron ore mines in the Michipicoten area (including the Helen Mine). In 1901, Clergue obtained an order from the Dominion government for steel rails and the Algoma Steel Corporation was formed with the intention of using Michipicoten ore. The plant was built at Sault Ste. Marie and was the first firm in Canada to make rails. Early history of the company was not especially prosperous. A bessemer plant had already been constructed when it was discovered the Michipicoten ore was not of Bessemer grade. At the end of 1902, the works had to close down; there was not pro-

tection for steel rails and German manufacturers were dumping rails in Canada. Financial difficulties came in 1904 which necessitated reduction of capitalisation. From then on, as more and more orders for rails came in, the rail mill was kept busy during most of the years up to the First World War. Great plant extensions were made in the years 1909 to 1913 when rolling mills, ore properties, coal lands and structural steel plants were acquired.

The products of the plant were limited to the heavier steel products and the management complained that the limited extent of the Canadian market for these products prevented them from diversifying their plant. Throughout the late twenties, heavy deficits were registered. Things went from bad to worse and the Algoma Steel Corp. and the parent company went into receivership in 1932. In 1935, the assets of the corporation were sold to a new corporation which bore the same name.

Operations are almost entirely integrated at the raw material stage, and enough coal and ore properties are controlled to supply a large part of requirements. Two coal properties are owned in West Virginia: the Cannelton Coal and Coke Co. acquired in 1910 with an annual production of 750,000 tons and the Lake Superior Coal Co. with an annual production of 450,000 tons. The coal from these mines is processes into coke in the company's own by-product coke ovens at Sault Ste. Marie. Algoma also controls the Fiborn Limestone Co. in Michigan with an annual production of 360,000 tons. Through a subsidiary, Algoma Ore Properties, iron ore deposits in the Michipicoten area are controlled. Annual

production is in the neighbourhood of 500,000 tons which is about half of requirements. Remaining ore is purchased from the Minnesota ranges.

Production has largely been confined to heavy steels: rails, structural shapes, merchant bars, light rails, rail fastenings, sheet piling, and some alloy steels. Following a contract with Continental Can in 1937, construction of a tin plate mill was commenced. Grinding balls for the mining industry have been produced since 1938.

THE DOMINION STEEL AND COAL CORPORATION

The career of Dosco has been one of the most chequered in the history of Canadian industry. It is the product of a long series of mergers, re-organisations and consolidations dating back many years. Prior to 1920, two large companies were operating on Cape Breton - the Nova Scotia Steel Co and the Dominion Iron and Steel (amalgamated with Dominion Coal in 1910 into the Dominion Steel Corp.) The Nova Scotia Steel grew up at Pictou in the 1860's first producing steel from scrap and imported pig and later producing pig from ores occurring around New Glasgow. More and more Wabana ore from Newfoundland began to be used and coal properties were acquired in the Sydney area. In 1904, construction of a new plant at Sydney with by-product coke ovens and open hearths was commenced. Through amalgamation, the company became a large producer of railway equipment (except rails) and was noted in Canadian finance for conservatism and stability.

The Dominion Steel Corp. was launched on a flood of

of optimism by the Whitney interests in 1899. To be sure the enthusiasm of the founders and the general public seemed well founded, since good grade ore was available at very much lower rates of extraction and transportation than in the Great Lakes area. The company expected to compete successfully with the pig iron and steel of foreign producers, even in time of depression; but after someyears found that it could sell abroad successfully only in years of high prices. Initial extravagance in construction of works and subsequent inefficiency of management brought financial embarrassment during the early years. Eventually operations were made efficient, rod and rail mills were built. The government bounties that had been in force since the inception of the company were not renewed in 1911 and more machinery was installed to cope with the expected increased costs. Success followed and the corporation declared itself in fear of no competitor, not even the United States Steel Corp.

Thus during the second decade of the century, the future looked bright indeed for the Nova Scotia steel companies. During World War One, rumours of merger were started, which were finally consummated in 1920, when they emerged as the British Empire Steel Corp. Over-capitalisation, internal inefficiency and obsolete nature of much of the plant throughout the twenties culminated in failure in 1928 and re-organisation as the Dominion Steel and Coal. Since that time, the company has gained in stability but has maintained a rather static position.

At present, Dosco operates a formidable array of subsidiaries which is the largest industrial group in the Maritimes and upon which the prosperity of Nova Scotia is largely dependent. Integration at the raw material level is complete, coal, ore and limestone supplies are owned. At the iron and steel works at Sydney, blooms, billets, slabs, wire rods, bars and smaller sizes of angles and shapes, wire nails standard rails and tie plates are manufactured. In addition, steamships, repair yards, car shops and a rolling mill at Montreal are controlled. The problems of the industry will be further discussed later.[3]

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3. See Chapter Seven.

CHAPTER II

CANADIAN IRON ORE OCCURRENCES

Early mining of iron ore in Canada did not reveal the extent, character and location of the present-day industry. The first evidence of iron ore was discovered as early as 1667 near Les Forges on the right bank of the St. Maurice River near Three Rivers. The ore mined was bog-ore which was first smelted at the St. Maurice forges, about 1730. Similar bog-ore deposits were commonly found at many locations throughout Quebec and southern Ontario and provided the basis for the earliest Canadian iron industry. Numerous small deposits supplied small local furnaces with all the ore they could use and when these deposits were exhausted and demand for iron products increased in the nineteenth century, other sources of ore had to be found.

The metal bearing regions of Canada are found in three of the four major geological divisions: the Appalachian Region, the Canadian Range. By far the most important from the standpoint of iron ore deposits is the Canadian Shield. Small deposits which are of no economic significance are found in the Appalachian and Cordilleran Ranges.

It would be advisable, before discussing the production of iron ore in Ontario, to give a brief treatment of the ore of Nova Scotia. Numerous small deposits of low grade hematite and magnetite have been found at various times in

in the northern mainland of Nova Scotia and on Cape Breton Island. Although they supplied the iron industry of the province before the first Wabana ore was imported from Newfoundland in 1895, they have never been a prominent feature in the mineral production of the province. Ore of low grade has been discovered in New Brunswick but it has no economic value.

It is in the Canadian Shield of Northern Ontario that the most favorable circumstances for iron ore occur. Here have been found deposits which are of considerable economic significance. Since the end of the nineteenth century, the Lake Superior region has attracted prospectors and capital. Until recently the Michipicoten area has produced all of the ore shipped from Canadian mines and was for years the centre of almost all activity. The Helen Mine situated about eleven miles from Michipicoten Harbour was opened in 1900, oxide ore being mined. It was the major ore producer until 1923 at which time the deposit was worked out. Other less extensive deposits of lower grade in the area were the Helen, Josphine and Magpie mines which produced iron carbonate and siderite. To fit these ores for furnace charging, they required roasting.

During this period (1900-1923), the bulk of the production of the Michipicoten area was shipped to the Algoma Steel Corporation at Sault Ste. Marie which owned the Helen Mine. A small quantity of the ore was shipped to the United States.

The Moose Mountain Range north of Sudbury may be cited

as an exmaple of an area which has faded in importance in recent years, although once it was estimated that the range contained 100,000,000 tons of high iron-content magnetite. During the same period there was activity in the Atikokan area west of Port Arthur. About twenty-five million tons of nagmetite were discovered around Sabawa Lake and ore docks were built at Port Arthur to accommodate shipments. However, the deposit was never exploited.

After production ceased in 1923, the prospects for the future were not very bright. Resumption of production would have to wait discovery of new high grade ore deposits, or improvement in beneficiation processes, to permit use of known deposits, all of which were low grade. With a view to finding a remedy for the situation, the Ontario government appointed an "Iron Ore Committee". After investigation, this recommended a bounty of one cent per unit of iron per long ton (a unit being one percent of iron in each ton of ore). On the basis of this recommendation, the government established in 1924 a bounty of one half cent per unit to be granted for a period of ten years from the date of proclamation of the act. Since theproclamation was never made, the bounty had no opportunity to stimulate production of low-grade ores.

From 1923 until 1939, production was almost nil, but since that year there has been activity in Michipicoten and at the Steeo Rock Mine in the Atikokan area.

The opening of the New Helen Mine was the result of prospecting begun in the vicinity of the old Helen Mine in

1937. This is owned by Algoma Ore Properties Limited, which is a subsidiary of the Algoma Steel Corporation. Reserves amount to some one hundred million tons of siderite of about thirty-five percent iron content, which requires sintering (roasting) before it can be charged to blast furnaces. The sintered ore is shipped to Algoma Steel Corporation and some is exported to the United States.

An important factor in the resumption of production in 1939 was the aid given by the Ontario government in placing a bounty of two cents per unit of iron on iron ore mined from Ontario mines. Where concentration is required, the bounty is paid on the iron content of the concentrate. For example a concentrate of iron content of sixty-five percent would be entitled to the bounty to the extent of $1.30 per ton. Without the bounty, it is certain that production could not have been resumed at that time.

The discovery of high-grade hematite in the Steep Rock area in 1937 may well have ushered in a new era in the mining of iron ore in Canada. Before it was drained, Steep Rock area was located four miles north of Atikokan, which is on the mainline of the Canadian National Railway roughly 135 miles west of Port Arthur. The ore possibilities of the area were seen as early as 1891 and in 1897 it was discovered that the main ore body was under the lake. Investigations were made every few years until E. S. Moore of the University of Toronto conducted a survey in 1937. On the basis of information disclosed from drilling into the lake-bottom through the ice, the Steep Rock Iron Mines Limited, was founded. Since that time, it has been the object of conjecture

regarding its probable importance. In any case, the importance of the project was never minimized.

By the end of 1940, drilling under the lake had revealed three main ore bodies. These could not be reached until the Seine River, of which Steep Rock Lake was an enlargement, was diverted and the lake drained. This operation entailed considerable expense, but it was expected that the economies of open pit mining would eventually pay for the draining of the lake. By July 1944, the lake had been emptied and large scale stripping of the overburden was well under way.

The enterprise was backed by Canadian and American capital, which paid the expenses of draining the lake and of installing the necessary equipment for open-pit mining. Because of the reluctance of Canadian investors to participate to any great extent in the project, the bulk of the funds were obtained in the United States: $5,000,000 from the sale of bonds secured by the United States Reconstruction Finance Corporation, and over $2,000,000 from the sale of debentures.

In addition, specific aid was given by the Ontario and Dominion governments who recognized the importance of the enterprise. The Ontario government constructed a Hydro-Electric power line to the site at a cost of $1,600,000. The contribution of the Dominion government was a four mile C. N. R. Spur from the main line at Atikokan and a high-level ore dock at Port Arthur, all to be erected at a cost of $2,500,000 and to be operated as public utilities. However, the ore dock was not completed until the middle of 1945. In addition to providing adequate shipping facilities,

the government agreed to pay a bonus of twenty cents per ton on ore shipped to Port Arthur.

From the first, the ore was found to be of the highest grade hematite. Natural iron content is 56.54 percent was compared with the average content of Lake Superior ores of 53.00 percent. Silica content is low (3.42 percent), hence the ore can be used to reduce high silica content ores to the standard eight percent used in furnaces. Phosphorus also is low (.017 percent) and can be mixed with high phosphorus ore to give ore of Bessemer grade. When the first shipment reached its destination, the quality of the ore was found to be even better than anticipated. In view of the high iron content, the ore is not entitled to the Ontario bounty of two cents per unit of iron, which has been so instrumental in furthering the progress of low-grade mining in the Michipicoten area.

The precise extent of the ore-body is as yet indeterminate. Proven reserves amount to twenty-five or thirty million tons and estimates of probable reserves (depending on the depth of the deposit) bring the total to at least one hundred to two hundred million tons. Some even estimate a reserve of half the extent of the Mesabi range.

Before operations commenced, the management aimed at a production figure of one million tons annually but since that time, the demand for high-grade ore has become so great that plans call for the shipment of five million tons in the 1945-47 shipping seasons. In June 1944, the Cleveland Cliffs Iron Company Limited, an American firm,

firm, announced that it had contracted for the purchase of the entire output of Steep Rock ore. With a market assured, open pit operations were inaugurated in August 1944, but little was shipped during the current shipping season because of production difficulties. Until the middle of 1945, when the Port Arthur ore docks were completed, shipment was made through Duluth. By June, ore shipped reached an average of 8200 tons daily.

The real economic significance of the Steep Rock iron mine is its suitability for use in open hearth furnaces and for mixing with low-grade ores to give an ore mixture of the required grade for blast furnace charging. The ore possesses the qualities of fast heat time and high ingot yield. It permits the use of a great deal less scrap in open hearths - an important factor when scrap is scarce. In view of these special qualities, the management plans to concentrate on production for export to the United States where reserves of high grade ore in the Mesabi range of Minnesota are nearing exhaustion after the over-stimulation of the war years.

Messrs. Roberts and Crago of Duluth estimated in 1943 that at an annual rate of two million tons from open-pit operations, the cost of producing per long ton would be $3.239 Canadian currency delivered at lower lake ports. A conservative appraisal of the average value of the ore is $5.61 Canadian per long ton. This would give an operating profit of $2.37 per ton. Since comparable American ore is being sold at prices varying from $6.20 to over $7.00

American funds, Steep Rock can successfully compete with any other producer. Operations were at the half million mark during 1945, but it is hoped to expand operations to a point where they will be really profitable. The sales policy which has been adopted by the management of the mine will necessitate continuance of imports of United States ore to fill the bulk of the requirements of Ontario blast furnaces.

Of more long-range significance are the Northern Quebec and Labrador deposits. For the past ten years or more, extensive surveys have been made by the Labrador Mining and Exploration Co. and the Hollinger North Shore Co. (both subsidiaries of Hollinger Consolidated Gold Mines) near Sawyer Lake and the Quebec-Labrador boundary line. In the seasons 1936 to 1939, six ore deposits had been discovered, but at that time it was not possible to determine their extent. More recent investigations have revealed bodies of truly significant proportions. A total of eleven have been located with an estimated tonnage of 659,000 long tons per vertical foot. Drilling has not yet revealed the depth of the deposits and estimates have been based on surface exposures. Widths, but not lengths of bodies have been disclosed - two of the larger ones are 800 and 900 feet wide respectively. The average content of iron plus manganese is 62.4 percent) and the average silica content is 3.99 percent. Both sulphur and phosphorus are present in negligible quantities.

It is not yet certain whether the reserves are large

enough to bring the area into production because of the large capital expenditures needed. If reserves warrant it, expenditures of $100 to $200 million are projected to put the properties into operation within a few years. Concentration will be on open-pit mining,- the only kind of operations that would be economical. The limitations imposed by climatic conditions will present a serious problem, but perhaps a still larger problem is that of transport. The construction program includes a 350 mile railway to the St. Lawrence River at Seven Islands, a port open to navigation all year round. However, it is estimated that reserves of 300 million tons will have to be established before the railway can be built.

The completion of the St. Lawrence waterway would play a significant role in the future. Depending on the cost of extraction at the pit, the ore could be shipped to the lower lake ports as cheaply as shipment can be made from the Minnesota ranges. With the impending exhaustion of high-grade iron ore deposits in the United States, the Labrador-Quebec deposits should prove of real value before very many years.

CHAPTER III

THE CANADIAN STEEL INDUSTRY IN THE FIRST WORLD WAR

The steel industry entered the war in a depressed condition; in 1914, the Canadian steel companies lacked enough orders to employ their plants to capacity. This lack of orders was partly due to a slowing down in the economic development of the country. The west was now open, and the period of rapid expansion of the railways had almost come to an end. The demand for steel rails had always been a determining factor in Canadian steel production and the demand for rails had fallen off enormously. Because of damage to crops and real estate speculation coupled with a decline of building activity, and the demand for iron and steel for farm purposes was also on the decline. Many steel plants had anticipated a continuance of the boom days of frontier expansion and had accordingly been rapidly increasing the capacity of their plants. Thus, some companies had increased their capital charges at a time when earnings were falling. Many were burdened with a large floating debt which would have to be met in a short time; many were over-capitalized and had been too liberal with dividends.

Management was dissatisfied with the tariff set-up just prior to the war. The steel manufacturers appealed in 1913 for a revision of the steel tariff. The main protest

was that too much protection was given to secondary steel production. Development along more basic lines, such as ore, pig-iron and steel ingots was hindered by the existing tariff. The demand for ahigher tariff on primary articles was stopped short by the paralysis and inertia brought by the war. Eventually, the war itself succeeded in doing what the steel men had in mind besides making a larger profit, namely the strengthening of primary production.

We can see that the outlook for the companies engaged in primary production in Canada was not promising during the early part of 1914, although their condition only reflected the general economic condition of the country. Although the war eventually turned out to be a tremendous boon to the industry, the pre-war depressed condition continued for the remaining part of 1914 and through-out 1915. It wasnot until 1916 that production began to pick up and not until 1917 that the production figure exceeded that of 1913.

When war broke out, the steel industry was hit with more force than any other in Canada. The Nova Scotia Steel and Coal Co. had sold almost its entire 1914 output of iron ore to German buyers. It was not possible to deliver the ore, and since the industries of Great Britain and the United States were similarly paralyzed, the Wabana mines in Newfoundland had to be shut down. Blast furnaces, open hearths and finishing mills of the Nova Scotia company were closed down for the balance of the year. Other companies were in a similar position: the Steel Company of Canada's business was completely disorganized and all old orders were cancelled;

the Dominion Steel Corporation and the Lake Superior Corporation were working at only a fraction of capacity.[1]

The steel industry was initially the hardest hit by the war, but was the first to recover from the demoralisation of conflict. As would be expected, orders for munitions of war, especially shells provided the greatest stimulus. The manufacture of such articles required specialised tools such as gorges, hammers and saws, which were not in Canada at the time and would be of little use after the sessation of hostilities.

The turn of events at this point in respect to the placing of contracts is interesting, and had an important bearing on the growth of the primary industry during the war. In August 1914, Lord Kitchener cabled to the Minister of Militia in Ottawa asking for sheels and guns which were to be obtained in the United States. The Canadian government approached important American steel men. In a meeting with the heads of the Bethlehem Steel Corporation, the question of producing shrapnel shells in Canada was discussed. One of the Americans said that such a plan was absolutely impossible, for Canada had neither the steel nor other facilities. In answer to this challenge, the Steel Committee was formed.[2]

Among the first problems which faced the Committee was the source of supply of steel for the manufacture of shells.

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1. Donald, W.J.A., Canadian Iron and Steel Industry and the War, Monetary Times, January 7, 1916, page 248.

2. Carnegie, D.C.B.A., The History of Minitions Supply in Canada, 1914-18, page 3.

The fact that all steel in Canada was made by the basic open hearth process was the source of difficulty. British specifications for high-explosive shells called for acid steel, since that was the only kind that had ever been produced in quantity in Great Britain. The term "Basic" indicates that there is very little silica in the ore and the term "acid" indicates that there is a fairly large amount of silica present. Britain had more access to siliceous ores than Europe or America, hence the latter countries developed basic steel and England developed acid steel processes. British users did not have much respect for basic steel and would not accept it. When the war broke out, the basic product compared favorably with acid steel for many commercial uses, but Britain did not want to run any risk until the worth of basic steel had been established. It was necessary to overcome difficulties in the use of basic steel for shrapnel and for high-explosive shells.

The credit for solving this metallurgical problem must go to the Nova Scotia Steel and Coal Co. The company decided that it could produce basic steel from Wabana ore, which would conform to the British specifications. A sample was made and found to be suitable for shrapnel and equal in quality to United States acid steel used in the Dominion Arsenal. The British War Department approved the product and placed an order for 200,000 shells. After much further experimentations, basic steel was perfected that rivalled acid for high-explosive shells. British officials were pleased and after exhaustive tests, the steel was accepted with a slight

change in formula. Details of this new process were made available to all other steel plants in the Dominion and shell production was greatly accelerated.

The importance of these events cannot be exaggerated. It is impossible to tell what might have happened if basic steel had not been proven to be equal to acid steel for shrapnel and high-explosive shells. Canada would have been dependent on United States sources for its shell steel, which even then would only be available at very high prices. In addition, the great expansion of the industry would not have been possible and the increased inflow of American steel into the country might have persisted in peace-time and could easily have caused a decline of the industry in Canada. Because of the development of new metallurgical methods, Canada was enabled to ship to the United Kingdom, 3,000 shells in 1914, 24,000,000 in 1917 and 16,000,000 in 1918.

The expansion of steel furnaces capacity was the significant feature of the war production of the industry. The war caused a development which exceeded proportionately, that of any other producing nation. Before the war, the total annual world capacity for producing steel was eighty million tons and immediately after it was 100 million tons. The United States had increased its annual tonnage from thirty-two to forty-five million tons, Britain from seven-and-a-half to twelve million tons and Canada from one to two-and-a-quarter million tons. Canadian capacity to produce steel had thus increased from about one-and-a-quarter percent to two-and-a-quarter percent of the world total. This was a greater

increased percentage than that of any other steel-producing nation. However, as we shall see, there was no great increase in the capacity to produce iron ore and pig-iron.[3]

The stimulus of war did not immediately cause an increase in p roducing capacity. By January 1916, little had been added to the capacity existing in 1913. Furnaces being built at that time would, when completed, only raise the steel capacity about 100,000 tons above 1913. Not until 1916 was the low of 828,641 short tons for 1914 exceeded bya figure of almost one-and-a-half million tons. By 1917, expansion was well under way, and the industry was enabled to hit a peak in that year. By 1918, production of steel ingots and castings had soared to the unprecedented height of over 1,800,000 tons, and increase of sixty-three percent over 1913 production and of 126 percent over that of 1914.

Similarly, the amount of pig and scrap iron and steel charged to steel furnaces during the period increased, but in different proportions. Pig iron charged to furnaces, after a temporary decline in 1914 of 32 percent from the 1913 figure, gradually rose to a peak in 1917 of 1,112,082 short tons, or eighty percent above 1914. In the last year of the war, the amount of pig iron used declined. During the period 1914 to 1916, the amount of scrap iron and steel charged to furnaces was slightly less than half the amount of pig charged during the same period. This situation was essentially the same as had existed in the years immediately prior to the war when the proportion of pig to scrap charged

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3. Carnegie, D.C.B.A., The History of Munitions Supply in Canada, 1914-18, page 281.

was roughly three to one. At any rate, the amount of scrap used at no previous time had been approached the amount of pig used. However, by the end of 1916, manufacturers had begun to feel the pinch and were beginning to look around for a source of supply for their new-found steel producing capacity. Since this need could not be filled by the increase in pig production, more scrap had to be used. This scrap was of two kinds; domestic scrap collected by scrap dealers and scrap turnings and borings resulting from the manufacture of shells.

As shell production mounted, the problem of disposal of of steel scrap turnings and borings became acute. Because of the probable development of a shortage of scrap iron and steel, an embargo was placed on the export of scrap turnings from Canada. This embargo was in operation throughout 1916 until the accumulation of turnings and borings had become so great that export of the surplus was necessary. At the end of 1916, the exportation of steel scrap was discontinued. Subsequently, the munitions manufactueres brought pressure to bear on the government to lift the embargo so that they could sell their scrap at a good price. In 1917, the situation was considerably improved, and most of the scrap was used in Canada. This improved situation was due to the formation of British Forgings Limited at Toronto. This factory was organised by the Munitions Board and consisted of ten electric furnaces, which produced steel ingots from the hard steel scrap. At that time, the plant was the largest

electric furnace establishment in the world.

By 1917, the consumption of scrap iron and steel in steel furnaces had increased 256 percent over the amount consumed in 1914. By 1918, the amount of scrap used exceeded the amount of pig used. Even in 1919, a year of temporary post-war decline, the amount of scrap used was only slightly exceeded by the amount of pig iron.

In contrast with the enormour increase in production of steel ingots and castings and in the capacity for such production, expansion of pig-iron production during the war was not remarkable. Inaddition, increases in the production and importation of iron ore were not great. To be exact, shipments of ore from Canadian mines registered a decline during the war period: from a figure of about one quarter million tons in 1914, there was an increase in 1915 of fifty-nine percent to almost 400,000 tons, with a subsequent decline to a low of slightly over 200,000 tons in the last year of the war. The reason for this decline may be found in the petering out of Canadian high-grade ore reserves. This decline was paralleled during the years 1914 to 1916 by a decline in imports. It is interesting to note, that although total imports of ore declined, the amount shipped from Wabana to Cape Breton almost doubled, indicating a temporary falling-off of ore imports from the United States. Not until 1917, when shell production was in full swing, was the amount imported in 1913 exceeded by a war-time peak of over two and three-quarter million tons.

In 1914, the total daily capacity of the twenty-two

blast furnaces throughout Canada was 4,470 tons, of an annual capacity of 1,631,550 tons. Of these furnaces, only eleven were in blast during the year and production of pig-iron was only forty-eight percent of capacity. By 1918, the number of blast furnaces in Canada had declined to twenty (fifteen of which were in blast), with a slightly increased annual capacity of 1,784,850 tons. Production of pig iron reached an all time peak of almost 1,200,000 tons which was fifty-three percent above 1914, but only five percent above 1913. As against a capacity utilisation in 1913 of sixty-nine percent, utilisation in 1918 was sixty-seven percent. It seems strange that during such a period of general increase of pig iron imports, for such imports in 1914 were only one third what they were in 1913 and at not time during the war did they exceed six percent, of the amount produced in this country. It is feasible to believe that increased lack of reliance on scrap was an important factor in accounting for this remarkable lack of growth.

In the production of pig iron, the relative positin of Ontario and Nova Scotia was not the same throughout the four years. At no time did production in the latter province exceed that of 1913 whereas Ontario reached a peak fifteen percent above 1913. This would indicate that the Nova Scotia industry had more fully utilised its capacity before the war than had that of Ontario, but that the Ontario industry responded more readily to the stimulus of war.

Concomitant with the increase in production, the war years saw a rise in the price of primary steel products.

Between 1914 and 1918, the price of Mesabi Bessemer grade ore per long ton rose from $3.50 to $6.00 and continued to rise until 1920. The most remarkable rise was that of basic pig iron from $16.00 per gross ton in 1914 to $48.12 in 1917; during the last year of conflict, however, the price of pig was dropping. Steel bill ets rose from $25.23 per short ton in 1914 to a peak of $59.17 in 1918. During the same period, wholesale prices in Canada registered an advance of 133 per cent.

At this time, there was much talk of the possibility of a consolidation of the whole industry in Canada which was probably stimulated by the plans of the United States Corporation to erect a huge iron and steel plant at Ojibway on the Detroit River near Windsor. This plant was to engage in all steps in the production of steel from blast furnaces to rolling mills to supply the Canadian market and part of United States' Steel's export trade. Although construction was commenced on the project, it never got into production. This talk of consolidation in the face of foreign invasion into the Canadian sphere of production materialised in the only large organisational development of the war years. This was the amalgamation of finally consummated in 1920, of the Nova Scotia Steel and Coal Co. and the Dominion Iron and Steel Co. At Sydney.

In sum, we may say that the war period saw a general expansion of the primary iron and steel industry in Canada, but did not exert any influence whatsoever on the most basic lines of production. While production of steel ingots and

castings increased enormously, mainly because of the increased use of scrap, shipments of ore from Canadian mines even declined and pig iron production increased only very slightly. Not only was the capacity to produce steel increased, but the quality of the product was improved; the experimentation of the war years and the importation of specialists tended to better the metallurgical technique of Canadian producers.

CHAPTER IV

THE PERIOD OF RE-ADJUSTMENT

After the hectic over-production and artificial consumption in the form of munitions during the war period, most buyers thought that steel prices would fall rather rapidly and hence postponed their buying until this should be effected. This sluggishness of demand caused a decline in production in the first months of 1919. Throughout the entire year, conditions were erratic, but by the end of the year demand was steadier. A notable feature of the year was the resumption of building operations on the Canadian branch plant of the United States Steel Corporation at Ojibway on the Detroit River near Windsor, at a newly estimated cost of $40,000,000. In view of the fact that total capital used in the primary branch of the steel industry in 1919 was just under $124,000,000, this constituted a serious threat to the already none-too-steady Canadian industry.

After this temporary disorganisation, business began to pick up. Production expanded in 1920 but the expansion was of an unhealthy nature, accompanied as it was by conditions of general inflation which had to be eliminated before things could get back to "normal". The increased production may be termed unhealthy in spite of the fact that primary steel producers found a ready market for all they produced.

Scarcity of raw materials, which is the inevitable initial

initial consequence of a war, forced up the prices of such staples as iron ore and pig iron to all-time highs which could not last indefinitely. Prices of these products for representative years are indicated in Table 3.

TABLE 3
Pieces of Iron Ore and Pig Iron In Canada
For Representative Years 1913-22
(Source - Prices and Price Indexes, 1913-25)

Year	Iron Ore, Mesabi Bessemer Average Price per gross ton, lower lake ports	Pig Iron #1 Foundry. Price per gross ton at Montreal
1913	$4.15	$17.50
1915	3.45	20.79
1918	6.00	50.50
1919	6.40	40.41
1920	7.03	56.00
1921	6.70	35.76
1922	5.95	33.89

Because of the tighter money market and the higher prevailing interest rate, steel plants found it necessary to discontinue large expansions which were both under construction and projected. Labour troubles were rampant at Sydney in the plants of the Dominion Steel Corporation and the Nova Scotia Steel and Coal Co. The fact that the proposed merger of the two concerns into the British Empire Steel Corporation had not yet Quite materialised did not ease the troubles.

Business in 1921 was depressed both on this continent and abroad, but the slower conditions did accomplish useful purpose in starting prices on a downslide from the inflated levels of the war and post-war periods, a trend which persisted on into the thirties. Net value of production fell to one third of the 1920 figure and for the first time since

1904, the wage scale turned downward after reaching its peak in 1920. Average annual wage in 1922 was $1331.00 as against $1645.00 in 1920.[1] Domestic depression did not discourage the importation of almost a quarter of a billion dollars worth of iron and steel goods, the largest amount yet to be imported in any one year and an amount not to be exceeded again until 1929.

The general lassitude which characterised this period may be traced to the dearth of orders for steel from the railways and from the manufacturers of agricultural equipment. Production eased down until 1922 when only half as many steel ingots and castings were produced as two years previously. The period 1920 to 1922 saw the elimination of twenty-five small firms from the primary iron and steel setup in Canada, with a reduction in capital used of more than thirty percent. The following table illustrates the sort of adjustment taking place:

Year	No. of Plants	Capital Used	Average No. of Employees
1918	60	146,651,376	20,646
1920	50	119,761,718	13,874
1922	25	78,687,321	5,886

Not until 1932 were employment figures so low again.[2]

The next year (1932) saw some recovery, due mainly to the placing of long-delayed orders for railway equipment. Production figures for the year indicate the extent of the recovery which would have been more pronounced but for a strike at the plant of the British Empire Steel

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1. For Source, See Appendix A.
2. For Source, See Appendix A.

Corporation. This dispute became so heated that an investigation by a Royal Commission was necessary.

However, 1923's recovery was only temporary. A relatively high level persisted into the first half of the next year, but by June, the generally unsatisfactory industrial conditions prevailing contributed toward a drop in production as contrasted with the level of the year before. In spite of this recession in 1923, the general trend had turned upward and was to continue until the early thirties. Contrasted with this upward trend was the persisting fall in prices which was setting the stage for increased production at more sane levels.

As may be seen from Table 4, the iron ore situation was becoming steadily worse for the Ontario industry especially.

TABLE4
Imports and Shipments from Canadian Mines 1919-1925
Short Tons
(Source - See Appendix B.)

Year	Imports Fiscal Years	Shipments from Canadian Mines Calendar Years
1919	2,227,919	197,170
1920	1,632,011	129,072
1921	1,950,291	59,509
1922	656,902	17,971
1923	1,044,999	30,752
1924	1,807,223	.....
1925	911,586	.....

The amount of domestic ore produced, although it had never comprised a very large percentage of the total used, had been declining steadily for a number of years and by

1923 has ceased entirely. The Federal government began to look around frantically for new iron-ore deposits while the country fell back on a 100 percent dependence on imported ore.

The period of re-construction ended about 1926 when a short period of healthier econonic growth set in. This growth of the primary industry was accomplished in the face of a high level of imports of all varieties of iron and steel goods especially from the United States. The characteristic of the time was a steady secular downward trend of the general price level accomplished by falling prices for all primary iron and steel goods and a gradually accelerating rate of production of steel ingots and castings.

Until 1926, production figures for pig-iron had long been regarded as one of the most reliable indicators of general business conditions, for reasons which are obvious to anyone who knows the used of iron and steel. An examination of the graph in Appendix E. will reveal the increased dependence on iron and steel scrap as a source of open hearth charging material after the war. In fact, during 1924 to 1929, more scrap was charged to steel furnaces than pig iron. This more extensive use of scrap has made steel ingots and castings production figures a more reliable index than pig iron. But our great dependence on the United States for many of our steel goods would tend to lessen their reliability as indicators of business conditions in Canada.

Again, in the late twenties, the British Empire Steel Corporation at Sydney attracted attention. In 1927,

application was made for the winding up of the corporation. To some extent, the step was necessary because of unstable trade conditions of the past few years; but by far the greatest contributing causes were of an internal nature. Large sections of the plants were obsolete. They had been built up in the hey-day of ffontier and railway expansion (an Abnormal period) and developed into the biggest industrial concern in Canada in 1920. When the period of expansion came to an end and a steel industry grew up in Ontario closer to the centres of demand, the Nova Scotia industry was cut off from the wide domestic market it had once had, although its resources of all material necessary for iron and steel making were readily available and in quantities which were more than ample. In the immediate post-war period, Besco did not get a large chare of the orders because of its geographical isolation from the rest of Canada. Higher tariff walls cut off foreign markets and accentuated the distress.

The internal causes of failure in 1927 were many. First, the Sydney plants were not diversified enough to withstand much of a shock; their mainstay had always been primary products. In addition, Besco had been overcapitalised for the start in relationto earning power. The management had not been very efficient with the investment. The capital, both of Besco and its subsidiaries, had become hopelessly impaired; market value of the corporation's securities had fallen far below book value. Securities issued amounted to almost $90,000,000 while their market

value was less then $3,000,000.

In 1928, the British Empire Steel Corporation was re-organised as the Dominion Steel and Coal Corporation with a capitalisation of $65,000,000 (contrast this with the original capitalisation authorised for Besco of $500,000,000).

The record of Algoma Steel Corporation during the period was not brilliant. When it was first founded by American interests in 1902, its main product was steel rails which at that time were much in demand and which the company was in favorable geographical position to supply. When railway demand tapered off, the company complained that the limited extent of the Canadian market for their products prevented them from diversifying their plant. Because of this inadequacy of the market for steel rails, the company registered heavy deficits mounting to a quarter of a million dollars in 1926.

During the boom period, even companies in as poor a condition as Besco and Algoma could make a profit. The Steel Company of Canada went on expanding; its central position to demand and the variety of its products obviated serious difficulties which the other two large plants encountered.

About the time of the re-organisation of Besco, the possibility of a merger of the three large producers was rumoured. In 1928 there was no immediate prospect of such a merger although the benefits would have been considerable. Specialisation would lower costs by permitting fuller utilisation of existing capacity. But it was argued that the social evil of such a combination would far outweigh any economic advantages that might accrue. If tariffs were

removed from all types of goods manufactured by the merger company, competition with the big mills in the United States would keep prices down. On the other hand, the great influence which an organisation of the size would wield could easily be brought to bear on the government to erect higher tariff walls, thus ensuring the company an iron-clad monopoly market. The compaint of the steel makers that the tariff was not high enough had been traditional. Chief among these had always been that not enough protection was afforded the primary industry. If higher tariffs were instituted, they claimed that the exclusion of foreign products (especially rolling mill products) would enable the home industry to expand enormously.

In 1928, the steel corporations petitioned the government for a revision of the iron and steel tariff schedule. All were unanimous in demanding a higher tariff but the hearings before the Advisory Board on Tariff and Taxation disclosed the clash of interest between the three big companies and the lack of agreement as to what the specific tariffs should be. Both Algoma and Dosco desired a much higher tariff whereas Stelco, which was by far the most prosperour during the boom, opposed these high tariffs. The first two companies claimed that their plants were highly efficient mechanically and in management, but that they needed protection because of the proximity of the mass-production plants of the United States. The prosperity of the Nova Scotia steel industry was vital to the prosperity of the province and many Maritime members felt that the

industry should be helped. Dosco applied for a bounty which Stelco opposed, charging the former with inefficiency and over-capitalisation.

The new tariff was passed in 1930 during a special late summer session of Parliament. It was designed, through the introduction of British preferential tariff, to divert trade from the United States to British Empire Countries. The chief items affected were iron and steel products. The sections covering raw, primary and secondary products, structural forms and rolling mills products were to give more business to Canadian mills. Until then, Canada had been deficient in home-produced stfuctural steel and rolling mill and had had neither the protection nor the capital to enable her to turn them out. Because of the ensuing depression, it is difficult to tell whether the object of the new tariff would have been more fully realised if times had been "normal". An examination of Table 5 will show that imports from Britain were definitely stimulated in proportion to total imports of iron and steel goods, in the face of generally depressed world conditions.

TABLE 5

Imports of Iron and Steel Goods from Great Britain and the United States and Total Imports. (in thousands of dollars) 1929-1935 (Source-Iron and Steel and Their Products 1940-42; Table 3)

Year	Great Britain	Percent of total	United States	Percent of Total	Total
1929	18,803	5.4	316,096	91.3	345,195
1930	21,251	6.8	279,132	89.7	311,188
1931	18,040	9.4	166,794	86.6	192,614
1932	13,382	13.6	80,539	81.9	98,298
1933	11,997	20.3	43,934	74.5	58,918
1934	16,712	24.1	49,099	71.0	69,127
1935	18,601	17.6	77,478	77.4	100,056

It is more than likely that the higher tariff on United States steel goods, coupled with unhealthy business conditions, caused many buyers to switch to the British market. When the pressure of the depression was relieved somewhat, the proportion of British steel imports to Canada to total steel imports declined. If conditions had been healthier, it is likely that the higher tariff would have affected imports from the United States scarcely at all.

To backtrack slightly, the expansion of 1929 was the greatest since 1918. Railroad and construction activity, together with larger automobile output took up the increased production. 1930 was a heavy year for construction although steel ingots and castings fell off almost forty percent. From 1930 onward, production declined steadily to the lowest point since 1905. In theyears following 1929, the steel industry was held firm in the grip of its greatest recession. The erratic twenties came close to rivalling this period for insecurity in the industry; but then the erratic production of the twenties arose mainly from uneconomical and abnormal sources (i.e. the aftermath of war). Production of steel ingots and castings dropped from its peace-time record figure of 1,543,387 short tons in 1929 to a low of 380,067 tons in 1932, the lowest since 1904. An examination of Table 6 will show that although the volume of production and value of production declined in varying degrees to between one quarter and one fifth of former figures, the number of plants actually increased slightly and the amount of capital employed decreased very little from 1929

to 1934. This indicates a persistence of fixed charges which coupled with the low return on capital investment acted as a further drag on recovery.

TABLE 6
Principal Statistics of the Canadian Primary Iron and Steel Industry 1929-34
(Source-See Appendix A.)

Year	No. of Plants	Capital Used	No. of Employees	Salaries & Wages	Gross Selling Value	Net Value
1929	45	109,446,529	11,218	18,534,681	72,231,995	39,717,399
1930	49	112,079,926	9,723	14,934,325	52,588,935	29,823,287
1931	53	104,512,104	8,026	11,072,054	36,911,245	21,619,831
1932	52	96,323,629	4,847	6,131,057	16,197,526	9,908,048
1933	50	96,444,846	5,200	6,049,189	18,492,549	8,193,781
1934	51	90,079,004	7,400	9,009,512	29,101,463	12,458,929

At this time, the use of scrap in steel furnaces became more important than ever before. During the war (1914 to 1918) producers had come to realize the potentialities of scrap charged to steel furnaces closely paralleled the amount of pig iron charged, never exceeding it, which has continued to the present day. The proportion of scrap to pig steadily increased as production and prices declined until in 1932, the ratio was 5:2 (119,785 short tons of pig as against 301,506 tons of scrap). Supplies of scrap were readily available, and at relatively cheaper rates than pig. Whereas scrap prices had, by 1932, declined to roughly half the 1929 prices, the price of pig iron was maintained at only a slightly lower level.

TABLE 7
Prices of Pig Iron and Scrap Ironand Steel, 1929-32
(Source-Prices and Price Indexes, 1913-32)

Year	Pig Iron No. 2 Foundry	Scrap Heavy Melting Charging Box Size
1929	$23.60	$12.67
1930	22.10	12.08
1931	22.10	81.87
1932	22.10	6.83

Scrap fluctuates in price much more than even pig iron, following a pattern of an increase in price in boom periods and a drastic decline during recessions. During a boom, steel products are in great demand. This reflects itself in an increased demand for the raw materials of steel, which can be only partially satisfied through an increase in pig-iron production since the scrap heap provides a much more readily available and flexible source of raw material than does pig. Since supplies of scrap are so readily available, producers compete with each other for the existing scrap supplies, thus forcing up the price to a higher level than that of pig iron. This high price starts an accelerated flow of scrap into the hands of dealers, and by the time the boom has exhausted itself and decline has set in, the market is flooded with supplies far exceeding current requirements, hence the drastic drop in price.

The depression reached its lowest ebb in March of 1933, when only 12,557 short tons of steel ingots and castings were produced. This was about one tenth of the average monthly rate for 1929.

The depressed conditions precipitated the failure of the Algoma Steel Corporation which went into receivership in June 1932. The petition for receivership was made by the Cannelton Coal and Coke Co. of West Virginia, a subsidiary of Algoma. The corporation had been unable to secure a market for its chief product, steel rails, and had in preceding years registered large deficits. It was operated under receivership until 1934 when a new corporation

bearing the same name was formed to acquire the assests and good-will of the old company. Since that time, the company has shown a marked tendency toward greater diversification of its plant which has brought it greater stability and earnings.

Recovery was more rapid than it had been following the depression of 1921 and 1922. After the abnormal low of the early months of 1933, production began a slow, steady upward swing until 1937. In that year, more steel was produced than in the boom year of 1929, mainly as a result of the rearmament movement which was at that time beginning to manifest ifself in almost all countries of the world. Although not extensive, this movement toward arming for war exercised a very real influence on steel production, even in Canada.

CHAPTER 5

THE STEEL INDUSTRY AND TOTAL WAR 1939-45

The importance of steel in modern war is obvious. In peace-time steel forms the back-bone of our modern technological civilisation, but in time of war, it assumes a position of even greater importance. The production of all types of armoured and transport vehicles, guns, shells and ships all demand steel in abnormal quantities, and it is natural that the steel industries of all countries should be stimulated far beyond the point of production necessary for the satisfaction of peace-time needs. It was quite as natural for expansion to take place in the Canadian iron and steel industry as it was for the steel industry of any other nation to expand. When a highly mechanised was ends, it is also quite natural for such abnormal expansion eventually, after re-construction, to contract to a considerable degree. Such a contraction may be regarded as inevitable.

The advent of the Second World War found the steel industry in a much more favorable condition than it had been in 1914. The recovery phase of the business cycle was in progress, and business in 1939 was good after the temporary set-back in 1938. Since the last war there had been re-Organisation and write-off of capital investment on the part of two of the three major producers: Algoma Steel Corp.

and Dominion Steel and Coal. Although there had been little expansion of basic iron and steel production during the thirties, much progress had been made toward diversification of output. A notable example of this trend toward increasing diversification was the erection of two tin-plate mills in Canada. Dominion Foundries led the way in 1936 by commencing construction on a cold-reduction mill and tin-plate mill. Algoma Steel followed with completion of a tin-plate mill in 1939. Extensions such as these into the lighter steels field tend to lead steel plants away from dependence on heavy steel users and provide one possible source of greater over-all stability.

Peace-time demand was high in 1939 and steel making operations were 67 percent of theoretical capacity.[1]

At the same time pig-iron operations were only about half capacity. Immediate expansion was not necessary, for immediate needs could be taken care of through more intensive utilisation of existing capacities. Even so, up until the end of 1939 there was very little use of steel facilities for war requirements. Production could not be increased to any great extent without reaching the limits of capacity, and increased production in the following year was due mainly to more full use of plant, and planning of production through government control.

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1. Annual theoretical capacity of a steel furnace is determined on the basis of operation of the furnace every day in the year. Thinking in terms of such capacity is erroneous, for it does not take into account the time necessary for tearing down and repairing of furnaces.

Problems that were shortly to figure prominently had not made their appearance, and the industry was largely marking time until plans could be made. While these plans were being formulated for the production of all types of steel-using minitions in Canada, no effort was being made to curb the use of steel for civilian non-essential purposes. It is likely that at the outset of the war it was thought that restrictions on civilian production would not be necessary for its successful prosecution. Such an attitude is easily understood. Canadian participation in large-scale production of munitions in 1914-18 did not affect the use of steel for civilian goods, so that in 1939 it was quite natural to think that enough munitions could be produced without making inroads into peace-time uses. The concept of total economic war had not yet been driven home.

The period 1940 to 1942 was one of extreme flux. Expansions too numerous to mention individually were being made constantly and production of the basic ingredients of war soared to heights surpassing any previous record.

TABLE 8
Production of Pig-Iron and Steel Ingots and Castings in Canada, 1939-42
(Source - See Appendix C and D.)

Year	Pig-Iron	Steel Ingots and Castings
1939	846,418	1,551,054
1940	1,309,099	2,253,769
1941	1,528,053	2,712,151
1942	1,975,014	3,109,851

The problems attendant upon this increase were numerous and began to manifest themselves during 1940. The overrunning of the Low Countries and the fall of France

in the spring of 1940 impressed for the first time on the Canadian people the seriousness of the struggle into which they had entered.

On June 24, 1940 under Order-in-Council 2742, a Steel Controller was appointed for Canada and given very extensive powers. These powers included the right to purchase, expropriate, manufacture and take virtually any steps required to facilitate the flow of a supply of steel for war purposes. The objects of the new regulations were outlined to representatives of the steel companies by the Minister of Munitions and Supply at a meeting of July 4. Prices were not unconditionally frozen, but the industry was required not to increase prices without the consent of the Steel Controller. Following this, plans were made to increase pig-iron, steel-making and rolling capacities. The main work of the steel controller was in adjusting the rolling schedules of the steel mills. The Canadian industry had always had difficulties in the production of rolling-mill operation.

In the United States the demand for each type of rolling mill product is so great that each mill can specialise in a certain product and hence reap the benefits of continued and large-scale production. In Canada, the same rolling mill must be used for the production of many types of goods with a resultant loss of time and increase of costs when rollers are changed. Because of the smaller size of the Canadian market for rolled steel, the full benefits of large-scale production are denied Canadian producers.

The Controller required all plants to submit their rolling schedules for his approval. Through this arrangement, the Controller could see that the production of various types of steel was rightly proportioned and that if surplus of steel ingots occurred in one plant, it could be shipped to another which at the moment was not producing enough ingots to supply its own rolling mill requirements. In this way, output from existing capacity was maximised until new rolling mills could be constructed.

Production of steel ingots and castings in 1940 was dangerously close to theoretical capacity. This left little margin for contingencies and did not allow furnaces to be shut down for the periodic repairing and rebuilding so necessary for efficient operation. Such a basis of operations could not continue for very long without net additions to blast and steel furnace capacity. In the fall of 1940, no blast furnaces were being constructed in Canada and none were planned (most of the additional capacity put into use in 1940 consisted either of furnaces not hitherto fully utilised or those whose erection had been planned before the war.)

By this time, retooling for war had made considarable progress; but conversion had not yet reached the point where supplies of steel for the production of durable consumers' goods were declining.[2]

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2. As an example, the passenger automobile industry had not as yet begun to curtail its production. In fact, the following table will show that the number of passenger automobiles produced in Canada actually increased from 1939 to 1940:

As a consequence of the as yet incomplete state of conversion, there was no shortage of basic steel products during 1940. There were, however, shortages of special alloy and armour plate steels. In 1940 there was only one producer of armour plate in Canada (Dominion Foundries). As we shall see later, the development of electro-metallurgical processes for the production of high-grade steels was one of the significant features of war productions.

At the beginning of 1941, the supply of steel was close to meeting requirements. This improved situation was due to: increased production, increased imports from the United States and a certain amount of decrease in domestic demand, although the automobile industry was still going strong. Sheets and plates were in very short supply.

In February 1941, the Controller established maximum prices for the various grades of iron and steel scrap. Mills and foundries were ordered to import not less than twenty-five percent of total scrap tonnage purchased. This scrap came from the United States and the plan was designed to alleviate the drain on Canadian scrap reserves. The plan was not successful, for as the amount of scrap used increased, the amount imported from the United States steadily

Year	Passenger Autos
1938	123,761
1939	108,369
1940	109,911
1941	96,603
1942	12,236

This is only one instance of the distance that had to be travelled toward a total war effort.

declined from its 1940 peak, in which year only 22 percent of total scrap used in Canada was imported from the United States. At this time the scrap situation was not desperate, but available supplies were tightening.

TABLE 9
Amount of scrap used in Canada, and Imports and Exports of scrap 1939-43
Short Tons
(Source - See Appendix E)

Year	Amount Used	Imports	Exports
1939	1,299,870	177,564	93,837
1940	1,851,746	415,981	3,261
1941	2,285,286	295,990	28,089
1942	2,523,461	114,917	57,348
1943		38,195	105,737

New restrictions were placed on the used of steel for non-vital construction. The use of wood for structural purposes was introduced wherever possible. Structural steel shapes were standardized and their number reduced from 267 to 70 sizes. Such a measure increased the output of the mills by cutting down on the number of roll changes. Other points of the control plan were to encourage increases in furnace capacity and to make the restriction of purchases of steel for all purposes purely voluntary.

In Juen 1941, the increasingly short supply of pig-iron made i t necessary to concel existing orders and require that all new orders be submitted to the Controller for his approval. This was the first preference control to be made according to essentiality to the war effort.

A serious shortage of steel first threatened in the summer of 1941. The situation became progressively worse after Julyl. This shortage arose partly from the difficulty

of getting steel supplies from the United States where a rigid system of priorities had been instituted. It was necessary for Canada to make her "honour" system more rigid and a priority schedule was devised so that essential users would be ensured supplies.

Canada became more dependent on the United States for iron and steel products than ever before as indicated in Table 10.

TABLE 10
Imports of Iron and Steel Products into Canada 1939-43
(Source - Iron and Steel and Their Products in Canada 1940-42 Page 21)

Year	United States	All Countries
1939	$158,138,245	$183,159,650
1940	273,253,260	298,902,743
1941	410,279,249	431,622,365
1942	368,138,292	377,765,477
1943	411,038,680	420,190,144

It might be noted that imports from the United States fell in 1942 because of the increasing difficulty of obtaining steel in that country and because some civilian buyers were eliminated by the priority system.

Control over iron and steel scrap became increasingly rigid as 1941 progressed and the demands of war mounted. Prices, dealers and sources of supply all came more and more under government control. In 1942, the danger that supplies might "peter out" at any moment became very real. The government launched a drive to collect the scrap needed to keep the furnaces busy. This was collected from all parts of the Dominion irrespective of distance from steel plants and transportation facilities. Supplies from the United

States were now cut offand scrap had to be found somewhere. It was needed so desperately that it was collected from farms in the west and shipped east to the steel plants. The government went so far as to subsidize scrap shipped eastward in order to keep cost within reasonable bounds. The suggestion was even made that steel ships be raised from the bottom of the Great Lakes to feed the furnaces.

The great increase in scrap used was, however, not attribuatable to such measures. The chief source is industrial plants which account for fifty percent of supply; the next important source is "plant" scrap which is a recurring item and refers to the metal scrap collected in steel fabrication plants and accounts for twenty percent. Other sources of supply account for the remaining thirty percent. There was a great absolute increase in the amount of scrap used in steel furnaces, but the ratio of scrap to pig remained substantially the same. In fact, the scrap content of steel used was the lowest since 1930. The use of more scrap was also significant in that it decreased the amount of iron ore which it was necessary to import from the United States. To be sure, imports of ore did increase to a degree commensurate with the increase in pig production, but through increased use of scrap, especially in electric furnaces, Canadian balances of United States dollars were preserved.

During 1942, regulations concerning the use of steel became more strict. On March 19, all unfilled orders on producers' books placed prior to December 1941 were cancelled

except for orders from direct war users. This was to clarify the situation in respect to the demand for steel. Non-essential users had been in the habit of placing orders with several mills, hoping to get delivery from at least one. Such a practice tended to create an illusory demand for steel.

TABLE 11
Scrap Iron and Steel Used in Steel Furnaces in Canada 1939-42
Short Tons
(Source - See Appendix E.)

Year	Scrap	Pig-Iron	Percent Scrap
1930	641,818	583,029	52.4
1932	301,506	119,785	71.5
1937	1,003,791	747,747	57.3
1939	927,018	733,096	55.8
1940	1,323,501	1,083,421	55.0
1941	1,599,124	1,340,441	54.1
1942	1,826,911	1,615,396	53.4

Subsequent orders could only be made by Wartime Merchant Shipping Limited, government companies, the Department of Munitions and Supply, railroads and subcontractors for the foregoing. On March 24, rolling or shipping of tin plates or sheets could not be made until the order had been approved by the Controller. On the same day the importation of high-grade tool and alloy steels from the United States was forbidden except under permit. In spite of difficulties encountered during the year in procuring adequate supplies of raw materials, the production of steel reached its war-time peak.

A major crisis faced steel production during the early months of 1943. This was directly due to labour troubles, at the plants of the Algoma Steel Corporation and the Dominion Steel and Coal in Sydney.

In order to understand the issue at stake, we must go back to March of the preceding year. On March 18, 1942 the employees of Algoma, whose union was the United Steel Workers of America applied to the Ontario Regional War Labour Board for an increase of basic wages for unskilled workers to fifty-five cents per hour. This really involved not only an increase in the basic rate for unskilled labour but increases all the way up the wage scale. On March 31, the same union at the Dosco plant applied to the Nova Scotia Regional Board for a similar increase. Neither board saw fit to consider the increase.

Order-in-Council 5963 issued on July 10 undertook to stabilize wage rates in Canada to prevent inflation. This wage control order provided for examination into cases where special conditions could be said to exist; for example: where wages for a certain type of labour were lower than the generally prevailing rate. A week later, the Nova Scotia Board refused the application of the Union at Dosco, because prevailing wage rates at the Sydney plant were at least equal to rates current in the district. In August, the Ontario Board recommended that Algoma and the union negotiate some agreement in respect to increases and submit it to the Board. Negotiation did take place and some twenty agreements on wages were made but the application for an increase was still turned down.

All this time, increasing restlessness at Algoma had made the threat of work stoppage very real, just at a time when the war effort was at its peak and every scrap of steel

that could be produced was needed desperatley. When a strike vote was conducted at Algoma in August, workers voted 3126 to 17 in favour of a strike.

Following a conference of the United Steel Workers of America and the government, the Barlow Royal Commission was appointed. The commission conducted hearings at Sault Ste. Marie, Toronto and Sydney and on December 28 presented its Majority Report which recommended no change in the basic wage rate. The wages at Algoma and Dosco were the highest in the companies' history. The rates were not substandard but actually were above average rates prevailing for that class of labour.[3] Furthermore, workers did not continue long at the same basic wage and very few workers at Algoma (10 to 15 percent) received it. At Sydney, it was found that Dosco rates were setting the pace for the district. The union had desired to have the steel workers exempted from wage control regulations; but the conditions in the industry were not sufficiently different from those in other industries to warrant raising the wages and violating the ceiling.

The Minority Report of the Commission presented a somewhat different sttitude. Here it was stated that because of the long hours and the dangerous work involved in steel production operations, an increase in the basic rate was justified. The Report recommended a raise to fifty-five cents per hour and suggested that the steel industry be exempted from control regulations so that wages could be adjusted.

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3. Labour Gazette, January 1943, Page 58.

The argument for higher wages put forth by the union was based on the claim that living conditions of the workers were poor and that hours of work were excessively long. Long hours were necessary at the two plants because of the acute shortage of manpower that characterized the labout market in 1942. Most workers at Dosco and Algoma were paid more than the basic rate and one is led to suspect that wages were only one factor in the dispute, as witness the twenty agreements made between Algoma and the union up to December, to the satisfaction of the union. Labour politics may have been involved in the competition between the United Auto Workers and the United Steel Workers of America for dominance in the Canadian steel and steel products industry.

The Reports of the Commission were transmitted to the companies and union at the beginning of January. On January 12, 5200 employees of Dosco went on strike and two days later, 3,786 workers at Algoma. A conference was held and the government agreed to pass and order-in-council implementing the recommendations of the Majority Report and fixing the minimum wage in the two plants at fifty-five cents if the workers would return to work. This wage was to include cost of living bonus. Eventually the union accepted the offer, a vote was taken and both plants were in operation again before the end of January.

Some dispute arose over the interpretation of the terms of the order-in-council. This centred around the use of the term "basic" steel plant. If the manufacturers of gun barrels, car wheels etc, were to be included, then the order would have to be applied to many industries to which

it was not intended to apply. In addition, some claimed that the industry was entitled to cost-of-living bonus over and above the new basic wage. Stelco jumped in at this point and asked for a basic wage of fifty-four cents plus cost-of-living bonus, which would mean an increase in all pay categories.

The union charged that the government was not carrying out the promises made during negotiation; but the latter made it clear that it would not allow cost-of-living bonus on top of the basic rate. Unrest persisted in the plants and the drop in output began to hit the war effort. For a while it was not certain whether or not it would have to be necessary to scrap the wage ceiling in order thatproduction of steel could be maintained at the level necessary to fill the requirements of industries fully geared for war. Through skillful handling of the situation by the new chairman of the re-organised National War Labour Board, Hon. Justice McTague, the government was able to hold its ground. In ensuing months, production reached a level almost paralleling that of the peak of 1942 in spite of the strike and the short supply of labour.

To meet the requirements of the shipbuilding industry which mushroomed in Canada during the war, two new plate mills were brought into operation and a new 110 inch mill was completed at Stelco in 1941. With the aid of the government, Dosco renovated an old plate mill that had not been used since the First World War and placed it in operation in 1943. In this wat the Dosco mill was able to supply the

Maritime shipbuilding industry.

War orders for steel began to fall off in January 1944 and the industry began to think in terms of post-war needs. What would be done with the enormous increase of pig iron and steel capacity? For the time being, imports of steel from the United States was declined. With the great reduction in shipping losses ship-building was eased and the demand for steel plates dropped. More steel became available to civilian buyers; but the priority system was still in force. The only major shortage was in light sheet steel, quantities of which were still required for war purposes.

CHAPTER 6

SUMMARY OF PROGRESS MADE 1939-1945

1. EXPANSION OF FACILITIES

Early in the war it was evident that increased production would have to come from the expansion of existing facilities rather than from the erection of new plants. Steel plants are heavy and complicated productive units and the construction of an integrated plant for the production of the raw material of war supplies could not be made rapidly enough to carry steel users over the crisis. For example, the erection of a blast furnace may take six months to a year to complete and even at that, most of the component parts would have to be imported from the United States. As old capacity became fully utilised, new blast furnaces, open hearths, electric furnaces and rolling mills were brought into operation. We might be tempted to ask ourselves what would have happened if, instead of expanding her own steel industry, Canada had imported her additional requirements from the United States?

TABLE 12
(a) Statistical Summary of Primary Iron and Steel Group 1938-43
(Source - See Appendix A.)

Year	No. of plants	Capital Employeed	Av. No. of Employees	Salaries and Wages	Gross Selling Value of Goods at Works.
1938	53	100,272,104	13,100	18,256,627	59,606,150
1939	54	113,660,251	13,827	20,410,517	75,934,481
1940	54	133,844,814	17,774	29,207,036	114,598,409
1941	60	168,750,344	23,735	45,037,095	164,566,392
1942	61	205,804,671	33,245	60,874,818	232,105,755
1943	63	235,386,238	34,222	65,654,468	223,951,059

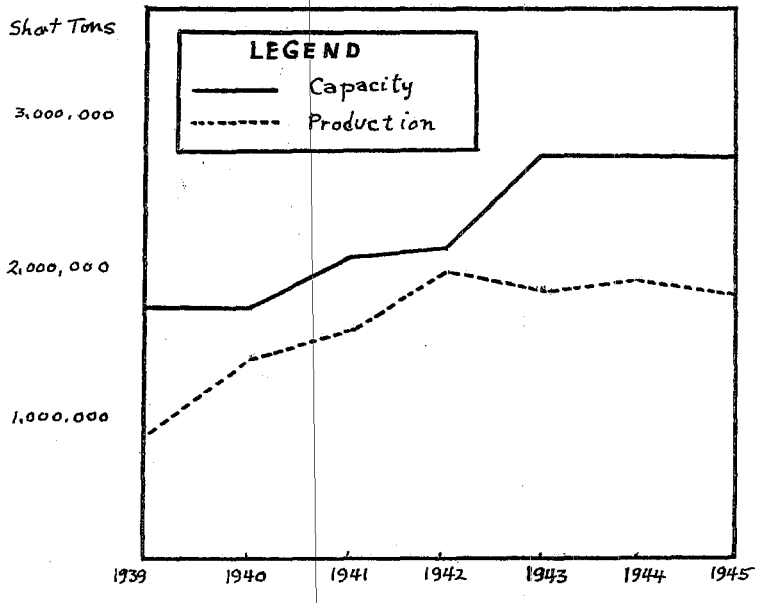
(b) BLAST FURNACES

Table 13 will give an indication of the comparative expansion of blast furnace capacity on the part of the four pig-iron producing concerns. During 1939 and 1940, no change was made in furnace capacity; although through more intensive use of existing furnaces, pig iron production increased fifty-five percent. No new furnaces were blown in until the second half of 1941 when Stelco added a furnace with a daily capacity of 980 net tons. In 1942, Canadian Furnace Co. Ltd. brought a small furnace of 147 tons daily capacity into operation. This was used part-time to produce ferro-alloys. Two furnaces were constructed in 1943: one with a capacity of 616 tons at Dosco and another of 1,120 tonsat Algoma. All net additions were made during the period 1941 to 1943 and no new furnaces have been construced since.

It is significant to note that all furnaces were not called into play until 1943. In that year also, all furnaces at both Dosco and Stelco were in operation 365 days. Four new furnaces were thys added to Canadian pig-iron capacity, one in each plant. Figure 1 shows that production

and capacity increased 1940 to 1942 and that production was very close to capacity in the latter year. However, in 1943, in spite of the construction of two new furnaces, production declined eleven percent.

Figure 1
Utilization of Blast Furnace Capacity 1939-1945
(Source, See Table 15, and Appendix C.)



(c) STEEL FURNACE CAPACITY

In 1939, some twenty-nine Canadian firms were engaged in the production of steel ingots and direct steel castings. They operated forty open hearths, forty-four electrics and three Bessemer converters. In view of the enormous expansion on the part of all these plants, many of which possess a comparatively small annual capacity, it would be an almost impossible and pointless task to trace the development of all plants. Instead, it would be best to consider general expansion and then only the largest plants, for of the 1943 capacity, seven firms with eighty-one furnaces accounted for 3,233,449 net tons annual capacity or eighty-nine percent of the total.

Table 13

Expansion of Blast Furnace Capacity in Canada
1939 -43
Short Tons

Company	1939			1940			1941			1942			1943		
	No.of Stacks	Total Daily Cap'y	Days in Blast	No.of Stacks	Total Daily Cap'y	Days in Blast	No.of Stacks	Total Daily Cap'y	Days in Blast	No.of Stacks	Total Daily Cap'y	Days in Blast	No.of Stacks	Total Daily Cap'y	Days in Blast
Dominion Steel and Coal	1	392	31	1	392	357	1	392	365	1	392	365	1	392	16
	1	336	265	1	336	354	1	336	298	1	336	365	1	336	326
	1	616	365	1	616	358	1	616	365	1	616	365	1	616	358
													1	616	180
Total	3	1344	-	3	1344	-	3	1344	-	3	1344	-	4	1960	-
Canada Furnace Limited	1	392	200	1	392	199	1	392	279	1	466	304	1	466	196
										1	147	289	1	147	332
Total	1	392	-	1	392	-	1	392	-	2	613	-	2	613	-
Steel Company of Canada	1	364	158	1	364	366	1	364	365	1	364	365	1	364	347
	1	728	365	1	728	330	1	728	365	1	728	365	1	728	365
							1	980	110	1	980	365	1	980	365
Total	2	1092	-	2	1092	-	3	2072	-	3	2072	-	3	2072	-
Algoma Steel Corporation	1	336	-	1	336	181	1	336	365	1	336	360	1	336	317
	1	336	-	1	336	-	1	336	-	1	336	184	1	336	277
	1	504	362	1	504	316	1	504	365	1	504	361	1	504	346
	1	616	85	1	616	366	1	616	262	1	616	349	1	616	346
													1	1120	32
Total	4	1792	-	4	1792	-	4	1792	-	4	1792	-	5	2912	-
Total Daily Capacity for Canada	10	4620	-	10	4620	-	11	5600	-	12	5821	-	14	7557	-
Total Annual Capacity for Canada	1,686,300			1,686,300			2,044,000			2,124,665			2,758,305		

Source: Preliminary Annual Reports on "The Primary Iron and Steel Industry in Canada", for the years 1939-43.

TABLE 14
Growth of Steel Ingot and Casting Capacity
In Canada 1939-43
Short Tons
(Source;) Figures for the years 1939-43 from annual reports on "The Primary Iron and Steel Industry of Canada"; figures for the years 1944-45 from "Monthly Report on the Production of Iron and Steel in Canada", December 1944 and December 1945.

Year	Basic Open Hearth		Electric		Converter		Total
	No.	Total Rated Annual Capacity	No.	Total Rated Annual Cap'y	No.	Total Rated Annual Cap'y	
1939	40	1,987,939	44	312,565	3	2,912	87 2,303,416
1940	46	2,480,879	48	300,083	3	3,080	97 2,784,042
1941	48	2,698,900	58	488,900	3	8,200	109 3,196,000
1942	50	2,777,300	70	672,700	3	8,200	123 3,458,200
1943	51	2,825,400	83	786,000	3	8,200	137 3,619,400
1944							3,591,000
1945							3,623,400

Table 14 will give an indication of the increase in steel capacity at the Steel Company of Canada, Dominion Steel and Coal, Algoma Steel Corporation and Dominion Foundries and Steel. Data is given only up to the end of 1943, for by that time, almost all expansion had taken place.

The most significant year was 1940, when four new open hearths were brought into operation: two at Dosco and one each at Stelco and Dofasco. Stelco commenced operations with another open hearths in 1941, and construction of new open hearths ceased in 1942 with the completion of one at Dosco and another at Algoma. Annual capacity of these new furnaces amounted to 658,183 short tons and constituated an increase in the period 1940 to 1942, of thirty-four percent. No new furnaces have been constructed since 1942.

The expansion of electro-metallurgical facilities on the part of these same four companies was not outstanding.

Table 15

Expansion of Steel-Producing Capacity by the Four Major Producers in Canada
1939-43
Short Tons

Company		1939			1940			1941			1942			1943		
		No.	Size	Annual Capacity	No.	Size	Annual Capacity	No.	Size	Annual Capacity	No.	Size	Annual Capacity	No.	Size	Annual Capacity
Steel Company of Canada																
		1	45	30,800	1	45	32,480	1	45	38,500	1	45	38,500	1	45	38,500
	Basic Open Hearth	1	55	44,800	3	55	130,200	3	55	139,500	3	55	139,500	3	55	139,500
		4	100	281,120	4	100	281,030	4	100	292,000	4	100	292,000	4	100	292,000
		3	180	329,280	4	180	439,130	5	180	550,000	5	180	550,000	5	180	550,000
	Electric	-	-	-	-	-	-	-	-	-	-	-	-	1	70	85,500
	Total	9	-	686,000	12	-	882,840	13	-	1,020,000	13	-	1,020,000	14	-	1,105,500
Dominion Steel and Coal																
	Basic Open Hearth	10	56	320,000	10	56	320,000	10	56	320,000	10	56	320,000	10	56	320,000
		2	112	128,000	4	112	324,000	4	112	324,000	5	112	402,400	5	112	402,400
	Electric	1	11	28,000	1	11	28,000	1	11	28,000	1	11	28,000	1	11	28,000
	Total	13	-	476,000	15	-	672,000	15	-	672,000	16	-	750,400	16	-	750,400
Algoma Steel Corporation																
	Basic Open Hearth	8	62	336,000	8	62	336,000	8	62	384,000	8	62	384,000	8	62	384,000
		3	123	280,000	3	123	336,000	3	112	336,000	4	112	336,000	4	112	336,000
	Total	11	-	616,000	11	-	672,000	11	-	720,000	12	-	720,000	12	-	720,000
Dominion Foundries and Steel																
	Basic Open Hearth	1	45	46,872	1	45	46,872	1	45	44,550	1	45	44,550	1	45	44,550
		1	56	53,676	1	56	53,676	1	50	49,450	1	50	49,450	1	50	49,450
		1	65	56,700	2	65	113,400	2	55	108,900	2	55	108,900	2	55	108,900
	Electric	1	½	817	1	½	817	1	½	730	1	2½	9,000	1	2½	9,000
		2	10	32,928	2	10	32,928	2	10	26,400	2	10	26,400	2	10	26,400
		1	20	36,512	1	22	36,512	1	25	24,750	1	25	24,750	1	25	24,750
								1	45	44,550	1	45	44,550	1	45	44,550
	Total	7	-	227,505	8	-	284,205	9	-	299,330	9	-	307,600	9	-	307,600

Source: Preliminary Annual Reports on "The Primary Iron and Steel Industry in Canada", for the years 1939-43.

Dofasco brought a large forty-five ton furnace into operation in 1941, and Stelco followed in May, 1943 with a seventy ton unit, the largest ever built in Canada. Aside from a two-and-a -half ton furnace built at Dofasco in 1942, these were the only additions to electric furnace capacity made by the four major producers. Two firms did not construct any new electrics at all. Dosco had one eleven ton furnace in operation throughout the war, but did not make any additions. Algoma remained, as previously, solely a producer of basic open-hearth steel.

All four did not expand their capacity for production at this primary stage to a like degree as Table 16 will show.

TABLE 16
ADDITIONS TO STEEL INGOT AND CASTING CAPACITY IN CANADA
1939-43
The Four Major Producers
(Source - See Table 15)

Company	Open Hearth		Electric		Percent increase in Capacity
	No. of Units	Capacity-net tons per heat	No. of Units	Capacity net tons per heat	
Stelco	2	180	1	70	61%
	2	55			
Dosco	3	112			58%
Algoma	1	112			17%
Dofasco	1	55	1	2½	
			1	45	35%

When er speak of these four producers, we are involving by far the major part of the Canadian steel industry. Of total annual capacity of 3,619,400 net tons in 1943, they accounted for 2,883,500 net tons, or eighty percent of the total. They also accounted for ninety-four percent of open hearth capacity and twenty-eight percent of electric capacity. This indicates that the larger

firms have left the special steels field mainly in the hands of smaller producers. The remaining six percent of open hearth capacity is divided fairly evenly between three plants in Montreal; Selkirk, Manitoba and Calgary, Alberta.

Although the four main firms operate virtually all Canadian open hearths, they only operate slightly over one quarter of the electric furnaces. The remaining seventy-two percent of electric capacity remains scattered over some thirty-three firms.

Not until the war years did the production of steel by the electric method attain any significance in Canada. The first electric steel was produced in 1944, and before the end of the first World War, the use of the method in this country had progressed so that steel ingots and castings produced in electric furnaces amounted to 119,130 short tons in 1918. From this high, production after a drastic fall in 1919 gradually declined to a low of 5,589 tons in 1924. During the period 1922 to 1928, production was almost infinitesimal, but some recovery was made in the late twenties only to share in the general decline that followed. Not until the late thirties did electric furnaces begin to increase in relative importance.

Table 17 indicates that the production of electric furnace steel increased four-fold during the period 1938 to 1943, whereas the production of open hearth steel only doubled. Capacity for production by electrics gained slightly in relative importance during the war. In 1939, such capacity constituted 18.5 percent of the total for

Canada, while by 1943, it had progressed to make up twenty-one percent of total steel capacity.

TABLE 17
Production of Steel Ingots and Castings in Electric Furnaces in Canada, 1938-43
(Source - See Appendix D)

Year	Ingots	Castings	Total	Percent of All Steel
1938	62,598	40,109	102,707	8
1939	79,718	42,590	122,308	8
1940	135,633	52,786	188,419	8
1941	199,414	85,867	285,281	10.5
1942	335,053	117,803	452,856	14.5
1943	362,192	124,490	486,682	16.0

To deal specifically with the expansion of individual producers of electric furnace steel aside from the four main plants is not an easy task. For convenience, such producers may be divided into three classes:

(1) Expansion by the four largest producers with which we have already dealt.

(2) Expansion by other companies.

(3) New companies formed during the war.

EXPANSION BY EXISTING COMPANIES

The most spectacular feature in this field was the growth of Atlas Steels Limited at Welland. This company, founded in 1925, was operating in 1939 two small electric furnaces having a total annual capacity of 27,000 short tons. At that time, the firm was the sole producer in Canada of high-speed, alloy and carbon tool, stainless and other special steels. Wartime additions to the plant were financed by Atlas Plant Extensions Limited, a government corporation. The company undertook to repay the loan and up to September 30, 1944 had repaid out of earnings a total

of $16,443,542. Additions consisted of two twenty-five ton furnaces in 1941 and two more of the same type in 1942, which added a total of 120,000 net tons to the annual capacity of the plant. During the war, these were used mainly to turn out steel for gun-barrel forgings. So rapid was the growth of the company that total assets increased five times and fixed assets increased eight-fold in the period 1940-42. The war brought Atlas Steels to the fore among Canadian producers of high-grade steels, but it still remains to be seen whether this position can be maintained. At present (February 1946), the Atlas plant is running about fifty percent of capacity.

Although of only indirect importance to the Canadian market, the expansion of steel furnace capacity at the Ford Motor Company at Windsor, might be mentioned. In 1939, this firm had three three ton electrics with a total annual capacity of 24,000 tons. In 1942 and 1943, sixteen four ton furnaces were brought into operation which raised capacity to 111,125 net tons. All of the production from these units is retained within the company.

Canadian Car and Foundry of Montreal which operated two open hearths and one small electric furnace in 1939, installed a twenty-two and-a-half ton unit in 1941. This added 40,320 tons to annual capacity of the plant, total capacity being almost doubled.

Several other smaller firms expanded their capacity, but this growth was slight when set against the total growth.

Specifically, these smaller firms accounted for only about five percent of wartime expansion. Taken together, the firms in this grouping accounted for fifty percent of the new furnace capacity.

EXPANSION BY WAR COMPANIES

Government financing extended to the establishment of two entirely new plants, both of which were crown plants operated by private corporations. Sorel Industries Limited was established at Sorel, Quebec, 1941. Electric furnaces were installed in 1941 and 1942 which comprised a total annual capacity of 40,700 tons. This plant was originally started to make twenty-five pounder guns and carriages and navy guns. Operations were integrated within the plant, and production was from steel scrap to finished gun. Throughout the war, 4,000 tons of high quality alloy steel were turned out monthly in the form of ingots, billets, light and heavy forgings and finished machine parts. Negotiations are under way to turn the facilities into peace-time channels.

In the same year, Electric Steels Limited was established at Cap de la Madeleine, Quebec. In 1943, this firm possessed a total annual capacity of 38,400 tons which was devoted to turning out steel for heavy ammunition, tanks and armoured vehicles.

Federal Foundries and Steel, set up at London in 1941, was a new corporation formed to take over the London Rolling Mill Company. This firm engages in the production of alloy steel hot-rolled bars and has a total annual capacity of 13,140 tons consisting of two six-ton units installed in 1941.

Except for three very small firms in British Columbia, these were the only new ones to enter the electric steels field. They made up twenty-one percent of the wartime expansion. Whether the two crown plants will figure in post-war competition among producers of alloy and special steels remains to be seen.

No important firms, with the exception of Algoma Steel Corporation, neglected to augment their electro-metallurgical facilities. As in all vital industries during the war, the government lent ready aid in financing additions to plant. War-time production was sustained at a higher level than could be absorbed in peace-time. This coupled with the fact that productive equipment is modern, may possibly give a basis for a good competitive market.

This survey of the expansion of steel-making facilities has been sketchy, but, it is hoped, adequate to give an indication of the significant growth involved. Any further discussion of such a mechanical sort would be superfluous.

SUMMARY

Briefly stated, the chief characteristics of the production of primary iron and steel during the period 1939 to 1945 were as follows:

(1) Increase in Production to accomodate the demand for shells, tanks, military vehicles, ships and other munitions; a purely temporary demand.

(2) Greater Capacity which made this increase possible and was added chiefly in the period 1940 to 1943. In peace-time this increase in primary capacity is useless unless accompanied by a like increase in facilities for the production of secondary steel products. If secondary and fabricating facilities arenot developed, then the expansion of primary facilities will be redundant.

(3) Greater Emphasis than ever placed on the importation of steel goods from the United States, chiefly rolling mill products, tools, machinery, and vehicle parts.

(4) Increased importance of electro-metallurgy.

(5) Improvement of technique.

ALLOY STEEL - BASIS IN CANADA

In recent years, the production of alloy steel has become increasingly important, as indicated in Table 18.

TABLE 18
Production of Alloy Steel Ingots and Castings
In Canada 1936-45

Years	Short Tons
1936	51,442
1937	64,351
1938	45,545
1939	57,583
1940	105,026
1941	218,850
1942	400,536
1943	413,483
1944	357,029
1945	290,710

Certain uses of steel demand special properties which may be classified according to hardness, stiffness, ductility, resilience, tensile strength, compressive strength, resistence to fatigue, abrasion and corrosion and ability to hold a cutting edge. These properties are acquired by the addition of one or more elements to carbon steel. Few steels of any quality can be produced without resorting to alloying with certain metals, which for most steel producing countries are of strategic importance, in view of the widely scattered nature of the deposits.

Six metals are commonly used in the improvement of steel:

The most important by far is manganese, although only a small part of the total used as an alloying material. Sound steel cannot be manufactured without it, for it removes the oxygen and sulphur from the iron. It is estimated

that for every ton of steel produced, about fourteen pounds of manganese are required. To conserve it during the war, this average was reduced to 11.8 pounds per ton. When used as an alloy, manganese imparts toughness and resistance, to abrasion. It is added to steel in two forms, as ferro-manganese (which is eighty percent manganese) in which form most of it is used, and as spiegeleisen (twenty percent manganese). In wartime, the use of low-grade domestic ore results in the use of more spiegeleisen. The Soviet Union produces from forty-five to sixty percent of the world's manganese ore, some of which is exported. India produces twenty percent and the GoldCoast, Union of South Africa and Egypt together produce twenty-five percent. This distribution necessitates importation of manganese by all major steelproducing nations except the U.S.S.R. There are no significant deposits of manganese in Canada and domestic production is small and far short of wartime requirements. During the war, Canada obtained seventy percent of her ore from the Gold Coast, twenty percent from British India and most of the remainder from the United States.

The almost unique resistance of chromium to corrosion at high temperatures makes it one of the most indispensable of alloys especially in the manufacture of armour plate and stainless steel. About half of the cromite mined is used in steel making. Normally, production is about one percent of the production of steel. The Soviet Union possesses the largest deposits of chromite, but in recent years has not exportedany.Southern Rhodesia produces fifteen to twenty-five percent of the world supply and Turkey produces slightly

less.

The Union of South Africa supplies eleven to seventeen percent. Four mines in operation in the Eastern Townships of Quebec produced over 10,000 tons in 1942, but his production is far short of donestic requirements.

Nickel imparts qualities of toughness, strength and resistance to chemicals. Adequate supply of this metal presents no problem in Canada since eighty-five percent of the world supply is mined at Sudbury. For most countries, however, it is of the utmost strategic importance.

Tungsten-steel alloys possess high melting point and great tensile strength; hardness and resistance to abtasion. It finds its most vital use in high-speed steels because of its retention of cutting edge at high temperatures. Tungsten carbide, used in facing cutting tools is second only to diamonds for hardness. China is by far the most important producer of tungsten with two thirds of the world total. The second important producer is Burma. Tungsten became very scarce when supplies were cut off from China and Burma, but Canada met the shortage by expansion of her own tungsten mines. However, as yet Canada has no plant for the manufacture of ferro-tungsten and the only producer of tungsten steel has been Atlas Steels, the tungsten concentrate being added directly to the steel bath.

Molybdenum imparts strength, toughness, resistance to shock - properties which are retained at a high temperature. The use of molybdenum steel extends where strength is essential. Between eighty and eighty-five percent of the world's

supply comes from Colorado in the United States. There are many molybdenite occurrences in Canada, but for the most part, they are small and irregular. The wartime shortage and increased demand resulted in prospecting activity and the establishment of a number of mines, but cost of production was greater than the price that could be obtained, and operations are now suspended.

The last important alloying metal to be mentioned is vanadium. Vanadium steels resist fatigue and shock, are strong and easily worked and welded. Peru supplies about forty percent, the United States thirty percent and South West Africa and Northern Rhodesia each thirteen percent. There is no production of either ore or metal in Canada.

We can thus see that Canada is self-sufficient only in nickel; can obtain her molybdenum in the United States and all she requires of manganese, chromium, tungsten and vanadium within the British Empire. Manganese has been admitted free of duty since 1916. Molybdenum, vanadium and tungsten ores are admitted free under the British Preferential and Intermediate Tariffs, but are subject to five percent ad valorem under the General Tariff. By a was measure of 1942, tungsten ore and ferro-tungsten were admitted free. During the war, many deposits of strategic metals were worked, the quality and size of which donot allow operations on an economic scale. Reversion to dependence on pre-war sources cut off in recent years is the logical course.

TABLE 19

Production of Ferro-Alloys in Canada 1937-45
(Source: Figures for 1937 to 1942 from "Iron and Steel and Their Products in Canada, 1940-42," page 63; figures for 1943 to 1945 from Preliminary annual and monthly reports of the Dominion Bureau of Statistics.)

Year	Short Tons
1937	91,921
1938	62,637
1939	85,540
1940	149,394
1941	198,364
1942	209,017
1943	197,094
1944	182,428
1945	186,978

TABLE 20

Imports and Exports of Ferro-Alloys into Canada 1938-42
(short tons)
(Source: Iron and Steel and Their Products in Canada; 1938 and 1939, page 63; 1940-42, page 63.)

	1938	1939	1940	1941	1942
A. IMPORTS					
(1) Ferro-manganese, spiegeleisen and other alloys of Mn and Fe	198	364	285	3,093	3,552
(2) Ferro-silicon, all grades, 8 to 60%	5	2	597	455	181
(3) Ferro-tungsten	..	..	...	...	...
(4) Other Alloys	548	1,005	1,782	4,731	1,104
B. EXPORTS					
(1) Ferro-silicon	12,492	21,149	58,917	73,307	74,550
(2) Spiegeleisen			20,893	7,815	2,352
(3) Ferro-manganese and other alloys	16,866	36,000	15,147	55,276	55,202

The most important producer of ferro-alloys in Canada is the Electro-Metallurgical Co. of Canada of ferro-alloys

of chrome and manganese. Four other firms are engaged in the production of ferro-silicon and other silicon alloys and five abrasive firms manufacture ferro-silicon as a by-product. Although most of the ore used must be imported, Canada in recent years has produced more than enough of certain types of ferro-alloys, notably ferro-silicon and ferro-manganese. Other types must be imported, either in metal or alloy form.

All kinds of ferro-alloys are admitted free under the British Preferential Tariff. The duty on ferro-manganese and spiegeleisen is one cent per pound under the Intermediate Tariff and one-and-a-quarter under the General Tariff. In order to further the war effort, ferro-manganese imported from the United States or other countries subject to the Intermediate Tariff was exempted from customs duty on November 1, 1942 by order-in-council under the War Measures Act. Ferro-silicon is subject to various rates under Intermediate (one-and-a-half to five cents per pound,) and General (one-and-three-quarters to five-and-a-half cents per pound.) depending on the amount of silicon contained therein. All other ferro-alloys not otherwise provided for are subject to five percent ad valorem. Ferro-vanadium, chromium metal and tungsten metal are admitted free.[1]

The shortage of alloying metals was met in other ways than by the exploitation of domestic resources. In peacetime, when these materials were in abundant supply, there was a tendency to use more and more specialty steels and

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1. Tariff 1944, page 295.

more alloying materials. In this way, excellent steels were produced, but at a relatively high cost. With war-time shortages and greatly accelerated demand for special steels, it was necessary to reduce appreciably the amount of alloying material in so-called "high" alloys (those requiring large amounts of alloying materials). The industry had to find methods of making hard and tough high-grade steels without the former high percentage of alloys. Processes were devised to impart special qualities to "lean" or low percentage alloy steels, chiefly by means of refinement of heat-treatment. In addition, more attention was given to the heat-treatment of plain carbon steels for use where formerly alloy steel had been used exclusively. The use of steel scrap which contained a certain percentage of alloy metals helped alleviate the situation.

The cost differential between Canadian and foreign steel has always been the greatest in high grade steels. For this reason, imports of alloy steel are subject to a high tariff in both ingot and rolled forms. Any steel not of greater value than six-and-ahalf cents per pound and containing more than a very small amount of vanadium, molybdenum, nickel, chromium, tungsten, cobalt, manganese and silicon is subject to an ad valoren surtax of five percent in addition to the regular tariff. This applied to ingots, billets, sheets, bars, rods and structural steel shapes.

There is no reason why the trend evidence during the war need not be continued in peace-time. Although home resources of essential ores are inadequate, ore is easily ob-

tained duty-free from abroad. In addition, Canada possesses the electric furnace capacity and the cheap hydro-electric power which are prime essentials in the production of high-grade steels. The ability, developed during the war, to turn out better, tougher and lighter steels at lower cost will prove invaluable in expected competition with the new light metals, aluminum and magnesium and their alloys. The improvement of quality may enable Canadian firms to compete with former specialties of foreign producers.

CHAPTER 7

FLUCTUATIONS IN THE PRODUCTION OF STEEL

Extreme violence of cyclical fluctuations is one of the most striking features of the iron and steel industry of any country. It is a well-known axiom that severity of fluctuation varies according to the stage in production that has been reached. Accordingly, raw materials tend to be more subject to radical change in rage of production than do finished goods. Primary iron and steel products fall midway between these two classes: they have been processed from the raw material (ore, coal, limestone and scrap but still cannot be classed as finished goods until they have been subjected to further processing.

How can this variability be explained? During the recovery phase of the business cycle, there first arises a demand for capital goods and investment material. This includes iron and steel as well as cement, bricks, and lumber. Increased demand for consumers' goods comes later. The prices of capital goods and investment material rise. This stimulates further investment, profits are increased and the velocity of prosperity is accelerated. As the crisis phase is reached, durable capital and consumers' goods (of which steel is one of the most important basic ingredients), tend to be overproduced. This involved a

Figure 2
Index Numbers of
Production of Steel Ingots and Castings in Canada
and Physical Volume of Business
1900-44
Base is 1935-39 equals 100
For Source: See Appendix D
See "Prices and Price Indexes, 1913-43"

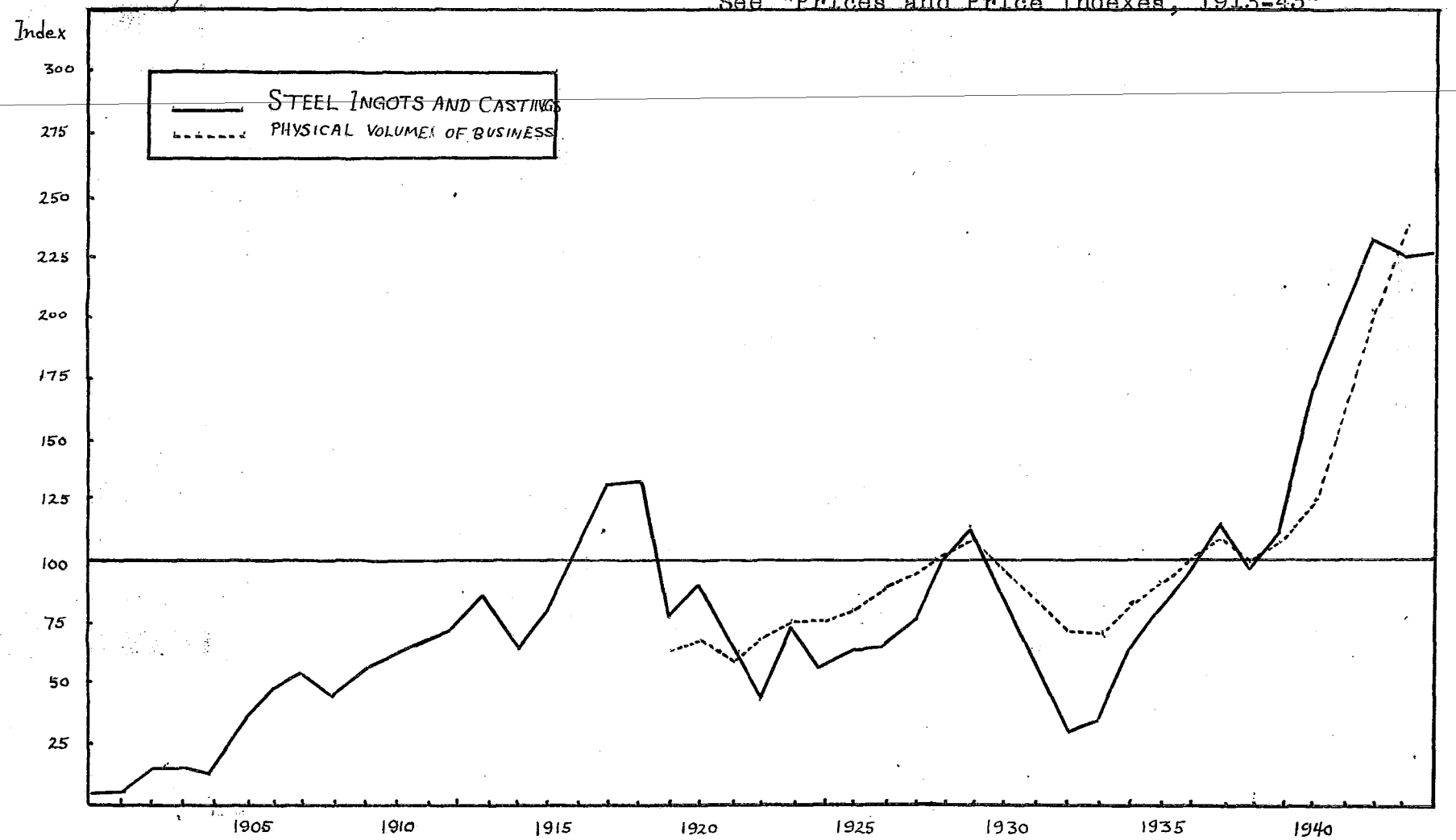
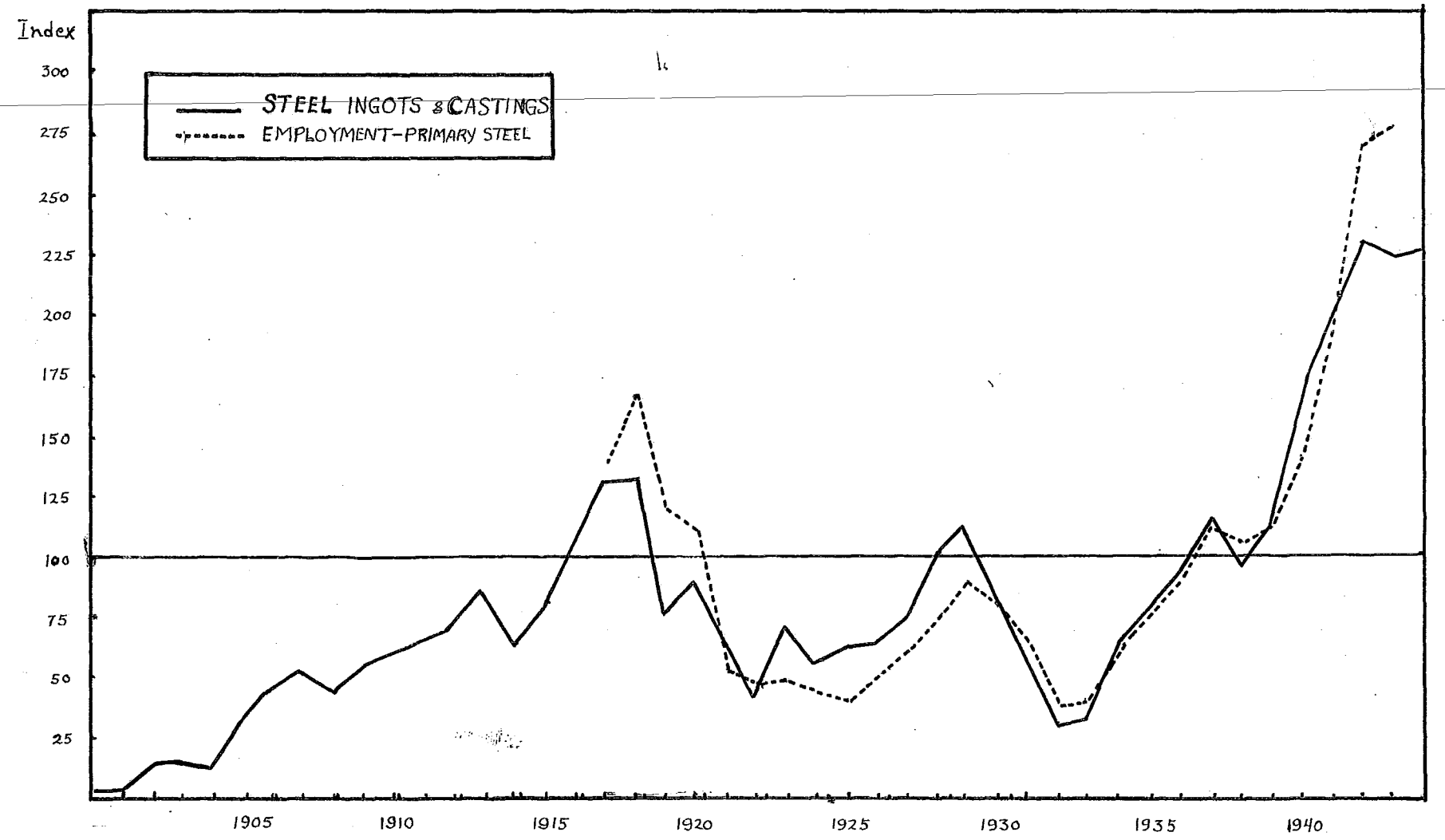


Figure 3
Index Numbers of
Production of Steel Ingots and Castings in Canada
and Employment in the Primary Steel Industry
1900-44
Base is 1935-39 equals 100
For Source - See Appendix A, D



saturation of demand and overproduction of construction materials.

During a boom, manufacturers install new machinery and construct new plants, while consumers, receiving higher wages are able to buy durable goods in much greater quantities than before. During the depression, producer and consumer alike refrain from purchases of durable goods as much as possible and make what they have do. Thus we can see, over a period of a number of years a basic pattern affecting the production of steel. This basic pattern is reflected in Figure 2 which reveals that the production of steel is more susceptible to severe depression that are general business conditions. The index numbers of the production of steel ingots and castings and of employment in the primary steel industry follow the same general outline fairly closely. (See Figure 3).

FIGURE 4
Seasonal Index of The Production of Steel Ingots and Castings in Canada 1938-45

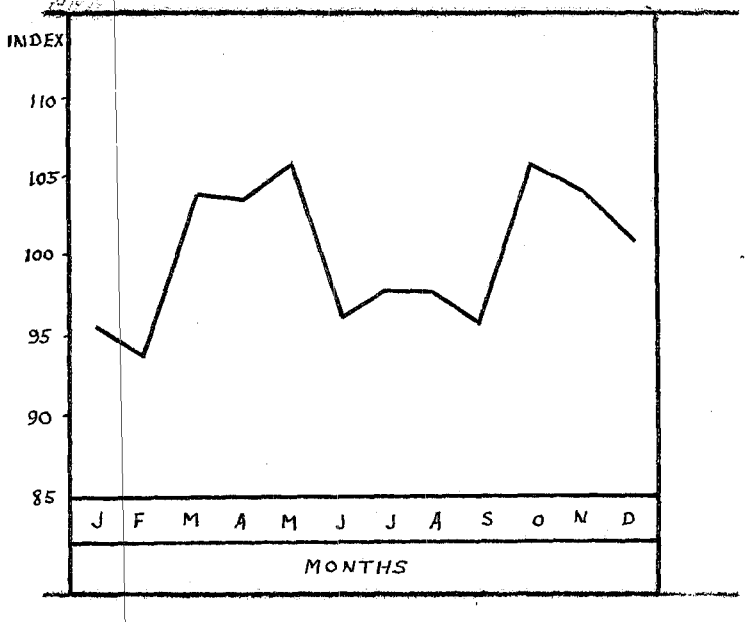


Figure 4 shows the seasonal variation in the production of steel ingots and castings. From the seasonal low in February, production increases up to May; then as the weather becomes hotter, productivity declines only to reach a second peak in October roughly equivalent to that reached in May. These seasonal fluctuations stem from the dependence of many steel-using industries on the weather and other natural conditions. Two notable exmaples are the automobile and the construction industries.

Seasonally fluctuating demand for steel has its influence on production. To take care of the seasonal demand, a producer may do either one of two things. (1) He may keep production at a constant rate and accumulate stocks to supply the peak seasonal demand when it occurs. Thus the reserve stocks act as a buffer between fluctuating demand and constant production. This would be the most socially desireable way of accomodating demand, but the constant tendency to over-production of durable capital goods during periods of prosperity introduces a second method.
(2) The producer may choose, not to maintain stocks, but to build up plant capacity to the point where it can meet seasonal demand whenever and to whatever extent it occurs. If this method is used, the producer must be ready to cut operations sharply when demand becomes seasonlly inactive and a large part of plant, workers, and equipment must remain idle until seasonal demand expands once more.

Our experience has shown us that in the steel industry there is a tendency to over-expansion of capacity especially

for pig iron and steel ingots and castings. This tendency is further accentuated during time or war when new blast, open hearth and electric furnaces are built to supply the short-term demand of plants built especially for munitions and not fit for other types of production. Since they have this excess capacity, producers will tend to use at least part of it and will probably follow the second method of accomodating demand. This brings us to one disadvantage to having a large amount of excess capacity: namely that it increases the fluctuations in production and that consequently society is disrupted more than it should be. The same expansion and contraction of plant operations occurs in orderto accomodate cyclical demand.

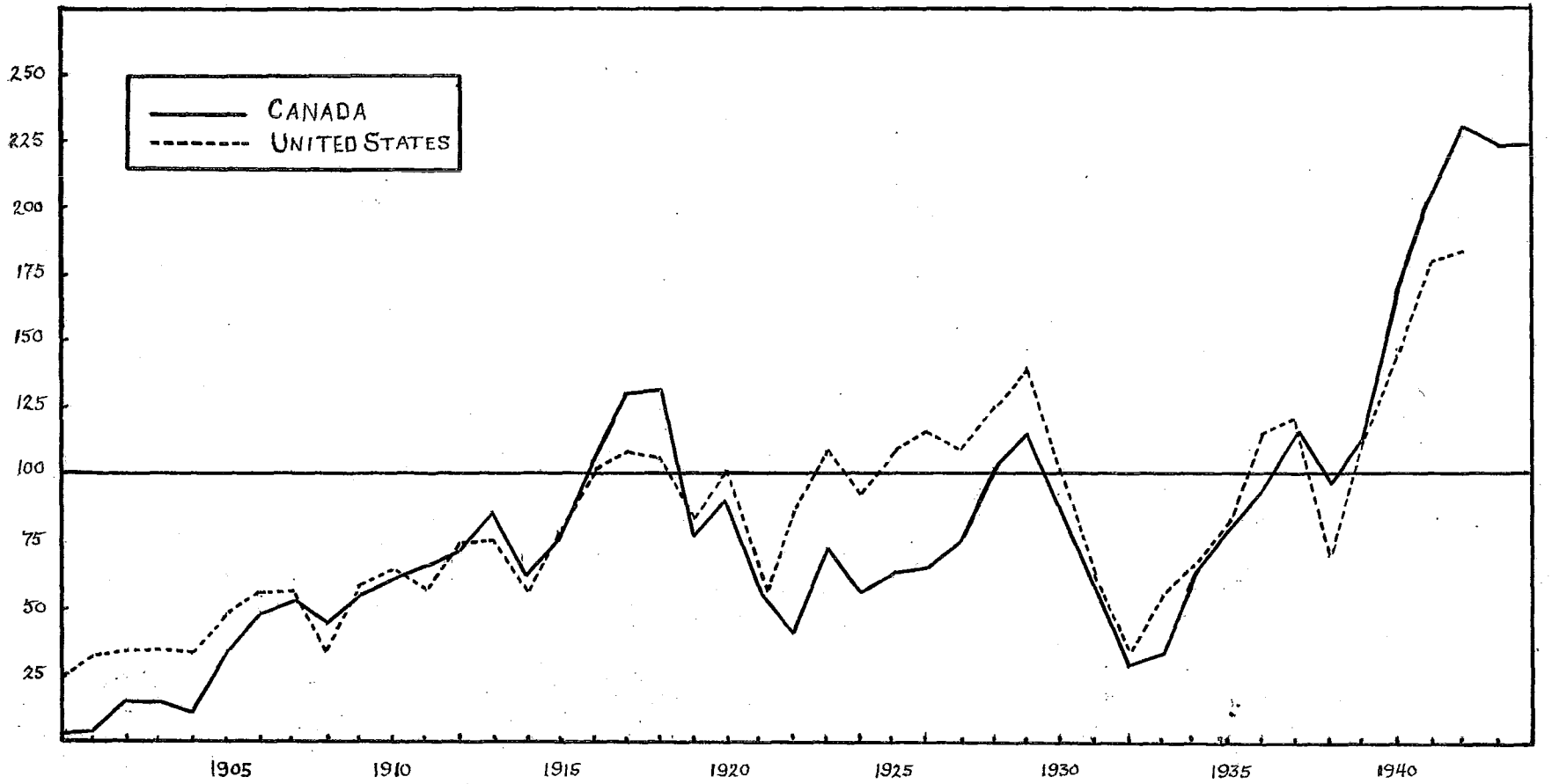
There will be a marked tendency on the part of producers to use both of the methods stated above, depending on the currently prevailing phase of the business cycle. When there is a depression or cyclical contraction, hand-to-mouth buying is a prominent feature. This makes demand more variable since the decline in prices and volume of activity discourages accumulation of stocks. Manufacturing activity becomes more variable in conformity with the variations in demand. During a boom or period of increasing volume of activity the tendency for hand-to-mouth buying is decreased and there is incentive for production for stock in anticipation of a rise in price. At such a time, production will tend less to follow demand variations and will tend to greater constancy.

PRODUCTION OF STEEL INGOTS AND CASTINGS IN THE UNITED STATES AND CANADA

Figure 5 reveals that although fluctuations in the production of ingots and castings are similar in contour in the United States and Canada, they vary in intensity and timing. The years up to 1913 show the steady rate of growth of the industry in Canada. In only one year was there a decline in production (1908). This was the period of steady railway expansion and extension of frontier. Fluctuations in the United States followed the same general pattern up to 1913 except that they were more violent than in Canada. The industry in both countries was almost equally affected by the recession of 1914. With the outbreak of war, production mounted in the same proportion up to 1916. Thereafter the production index curve for the United States flattened out while expansion of production in Canada continued.

In the short period of recession and boom before the depression of 1921, production in this country contracted slightly more than in the United States. It was in the years following 1921 that the relative level of production fell far below the level prevailing in the United States. In the latter country, the low point was reached in 1921, and thereafter there was a sharp upswing which resulted in 1923 in a level of production as high as the war-time peak of 1917. Except for relatively small decreases in 1924 and 1927, this trend continued upward in the United States until in 1929, an all-time peak was reached which

Figure 5
Index Numbers of
Production of Steel Ingots and Castings in Canada
Production of Steel Ingots and Castings in the United States
1900-44
Base is 1935-39 equals 100
For Source - See Appendix D



was twenty-five percent higher than wartime production (1917).

The figures for Canada over the same period tell a vastly different story. While recovery was being made in the United States, the trend continued downward in Canada to reach in 1922, a point below that of 1908 which was itself a bad year. Some recovery was made in 1923, but for the following four years, the unsteady position of a large section of the Canadian industry (British Empire Steel Corp. and Algoma Steel Corp.) resulted in production at a level not concomitant with the level of production being sustained in the United States during the same period. All in all, the middle twenties were trying times for Canadian producers and production was below pre-war levels. The sharp upswing began in 1927 but the crest of the wave reached in 1929 was eighteen percent lower than the wartime peak (1918).

How do we explain the disproportion between relative production levels in the two countries? During the war it is likely that the proportion of Canadian steel that went into expendable munitions was greater than the proportion of United States steel used for the same purpose. In addition, Canada did not have the secondary steel and fabricating capacity to enable Canadian steel to be absorbed by the domestic market at the war-time rate. The United States possessed the fabricating facilities to keep her steel furnaces just as busy during most of the twenties as they had been during the war. It was to be expected, then that

Canadian production would register a relatively greater post-war decline than would that of the United States. Canada continued to import an enormous volume of iron and steel goods, although at the same time she was building up her won steel-consuming industry. This new fabrication industry did not begin to influence steel production until late in the decade and then only for certain types of products.

The disintegration of the early thirties hit the industry in both countries with almost equal force. Better recovery was subsequently shown in Canada. By 1937, production had reached a point as high as the peace-time peak of 1929, whereas in the United States production was more than it had been during the war but was considerable below the boom peak. The recession of 1938 was extremely severe in the United States and production dropped forty-four per-cent from 1937.

In the recent conflict we have seen once again a relatively greater expansion of steel ingots and castings in this country than in the United States.

CHAPTER 8

Regional Tendencies in the Production of Iron and Steel in Canada

As yet little has been said of the distribution of steel capacity among the various provinces of the Dominion. In general, regional differences arise from much the same fundamental factors that have conditioned other phases of Canadian development. The extreme regionalism of the country which has beenpartly offset by a good transportation system has, as a matter of course, reflected itself in extreme regional differences in the distribution of iron and steel producing and consuming industries.

The most important manufacturing province is also the most important producer of steel. Ontario has, since 1880, consistently supplied about half of all Canadian-manufactured goods. Quebec has, in recent years, supplied about thirty percent of the total.

In the specific case of iron and steel products, Ontario in 1942 produced almost two-thirds of the total for Canada. Production of steel ingots and castings is not directly proportional to the distribution of production of fabricated steel goods. Table 21 reveals the fundamental regional differences. In 1942, seventy-one percent of Canadian steel was produced in Ontario, an amount more than

ample to supply the needs of Ontario fabricators, except for cer
certain types of products which must come from the United States.

TABLE 21
Provincial Distribution of Gross Selling Value of Production of the Iron and Steel Goods Group and Production of Steel Ingots and Castings in Canada - 1942
(Source: See Appendix A, See Appendix D.)

Province	Gross Selling Value of Production	Percent of total	Steel Ingots and Castings	Percent of Total
P.E.I.	529,273	.004	.....	.....
N.S.	59,694,095	2.8	637,993	20.5
N.B.	17,454,306	.8	.....	.....
Quebec	446,133,739	21.1	180,637	5.8
Ontario	1,354,797,857	64.2	2,207,208	71.0
Manitoba	38,467,226	1.8	55,067	1.8
Sask.	6,170,238	.2	.....	.....
Alberta	9,164,743	.4	22,264	.7
B.C. & Yukon	180,410,760	8.5	6,682	.2
TOTAL	2,112,822,237	99.8	3,109,851	100.0

Although Nova Scotia produces about twenty percent of the country's raw steel, it turns out only 2.8 percent of the manufactured iron and steel goods. It is this lack of a local steel-consuming market that has led the primary steel industry of Nova Scotia to seek a market for its goods in Quebec which produces 21.1 percent of all steel goods but only 5.8 percent of all raw steel. Taken together, Ontario and Quebec manufacture eighty-five percent of our steel goods.

British Columbia trails a very poor third, in comparison with the two important provinces, with 8.5 percent of gross selling value of iron and steel goods. During the war, there was much expansion of steel fabrication in British Columbia when plants co-operated in turning out ship sections. Steel goods of many descriptions are manufactured in the province, but by far the most important is shipbuilding and its ancillary enterprises . Of the more than $118 million or sixty-six percent consisted of ships and repairs to ships. This makes steel fabrication even greater in value than the traditional staple industries, lumbering and mining. Some contraction in output is natural but the new fabricating plants want a basic steel industry of their own. High freight costs, always a problem in British Columbia, show up in the high proportion of the cost of the finished article that goes for raw material. At present, the raw steel production of the province is almost infinitesimal (1/5 of one percent of the total in 1942), but there has always been much agitation on the part of west-coast interests for the establishment of an iron and steel industry in the province. The provincial government has undertaken to pay a bounty on all pig iron produced. Investigation was made in 1942 under government sponsorship which planned the erection of a small steel plant (75,000 tons annual capacity) at Union Bay on the east coast of Vancouver Island where supplies of ore, coking coal and limestone are readily available. More recently, the British Columbia Minerals and Resources Development Co. has made plans for the con-

struction of blast furnace and steel plant at Anyox on the coast north-east of Prince Rupert.

Production in the remaining provinces is relatively insignificant. In the Prairie provinces, the main steel-consuming industry is in the maintenance and construction of rolling stock and railway lines. All western provinces except Saskatchewan produce very small amounts of raw steel but are mainly dependent on outside sources (Ontario and the United States).

The greatest regional problem centres on the industry of Nova Scotia. The position of the region has not always been the same in relation to the rest of the country. The first significant producer of steel in Canada was the Nova Scotia Steel and Coal Co. at New Glasgow, built during the late nineties to supply materials for the railway expansion just getting under way. In the period up to the First World War, the company acquired the reputation of being one of the most steady firms in Canada. The combined factors of easily available Nova Scotia ore and coal plus the growing market for railway supplies contributed toward the foundation of an iron and steel industry in the province. At the turn of the century, the region emerged as the most important supplier in Canada. This predominance was not long-lived, for Ontario was rapidly developing her own steel industry, and during the First World War, became firmly entrenched as the leading producer. Since that time, the Nova Scotia industry has shown a remarkable lack of growth when we consider the extensive industrial growth that has taken place

in the Dominion over the past thirty years.

Figures for the production of steel ingots and castings by provinces for years prior to 1923 are not readily available; but it may not be too misleading to refer to the regional distribution of pig production as indicating the basic trend involved.[1] Throughout the first decade of the twentieth century, the steel plants at New Glasgow and Sydney held the ascendant position. By 1909, Ontario's pig production had, however, exceeded that of Nova Scotia and has done so ever since. The difference in trend between the two provinces since that time is marked. Nova Scotia reached its all-time peak in pig production in 1913 (incidentally the greatest year for railway expansion) which has not since been exceeded. Even production during the two wars fell just short of surpassing the 1913 mark. During the twenties, over-capitalisation and inefficiency of management depressed production below the 1907 level. This was followed in the thirties by a much slower and proportionately less extensive recovery than in Ontario.

During the recent war, the Maritime industry failed to expand to a degree proportionate to the expansion in Ontario. This is even more remarkable when we consider that on the surface, the region possesses certain advantages that should be of real value:

(1) Easily available raw materials at low rates of extraction and transportation.

(1.) See Appendix C.

(2) The industry is well-integrated and owns all its own sources of raw materials.

(3) The industry is situated on the sea-coast where easy transport is afforded to the Quebec market and to foreign markets as well.

Upon close investigation, many factors are revealed which have worked, and are working to the disadvantage of the region.

FACTORS CONTRIBUTING TO THE LACK OF GROWTH OF THE NOVA SCOTIA STEEL INDUSTRY

(1) TECHNICAL FACTORS

(a) Iron Ore: Ore is easily shipped from Wabana, Newfoundland, where labour will accept lower wages than prevail in the rest of North America. Cost of extraction is low and very few trained men are needed; but costs rise as more readily available reserves are depleted. The ore is high in phosphorus content and although the cost of laying down the ore in Sydney is low, the metallurgical cost of reducing the ore to metal and refining the metal into steel has always been relatively high.

(b) Coal: Whereas cost of ore is low, the cost of mining Nova Scotia coal has always been high. The main coal reserves are very large, but those that can be most readily worked stretch out under the sea. In estimating reserves, we must take into consideration the economic range of operations. The further out under the sea they must be pushed, the greater will be the distance from pit-head to coal-face. Under these conditions, actual man-hours

worked would be reduced and transportation and ventilation costs would be increased. The position of the Cape Breton coal mines is that of the marginal producer and if the price of coal fell, or if costs rose by even a few cents, the area would be greatly affected. The only way to offset conditions of increasing cost is by improving technique, but it is certain that such a measure could only achieve partial success. Of the mainland mines, many are nearing exhaustion and others have great engineering problems. In addition, endemic labour-management discord is a perpetual problem hindering the efficiency of the coal mining group.

(2) Geographical Isolation from Markets:

During the early part of the century, both Ontario and Nova Scotia steel producers placed their main reliance on heavier steel products and railway supplies. The nature of the products of the Nova Scotia group has changed but little in more than forty years of operation. To-day essentially the same types of goods are turned out as at the beginning, which is an indication of the static state which soon overtook the industry. Little has been done to keep pace with modern developments, especially the extensions of primary steel plants into the manufacture of the lighter rolled steels. This is partly due to the limited market to which the industry has access. Geographical conditions have conspired to provide sources of raw materials, but have neglected to provide the industry with the readily accessible and growing market that is a prime requisite for expansion. Nova Scotia and New Brunswick together account for only 3.6

of the iron and steel goods manufactured in Canada, whereas Nova Scotia produces twenty percent of the country's raw steel. It is thus clear that the market for Nova Scotia must lie outsidee of the Maritimes, and even then it is restricted. The foreign market is not toohopeful, since most nations expanded their own steel capacity enormously during the war, although there is a chance that a market may be found, as in the past, in sections of the British Empire which manufacture no steel goods of their own.

On the other hand, the Ontario industry has seen a growth and diversification since the First World War, which is in sharp contrast to the static condition of the Nova Scotia industry. The interior province possesses special advantages, situated as it is in the heart of the American machine tool and light steel industry. Supplies of ore, coal, limestone and heavy machinery are just as readily available as they are to American steel producers in the same region. An important factor was the establishment of Canadian subsidearies in Ontario by American steel fabricators- a factor which helped alleviate the chronic shortage of investment capital in Canada which has hampered the Canadian iron and steel industry so much. Through its diversification, the Ontario industry has acquired a greater stability and higher average labour productivity.

The Second World War served only to emphasize the trend which had commended during the First World War, and prospects for a greater fabricating industry in the Maritimes are not bright. Maritime wartime industrial expansion was of such

a nature (for example, ship building which consumed a large part of the output of Besco) that peace-time utilisation is not feasible.

A recent writer on the economic effects of the war on the economy of the Maritimes has summed up the position of the steel industry of the region: "In sum, we have to conclude that the wartime expansion of the iron and steel using industries in the Maritime provinces has been of a nature which, considering their competitive position and the probable state of postwar markets, will not be permanent. The wartime effects on this industry then, will eventually tend to leave it much as it was. It should continue as a successful competitor in local and Quebec markets in basic steel and in railroad equipment, wire and steel bars. It has not been equipped by the wartime changes or developed by the war to follow the line of great diversification, or is there likely to grow up in the Maritimes a great subsidiary engineering industry."[1]

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1. B.S. Keirstead, The Economic Effects of the War on the Maritime Provinces of Canada, page 152.

CHAPTER 9

CONCLUDING REMARKS

This thesis has described some of the aspects of the primary iron and steel industry in Canada. The ramifications of the subject are so vast and intricate that a short treatment such as this is woefully inadequate.

The conclusions that can be drawn are quite simple. The importance of iron and steel production in any modern civilised country requiring large quantities of durable producers' and consumers' goods is self-evident, as is the extreme sensitivity of the industry to variations in business conditions both in the short and long runs. Fathered as it was by the demand for steel rails and other railway products at the turn of the century, the industry has received its strongest sustenance in time of war. In fact, without war stimulus, it is doubtful whether it could have attained the strong position it is in to-day. During the conflict, both Algoma and Dosco reduced their funded debt and Stelco has had no funded debt since 1938.

In surprising contrast to many of our leading industries, the primary steel industry is largely free from outside influence. Of the three largest concerns in 1944, only one (Dosco) had an American director. The bulk of the controlling stock of all these companies is in Canadian hands and much

of it is centred at Montreal. Although Stelco has always been singularly Canadian in character, such has not been the case with Algoma and Dosco. Algoma was first organised by an American as a subsidiary of an American-controlled company which had many other undertakings in the same area. Even to the present day, it is not certain where the balance of power lies, although it is highly likely that it is in this country. American interests played a large part in the early history of the Nova Scotia steel industry. For many years, since the First World War, the United States Steel Corp. has threatened to enter into competition with Canadian firms in order to surmount the tariff barrier and take advantage of British Preferential Tariff in its foreign trade. Although a large plant was built at Ojibway, the production stage was never reached. Eventually, the plant was sold to Dosco who are the present owners. Although Canadian control predominates at the primary stage of production, some of the most important fabricators of steel (i.e., the automobile industry) are subsidiaries of American corporations.

Some insist upon thinking that a problem exists in the fact that Canada is not self-sufficient in steel. Normally, we are deficient in two types of products: the heavier structural steel shapes and light cold-rolled steel. When the new cold-roll mill at Stelco is completed, Canada should be virtually self-sufficient in light sheet products. A cry has always been raised that the Canadian market should be reserved for Canadian-made goods. On top of this, we have the current plans of some Canadian steel producers to enter into the export trade, especially with Latin America which possesses no raw

ERRATA

Page 3 : Transfer foot-note to page 2.

Page 4 : Transfer foot-note to page 3; foot-note should read "Chapter Six", not "Chapter Five".

Page 9 : Foot-note should read "Chapter Eight", not "Chapter Seven".

steel industry of its own.

At present, the industry is still in the throes of reconversion and is beset by labour troubles. The extent to which wartime capacity will be retained remains to be seem. At any rate, it is certain that the new equilibrium to be reached will be somewhat higher than that of the immediate pre-war period.

APPENDICES

APPENDIX A

Principal Statistics of the Primary Iron and Steel Industry in Canada: Pig iron, steel, rolled products, and ferro-alloys 1917-43

Year	No. of Plants	Capital Employed	Av. No. of Employees	Salaries & Wages	Gross Selling Value of Products at Works	Net Value of Production
1917	54	126,595,678	16,916	20,583,225	120,193,065	.....
1918	60	146,651,376	20,646	28,302,102	245,963,021	.....
1919	50	123,873,471	14,825	18,473,633	114,194,236	.....
1920	50	119,761,718	13,874	22,824,530	138,882,823	63,859,335
1921	36	121,859,860	6,466	9,970,360	56,201,810	21,402,807
1922	25	78,687,321	5,886	7,825,286	35,427,053	13,071,765
1923	26	82,880,333	6,049	10,816,201	66,070,771	23,141,650
1924	29	79,805,201	5,325	7,201,588	33,553,443	14,142,701
1925	32	82,693,940	5,101	7,291,172	35,357,685	18,903,774
1926	33	86,987,454	6,140	9,054,170	41,183,565	21,270,842
1927	36	96,295,734	7,396	11,809,198	45,571,264	26,577,324
1928	40	114,292,363	9,057	15,470,836	62,071,674	34,907,211
1929	45	109,446,529	11,218	18,534,681	72,231,995	39,717,399
1930	49	112,079,926	9,723	14,934,325	52,588,955	29,823,287
1931	53	104,512,104	8,026	11,072,054	36,911,245	21,619,831
1932	52	96,323,629	4,847	6,131,057	16,197,526	9,908,043
1933	50	96,444,846	5,200	6,049,189	18,492,549	8,193,781
1934	51	90,079,004	7,400	9,009,512	29,101,463	12,458,929
1935	53	86,465,490	9,523	12,279,390	38,700,961	15,316,350
1936	55	92,103,774	11,138	13,830,377	46,636,892	19,772,711
1937	55	96,875,377	14,054	19,926,498	74,580,669	33,841,030
1938	55	100,272,104	13,100	18,256,627	59,606,150	29,269,556

Year	No. of Plants	Capital Employed	Av. No. of Employees	Salaries & Wages	Gross Selling Value of Products at Works	Net Value of Production
1939	54	113,660,251	13,100	20,410,517	75,934,481	40,235,444
1940	54	133,844,814	17,774	29,207,036	114,598,409	50,969,926
1941	60	168,750,344	23,735	41,337,095	164,566,392	69,855,642
1942	61	205,804,671	33,245	60,874,818	232,105,755	102,820,061
1943	63	235,386,238	34,222	65,654,468	223,951,059	.....

Source:
Iron and Steel and Their Products in Canada, various years, 1920 to 1940-42.

APPENDIX B (1)

Iron Ore Shipments from Canadian Mines
1900-1944
Short Tons

Year		Year	
1900	122,000	1923	30,752
1901	313,646	1924	.....
1902	404,003	1925	.....
1903	264,294	1926	.....
1904	219,046	1927	.....
1905	291,097	1928	.....
1906	248,831	1929	.....
1907	312,856	1930	.....
1908	238,082	1931	.....
1909	268,043	1932	.....
1910	259,418	1933	.....
1911	210,344	1934	.....
1912	215,883	1935	.....
1913	307,634	1936	.....
1914	244,854	1937	.....
1915	398,112	1938	.....
1916	275,176	1939	123,598
1917	215,302	1940	414,603
1918	211,608	1941	516,037
1919	197,170	1942	545,119
1920	129,072	1943	641,294
1921	59,509	1944	553,252
1922	17,971	1945	1,134,808

Sources:

For the Years 1900-23: Annual Report on Mineral Production in Canada, 1926, Table 237, page 181.

For the Years 1939-43: Annual Report on Mineral Production in Canada, 1943, Table 147, page 129.

For the Years 1944-45: Preliminary Annual Reports on Mineral Production in Canada, 1944 and 1945.

APPENDIX B (2)
Imports of Iron Ore into Canada
1913-43
Short Tons

Year	Imports	
	Fiscal Years	Calendar Years
1913	2,116,933	
1914	1,972,207	
1915	1,055,724	
1916	1,595,995	
1917	2,318,547	
1918	2,203,506	
1919	2,227,919	
1920	1,632,011	
1921	1,950,291	
1922	656,902	
1923	1,044,999	
1924	1,807,223	
1925	911,586	
1926	1,053,593	1,465,715
1927		1,487,366
1928		2,222,897
1929		2,447,807
1930		1,485,429
1931		808,420
1932		67,567
1933		205,703
1934		977,341
1935		1,509,933
1936		1,517,033
1937		2,124,972
1938		1,302,430
1939		1,764,844
1940		2,418,237
1941		3,254,655
1942		2,701,968
1943		3,906,425

Sources:
For the Fiscal Years 1913-26: Canada Year Book, 1926, page 463
For the Calendar Years 1926-42: Canada Year Book, 1943-44, page 486.

APPENDIX C
Production of Pig Iron in Canada by Provinces 1900-45
Short Tons

Year	Nova Scotia	Ontario	Quebec	Total
1900	28,133	62,387	6,055	96,575
1901	151,131	116,371	6,874	274,376
1902	237,244	112,688	7,970	357,902
1903	201,246	87,004	9,635	297,885
1904	164,488	127,845	11,121	303,454
1905	261,014	256,704	7,588	525,306
1906	315,008	275,558	7,845	598,411
1907	366,456	275,459	10,047	651,962
1908	352,642	271,484	6,709	630,835
1909	345,380	407,012	4,770	757,162
1910	350,287	447,273	3,237	800,797
1911	390,242	526,635	658	917,535
1912	424,994	589,593	.....	1,014,587
1913	480,068	648,899	.....	1,128,967
1914	227,052	556,112	.....	783,164
1915	420,275	493,500	.....	913,775
1916	470,055	699,202	.....	1,169,257
1917	472,147	684,642	13,691	1,170,480
1918	415,870	747,650	32,031	1,195,551
1919	285,087	624,993	7,701	917,781
1920	332,493	749,068	8,835	1,090,396
1921	169,504	494,901	683	665,088
1922	135,261	293,662	.....	428,923
1923	310,973	674,428	.....	985,401
1924	198,327	465,888	.....	664,215
1925	226,010	413,248	.....	639,258
1926	280,267	567,928	.....	848,195
1927	279,495	515,366	.....	794,861
1928	339,087	823,167	.....	1,162,254
1929	348,097	861,682	.....	1,209,779
1930	238,152	598,687	.....	836,839

Year	Nova Scotia	Ontario	Total
1931	113,560	356,882	470,442
1932	34,381	127,045	161,426
1933	132,736	121,859	254,595
1934	149,363	304,231	453,594
1935	232,962	438,898	671,860
1936	288,006	471,613	759,619
1937	358,756	647,962	1,006,718
1938	270,879	519,199	790,078
1939	290,232	556,186	846,418
1940	441,741	867,358	1,309,099
1941	421,296	1,106,757	1,528,053
1942	467,951	1,507,063	1,975,014
1943	345,719	1,412,546	1,758,265
1944	.....	.....	1,852,628
1945	.....	.....	1,777,958

Sources:

For the Years 1900-16: Annual Report on the Mineral Production of Canada, 1916, page 75.

For the Years 1917-23: Iron and Steel and Their Products in Canada, 1923, Table 36, page 39.

For the Years 1924-30: Computed from long ton figures in Iron and Steel and Their Products in Canada, 1939, Table 19, page 58.

For the Years 1930-42: Iron and Steel and Their Products in Canada, 1940-42, Table 18, page 59.

For the Years 1943-45: Preliminary Annual and Monthly Reports on the Primary Iron and Steel Industry of Canada, 1943-45.

APPENDIX D (1)

Production of Steel Ingots and Castings in Canada 1900-1944

Short Tons (2,000 lb.)
Index - base 1935-39

Year	Ingots & Castings	Index	Year	Ingots & Castings	Index
1900	26,406	2.0	1923	987,306	73.4
1901	29,214	2.2	1924	738,939	54.9
1902	203,880	15.2	1925	842,803	62.6
1903	203,301	15.1	1926	869,413	64.7
1904	166,380	11.6	1927	1,016,898	75.7
1905	451,863	33.6	1928	1,382,885	102.9
1906	639,407	47.6	1929	1,543,387	114.8
1907	706,982	52.5	1930	1,130,728	84.1
1908	588,763	43.8	1931	752,762	56.0
1909	754,719	55.4	1932	380,067	28.3
1910	822,284	61.2	1933	459,176	34.2
1911	882,396	65.6	1934	848,716	63.1
1912	957,681	71.3	1935	1,054,509	78.5
1913	1,168,993	87.0	1936	1,249,672	93.0
1914	828,641	61.7	1937	1,571,227	116.9
1915	1,020,784	76.0	1938	1,293,812	96.3
1916	1,428,248	105.5	1939	1,551,054	115.4
1917	1,745,734	129.8	1940	2,253,769	167.7
1918	1,873,708	132.0	1941	2,712,151	201.8
1919	1,030,342	76.6	1942	3,109,851	231.4
1920	1,232,697	91.7	1943	2,996,978	223.0
1921	747,532	55.6	1944	3,024,410	225.0
1922	537,742	40.0	1944		

Sources:

For the Years 1900-12: Annual Report on the Mineral Production of Canada, 1916, page 81.

For the Years 1913-21: Iron and Steel and Their Products in Canada, 1920, Table 47, page 30.

For the Years 1922-31: Computed from long ton figures in Iron and Steel and Their products in Canada, 1933, Table 34, page 79.

For the Years 1932-42: Iron and Steel and Their Products in Canada, Table 33, page 66.

APPENDIX D (2)

Production of Steel Ingots and Castings in Electric Furnaces in Canada, 1914-42.
Short Tons

Year	Ingots	Castings	Total
1914	.....	60	60
1915	5,425	200	5,625
1916	17,939	1,699	19,638
1917	48,828	1,639	50,467
1918	115,615	3,515	119,130
1919	8,741	6,760	15,501
1920	13,493	14,808	28,301
1921	2,615	15,318	17,933
1922	.....	12,308	12,308
1923	.....	7,584	7,584
1924	.....	5,569	5,569
1925	.....	8,327	8,327
1926	.....	11,930	11,930
1927	150	21,514	21,664
1928	674	25,301	25,975
1929	16,177	33,625	49,802
1930	33,657	30,256	63,913
1931	28,019	21,622	49,641
1932	22,030	8,416	30,446
1933	17,240	11,889	29,129
1934	26,758	15,344	42,102
1935	41,151	25,286	66,437
1936	49,096	26,261	75,357
1937	68,584	46,828	115,412
1938	62,598	40,109	102,707
1939	79,718	42,590	122,308
1940	135,633	52,786	188,419
1941	199,414	85,867	285,856
1942	335,053	117,803	452,856

Sources:

For the Years 1914-21: Iron and Steel and Their Products in Canada, 1920, Table 47, page 30.

For the Years 1922-31: Computed from long ton figures in Iron and Steel and Their Products in Canada, 1933, Table 35, page 79.

For the Years 1932-42: Iron and Steel and Their Products in Canada, 1942, Table 33, page 66.

APPENDIX D (3)

Production of Steel Ingots and Castings in the United States
1900-42
To the nearest thousand long tons
Index : Base 1935-39.

Year	Thousands of Tons	Index	Year	Thousands of Tons	Index
1900	10,188	24.5	1921	19,784	47.6
1901	13,474	32.4	1922	35,603	85.6
1902	14.947	34.9	1923	44,944	108.1
1903	14,535	35.0	1924	37,932	91.2
1904	13,860	33.3	1925	45,394	109.1
1905	20,024	48.2	1926	48,294	116.1
1906	23,398	56.2	1927	44,935	108.0
1907	23,363	56.2	1928	52,544	123,9
1908	14,023	33,7	1929	56,433	135.7
1909	23,955	57.6	1930	46,099	97.9
1910	26,095	62.8	1931	25,946	62.3
1911	23,676	56.9	1932	13,681	32,9
1912	31,251	75.1	1933	23,232	55.9
1913	31,301	75.3	1934	26,055	62.7
1914	23,513	56.5	1935	34,093	82.0
1915	32,151	77.3	1936	47,768	114,8
1916	42,774	102.9	1937	50,569	121.6
1917	45,061	108.4	1938	28,350	68.2
1918	44,462	106.9	1939	47,142	113.4
1919	34,671	83.4	1940	59,806	143.8
1920	42,133	101.3	1941	73,964	178.8
			1942	76,814	182.3

Source:
Statistical Abstract of the United States, 1943.

APPENDIX E

Pig Iron and Scrap Iron and Steel Charged to Steel Furnaces in Canada 1910-42 Short Tons

Year	Pig Iron	Scrap Iron & Steel
1910	690,913	211,453
1911	700,769	278,797
1912	735,559	336,265
1913	913,722	406,403
1914	619,030	286,863
1915	748,114	413,266
1916	949,444	469,162
1917	1,112,082	1,022,456
1918	897,537	1,068,434
1919	609,670	575,213
1920	735,892	740,400
1921	465,750	405,357
1922	313,000	328,754
1923	594,811	578,955
1924	420,924	398,705
1925	438,766	453,342
1926	513,699	451,263
1927	577,443	522,680
1928	782,647	706,515
1929	853,305	824,628
1930	583,029	641,818
1931	367,430	449,624
1932	119,785	301,506
1933	175,794	345,326
1934	394,627	538,360

Year	Pig Iron	Scrap Iron & Steel
1935	499,824	718,658
1936	584,912	777,268
1937	747,747	1,003,791
1938	634,920	747,340
1939	733,096	927,018
1940	1,083,421	1,323,501
1941	1,340,441	1,599,124
1942	1,615,396	1,826,911

Sources:

For the Years 1910-12: Annual Report on the Mineral Production of Canada, 1916, page 81.

For the Years 1913-19: Iron and Steel and Their Products in Canada, 1920, Table 46, page 30.

For the Years 1920-29: Computed from long ton figures in Iron and Steel and Their Products in Canada, 1930, Table 37, page 75.

For the Years 1930-42: Iron and Steel and Their Products in Canada, 1940-42, Table 194, page 121.

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