THE ASBESTOS INDUSTRY IN CANADA

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THE ASBESTOS INDUSTRY IN CANADA

by

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INTRODUCTION

The asbestos industry in Canada, within the past few years especially, has required consideration by the economist. Engaged in the production of a mineral with great economic utility, it has shown that its prosperity has not been adequate. It is almost an axiom that Canada possesses a "monopoly" of the world's asbestos. The use of this commodity is wide-spread; while cognizance of its valuable properties is universal. In Canada the industry is one of long standing, and well-situated; yet a glance at the current stock market quotations is sufficient to undermine any faith in the industry. One will see at once that it appears to be a very unprofitable venture for the investor. This induses disquieting rumors, and one stops to wonder what the causes may be. Basically and internally, appearances favour the industry, which is well-established and efficiently conducted. On the other hand, there nevertheless exists the apparent paradox of an industry which is producing a commodity that enjoys favourable demand, and yet which is proving unprofitable as an investment. The causes of this situation can be ascertained only by means of a thorough investigation which embraces both the internal and the external economics of the industry in Canada. This thesis aims at such investigation. The enquiry proves absorbing inasmuch as the knowledge of certain

facts added to well-founded and reliable information is certain to lead to interesting and, in many cases, important deductions which are certain to throw new light upon the asbestos industry, around which too many unfounded rumors have gathered. It is hoped that the information contained in the pages of this monograph either substantiate or disprove such suppositions. In brief, it is an attempt to outline the present position of the asbestos industry in Canada; an estimate of its strength; and a comprehensive analysis if its numerous aspects.

CHAPTER I

THE ECONOMIC VALUE OF ASBESTOS

The modern machine age has, in its progress, already beheld the dissemination of knowledge by means of printed matter, a new rapidity of transportation by means of steam-engines and gasoline-motors, and new facilities in communication in the form of the telephone, the telegraph and the radio. This modern industrial age has brought with it, rapidity of movement and high-pressure operations in every phase of economic activity; a situation which has come to endanger human life in various ways. One of these dangers, aggravated by the complicated nature of modern existence, is fire, and the destruction which it wreaks wherever it occurs. The progress of flames can by halted in its advance, and the resultant damage thus minimized, yet the possibility of its occurrence has never been fully prevented. That "An ounce of prevention is worth a pound of cure", is obviously truer in this instance than in any other. If the ravages of fire which can be diminished, could be effectively prevented, such prevention would embody a real accomplishment. The discovery[1]

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[1]The term"asbestos" is derived from the Greek, and signifies "unquenchable", "inextinguishable", "inconsumable", It is defined in a French work as "mineral filamenteux et incombustible". The Germans call it "steinflachs" (stone flax); and the Italians "amiantho" signifying "undefiled, pure, incorruptible"; the French-Canadians call it "pierre a cotton" (cotton stone), in allusion to its similarity in appearance to cotton.

of asbestos has made such achievement possible, while its greater and greater usage has brought within the realm of reality , the dream of a safe and fireless age.

Perhaps the most widely-known incombustible to-day is asbestos whose valuable properties preclude the possibility of conflagration, wherever it is used. The great extent of its usage, and the highly-developed nature of the modern asbestos manufacturing industry, which is only about fifty years old, must not conceal the fact that this valuable mineral was known to the ancients. The wrapping of mummies by the Egyptians[2], the use of cremation cloths by the Romans, and other kindred uses which required an indestructible covering, involved the presence of asbestos. The use of asbestos as lamp wicks is also traceable to the Romans, to whom the discovery of the mineral itself is often attributed[3]. It is thus certain, however, that its valuable properties were recognized from very early times, and although it remained for the modern era to give this curious

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[2]It is now to be doubted whether asbestos was used here at all. R. H. Jones: Asbestos and Asbestic, p. 9-10.

[3]F. Cirkel: Chrysotile-Asbestos; its occurrence, exploitation, milling, and uses. Department of Mines, Ottawa, Canada, 1910, p. 15.

substance its real commercial value, its economic utility has been known for a long time past.

To ask anyone what he knows about asbestos, is invariably to receive the answer "It will not burn". This sums up the story of the valuable properties and extensive uses of this mineral curiosity which we call asbestos. For it is undoubtedly a curiosity. Fritz Cirkel and R. H. Jones, in their works on asbestos, characterise it as a "mineralogical vegetable" or a "physical paradox". Certainly its appearance and properties justify the use of names with paradoxical significance. To delve into the origin of asbestos, to examine its geological formation and occurrence, and to inquire into its chemical properties do not lie within the scope of this monograph[4]. Its physical properties, however, which are the basis of its economic utility, require consideration. Under the term "asbestos" are generally understood those minerals which possess a fibrous crystalline structure, combined with special qualities, and characteristic appearance; and thus completely differentiated from others. The most important of these is the "chrysotile"variety which is found in Canada. Other varieties of lesser importance are known as "crocidolite" and "amosite". Chrysotile is a fibrous form of serpentine. It occurs

[4] Studies of these subjects can be consulted in the appended bibliography for fuller information.

in aggregates of fine, crystalline, silky, fibres, usually ranging in length from 1/8 to 2 or 2½ inches, although fibres as long as 5 to 6 inches are sometimes found[5]. These long, silky, fibres, to be of commercial and economic value, must possess good length, flexibility, fineness and elasticity of fibre, tensile strength, and infusibility. Although light and feathery in appearance, asbestos is in fact as dense and heavy as the rock which carries it. It has many seeming inconsistencies, for its appearance belies most of its properties. It is ostensibly delicate, perishable and combustible; yet it is now widely in use because it possesses properties directly opposite. Then, too, it is both fibrous and crystalline, elastic and brittle; a floating stone, as capable of being carded, spun and woven, as wool, flax, or silk[6]. Some of its commercial qualifications, like silkiness, length of fibre, flexibility and purity, can be easily determined by the eye; but others, like tensile strength and infusibility, only by systematic tests[7].

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[5] "Asbestos", with special reference to Canada." National Resources Intelligence Service; Department of the Interior, Ottawa, Canada, 1926. p. 3.
[6] R. H. Jones: op. cit.; p. 1.
[7] F. Cirkel: op. cit.; p. 29.

The properties which make this mineral curiosity so valuable are its indestructibility, and its fire- and acid-proof qualities. It can be spun into yarn and rope, and woven into fabric, in which forms it finds many uses where a fire-resisting fabric is required. It is absolutely fireproof, a fact which was well known to the ancients. It is also a non-conductor of heat and electricity, as well as being practically insoluble in acids. It will withstand temperatures of from 2,000° to 3,000° Farenheit, and even 5,000° will produce no visible effects on the best qualities[8] It is now so well known in the electrical, chemical, and mechanical arts, and is so unique in its fire- and acid-proof qualities that it has become of universal application, and is indispensable in many trade and scientific appliances.

One of its best-known and most valuable properties is its indestructibility. This enables it to resist decompostion and decay under any conditions. It does not undergo any deleterious changes when exposed to heat or moisture. Further, it cannot be worn away, or rendered useless. It has no chemical effect on metals, and when brought into contact with them does not induce corrosion.

Asbestos, before being used, must be spun and

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[8] R. H. Jones: op. cit.; p. 3.

woven; but this constitutes only another quality which adds to its economic importance. When crushed out from the rock, and freed from all harsh or gritty particles, its fibres are very delicate, and, after carding, are spun and woven in precisely the same way as silk[9]. Were it not capable of being treated in this way, even to-day the world would perhaps have to forego the use of this admirable safeguard. As a matter of fact, for a long time, asbestos fibres obstinately resisted all attempts in this direction, the difficulty arising from the peculiar formation of the fibres, which possess a perfectly smooth surface. When it was attempted to twist these smooth, rod-like fibres together, they simply slipped past each other. This difficulty, however, has now been so entirely overcome, that yarns capable of withstanding great tensile stress can be readily produced by machines constructed for the purpose[10].

It is obvious that the presence of such remarkable qualities leads to wide usage. It is now a recognized commercial, industrial, and domestic necessity. In every field of modern production, in every phase of modern life, it has proved itself indispensable. The advent of the

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[9]R. H. Jones: op. cit.; p. 41.
[10]Ibid.

motor-car, and now of the airship, has only increased its utility. One is almost surrounded with asbestos. To quote an authority in the asbestos trade, "Modern comfort and convenience would be inconceivable without this mineral curiosity. Of course, iron-holders, mats and stands, gas-burners, and gas-logs are commonly known, but not many are aware that asbestos-composition floors are also being laid, unburnable and ever-wearing. Stoves and ovens are so efficient because of the same heat-wave resistant. If you started to uncover all the asbestos in your home you would have to take apart the electric wires, all your electrical appliances, phonograph records, radio parts, even your telephone mouthpiece. Only asbestos stands between us and the fire demon. Heat pipes in modern houses are covered with asbestos mixed with magnesia, or a similar substance. Chief of asbestos parts in motor-cars are the brake linings of which 75,000,000 feet are used in 20,000,000 cars. Our safe, steel, railroad coaches were once thought impracticable, because of the difficulty of insulating against cold and rambling. Now cattle between layers of asbestos keeps them at vapourless temperatures. Even ships' bulkheads are make fireproof with asbestos boards. Asbestos is just beginning to take to the air, around the motors and

as insulation".[11]

These colloquial remarks serve to give one a mere idea of the extensive uses to which asbestos has already been put, and of the far greater usage which it is capable of attaining. As tank covers for containers of inflammable fluids, it would save accidental fires, and asbestos mail-bags could protect letters as readily as the asbestos suit used to save the "human comet" of bygone country fairs. Wearing this suit he used to have gasoline poured over him and lighted; and then he plunged in a blaze of glory into a flaming tank.[12]

In its modern adaptation to the industrial arts and practical mechanics, the use of asbestos dates back less than half a century, although, as we have already seen, many of its properties have been known for thousands of years. One of the main causes of this tardiness in usage, was the fact that the varied and dissimilar properties of the different varieties, and there were many, were not sufficiently appreciated earlier. At the present time, the economic value of the greater number of the species is better known, but even now, little use can be made of some of them. No particular object would be served by giving a complete list of the uses of asbestos at this stage; yet the list

[11] Toronto Saturday Night, February 18th, 1928.
[12] Penny Magazine, 1832.

is constantly growing as new uses are being found daily.

The prominence of asbestos is now due to its application to engineering and electricity; and to military and civil building, and fire-prevention; as well as to other miscellaneous uses of the mineral itself, and of its by-products. These have recently been gaining in importance, as the increasing use of asbestic proves. This was a discovery of Mr. Boas, of Danville, Quebec[13], in 1896, and formed a new kind of plaster or cement composed entirely of asbestos and hence incombustible, fire-proof and practically indestructible under any degree of heat. Its value, therefore, when used in construction, is undeniable. It may be exposed to the direct action of flames or drenched with water, without injury; and it is of a peculiarly tough, elastic, and fibrous nature. Being perfectly plastic and adhesive, nothing has been found to compare with asbestic in its use for mural decorations. Although comparatively in the early stages of its application, the mere fact that the 1,358 tons which were produced in 1896, valued at $6,790[14] increased in 1920, twenty-five years later, to 20,956 tons

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[13] R. H. Jones: op. cit.; p. 268.
[14] Canadian Statistical Records.

valued at $57,601[15], and now reach almost 30,000 tons, proves its growing importance.

Although Canada excels as a producer of the raw product, some of the uses of asbestos only prove more conclusively the present importance, and the future potentialities of this incombustible and fire-proof mineral. In this country the principal manufactures of asbestos are millboard, paper, and shingles, for which purpose a short fibre is used[16]. In the United States and on the Continent, however, there is more extensive manufacturing, and a wider variety of products are shown.

Asbestos is the cause of greater economy in coal. It saves heat through insulation, insulation that retards the escape of heat from boilers, furnaces, pipes and flues. The earliest modern application of asbestos to engineering purposes was in the manufacture of an improved gland packing[17]. This packing is used for machinery, rods, and pistons of every kind. It possesses an inherent lubricating property which makes possible a perfectly pure piston packing. The modern adoption of higher steam pressures has made the employment of asbestos packing a necessity. It is therefore used in nearly all high-pressure plants, as well as very generously upon the ships of the navies of the world.

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[15] Canada Year Book, 1922.
[16] Frechette: Non-Metallic Minerals, 1924. p. 4-7.
[17] F. Cirkel: op. cit.; p. 247.

Asbestos yarn, composed of pure asbestos fibre of the highest grade, is woven into cloth of varying construction, weight and thickness, which in turn is re-manufactured into other products, such as fire-proof clothing, mail-bags, theatre-curtains, theatre scenery, rugs, tapestry, linings, and insulation. The yarn itself is used in cloth, tape, brake linings, clutch facings, twine, gaskets, and facings. The raw material, crudes, fibre, and sand, is used mainly for pipe coverings and packings, and in construction, as cement, paper, millboard and shingles. It is to this phase of the industry that Canada's manufacturing activity is confined. Asbestos composition material is used in phonograph records, insulation for electrical purposes, switch parts, various mountings, and flooring. Asbestos paper is found in roofings, linings and coverings. Asbestos timber, also a recent discovery, has come into prominence as sheathing in walls and insulated linings, while asbestos millboard is found in the linings of heaters, garages, and switch boxes[18].

The above serves only to give one a mere idea

[18] As a matter of fact, while on a visit to Thetford, the author was shown the walls of his host's small private garage, which were made of asbestos composition, and were completely fire-proof. His host, Mr. L. Doucet, son of the general-manager of the Asbestos Corporation, was particularly proud of the fact that these walls were, in addition, far more decorative and ornamental than the ordinary walls of a similar structure.

of the extent to which asbestos is being used in architecture, in building construction, and in the mechanical and electrical industries. In other activities, it also plays an important part. Experiments have recently proved that the great quantities of waste material produced in the industry possess utility as fertilizers for agricultural purposes[19]. It is used in a dozen or more parts of the motor-car, but principally in the manufacture of brake linings; the estimated consumption of asbestos brake linings is placed at 70,000,000 feet annually[20]. Thus the automobile industry and automobile owners consume 50% of the asbestos products manufactured in the United States. In the laboratory, the chemist and physicist find it indispensable. They use asbestos twine to bind together apparatus that may be exposed to fire and strong acids. As a filtering medium it is invaluable for use in connection with acids and alkalies. In the electrical industry it has made possible the success of many electrolytic processes and experiments. The coming prominence of aviation, moreover, is certain to lift asbestos to still greater importance. It is already in use in connection with motors, and in the construction

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[19]Montreal Star, November 25, 1926.
[20]Economic World, April 26, 1924. p. 583.

of indestructible mail-bags, but it is obvious that in this field where the dangers of conflagration are so great, its usage will be greatly increased, as progress is made.

Asbestos has no real substitute for powers of fire resistance, durability and adaptability. It can be woven, spun, matted, pressed and molded. It combines readily with almost any material because it offers no chemical of physical reaction. Only a slight study of its uses discloses its adaptability; and its presence in so many varied products only enhances its importance. Moreover, to attempt to make a complete list of its uses, so as to estimate its importance, is difficult, since such a list becomes incomplete the moment it is compiled. New uses are being found daily for this indispensable safeguard, and since it has already come to be recognized as such, there is no doubt that there will be a constantly growing demand for the mineral. Owing to the fact that there are so many varieties of asbestos, and that the minerals produced from any two quarries are never exactly alike, the application of asbestos varies in different countries, according ot the standard obtainable. While in the United States and Canada large quantities of short fibre are used in the manufacture of pipe coverings, paper, millboard and cement; the European market principally calls for long fibre to be used for spinning, braiding,

and weaving[21]. We may confidently expect that the rich deposits in various parts of the world will be made greater use of in the future than at present; inasmuch as some have only been touched as yet. Day by day the demand for asbestos increases with the discovery of new uses; hence so far as Canada is concerned the rate of supply will very likely prove insufficient to meet increased demand, and it will be necessary to resort to other sources as well. At present the only inconsistency that characterizes the Canadian industry is that in the case of such a valuable mineral with an increasing demand, the industry that produces it has never been prosperous. It has never been even stable. Our raw industry has always been afflicted with numerous problems, and the industry of manufacturing asbestos is still only in an embryonic stage. Certainly such an industry deserves a better fate; yet even a superficial investigation proves only too clearly that the industry itself has never attained an importance or a prosperity comparable with the economic value of its product.

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[21] F. Cirkel: Op. cit.; p. 245.

CHAPTER II

THE RISE AND GROWTH OF THE ASBESTOS INDUSTRY IN CANADA

It has already been noted that asbestos was known, in some measure, to the ancients, but that its uses were by no means exploited. It was then regarded mainly as a curiosity of nature to be wondered at and admired, but to be exhibited only as such. In practice, as we have seen, only a few uses for it were found. Its economic value, at that time, was almost negligible. The subsequent history of asbestos remains shadowy until the middle of the nineteenth century although it is mentioned in Marco Polo's travels through Siberia in the thirteenth century, and reappears in the year 1720 when it was discovered in the Ural Mountains. In 1760 an attempt was made there to exploit it on a commercial scale, but owing to a lack of knowledge of the uses of asbestos, the industry soon disappeared[1]. Some forty years later, technical interest in the industry was revived in Europe, and only increased when discoveries of formerly unknown deposits were made. Since then the search for asbestos has been incessant, and its exploitation and development remarkable, while the invention of mechanical methods for preparing the mineral for use in the industrial world, has kept pace with the rapid increase in its usage.

The first modern attempt to exploit asbestos deposits was made in the Aosta Valley of the Italian Alps by a London syndicate for the purpose of experimenting on a large scale; and almost simultaneously

[1] F. Cirkel: op. cit.; p. 15.

with the exploitation in Italy, asbestos was discovered in the Des Plantes River region, between the villages of St. Joseph and St. Francois, in the Province of Quebec[2]. The asbestos found in Italy is totally different, both in form and in appearance, from the Canadian variety, the technical name for which is chrysotile. Their differences are so great that the uses for each often vary, and in many cases a mixture of both is adopted. Generally, however, chrysotile "is" asbestos while the hornblende variety, such as is found in Italy, does not approach it in economic utility. In 1879, about a year after the opening of the first chrysotile mine in Canada, three firms which had made asbestos mining in Italy and the manufacture of asbestos goods a specialty, became amalgamated into the "United Asbestos Company, Limited," of London; and this new company, having secured about 180 mining properties, in the region of the Italian Alps, comprising nearly all the Italian mines then known, thereby obtained at once for the time being, a practical monopoly of the trade[3]. Thus prior to 1880, all the fine fibre of the quality most suitable for spinning was obtained from Italy, and also from Corsica where valuable deposits had been found; consequently Italian asbestos was supreme in the market.

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[2] F. Cirkel: op. cit.; p. 15.
[3] R. H. Jones: op. cit.; p. 85.

Owing to its fine quality and the difficulty in mining it, it naturally commanded a high price, sometimes as high as $250 or $300 per ton. The subsequent discovery of chrysotile deposits in Canada, which lay close to the line of railway and within convenient distance from a shipping port, soon made a great difference. Such competition, in addition to the fact that the best grades were becoming somewhat rare in Italy, soon caused the supply of Italian fibre to decline. After the discovery of Canadian asbestos at about the same time as the earliest exploitation of the mineral in Italy, a specimen was sent to London in 1862, where its fine silky-fibred appearance made a great impression. But the Canadian ore, being of an entirely different character from the Italian, appeared ludicrously short in comparison with the latter fibre. Much of it, as at first sent to England was coarse, and the rough and careless manner in which it was at first prepared for market readily gave it the appearance of a decidedly inferior article. With improved methods, however, in production and preparation, it has since proved itself to be of a very high grade indeed and a great deal more useful, economically, than the formerly superior Italian fibre[4]. The extension of the belt of serpentine rocks in which the mineral was known to occur had been traced with some care from the Vermont boundary to and beyond the Chaudiere River:

[4] R. H. Jones: op. cit.; pp. 101-102.

but the deposits of asbestos discovered were comparatively limited. All attempts to work them profitably failed. Consequently during the next fifteen years nothing was done in the way of exploration or exploitation.[5]

In the autumn of 1876, however, asbestos was found in another district in Quebec; this time in the serpentine hills of Thetford and Coleraine. The credit of this discovery is claimed by Mr. Robert Ward[6]; although by others it is stated that the first find was made by a French-Canadian named Pecteau[7]. There is no doubt, however, that the building of the line of the Quebec Central Railway across the serpentine belt at Thetford and Coleraine, was the proximate cause of the discovery. The accidental knocking off of a fragment of rock, and the consequent exposure of a vein of chrysotile signalized the beginning of an asbestos industry in Canada. The quality was pronounced by experts to be good and thus justified commercial exploitation. The burning of the forest which formerly covered Thetford, Coleraine and the entire range of the Black Lake Mountains, and the occurence in the vicinity of other large forest fires, facilitated the discovery of asbestos veins by the weathering of the mineral on the surface.

Following closely upon the discovery, several parties secured areas both at Thetford and Black Lake in Coleraine Township, close to the line of the Quebec

[5] F. Cirkel: op. cit.; p. 15.
[6] Ibid: p. 16.
[7] R. H. Jones; op. cit.; p. 132.

Central Railway, which, for some miles runs through this belt of serpentine. Three quarries were opened and operations on a small scale commenced in 1878. In this year, fifty tons were produced; but it was difficult to find a market. The quality of the fibre mined was excellent and the width of the veins everything that could be desired, being from ½" up to 2", 3" and sometimes 4". This justified the expectation that large deposits of the mineral might exist in the locality though their true importance and value were not ascertained for several years. Shipments of the better grades to London created a sensation in the British market[8]; hence expensive tests and investigations were made, with the result that on account of its exceptional spinning qualities, high prices were soon established, and the race for the acquisition of additional areas likely to contain the valuable mineral, began. The land, upon which the asbestos was found, was considered of very little practical value, whether for agricultural or any other purposes, and quarrying operations were rapidly extended. The principal areas in which the asbestos-bearing serpentine was found to occur were speedily secured, and the next twelve years witnessed a rapid development of the asbestos industry in this country. The mines were operated on a large scale while prospectors were busy exploring the hills

[8] F. Cirkel: op. cit.; p. 16.

of the surrounding country for new deposits of the mineral. The few scattered families living in the vicinity of the mines increased to several thousands, after operations had begun, and the whole country showed the marks of industrial activity and prosperity. The fifty tons of asbestos mined in 1878 became 300 tons for 1879, 380 tons in 1880, 540 tons in 1881, 810 tons in 1882, 955 tons in 1883, and 1,141 tons in 1884. There was no difficulty in finding a market for these small quantities which, owing to their scarcity at this early period, commanded the high average price of $65.00 per ton[9]. Beginning from 1885, however, large increases in the quantities produced took place and from that date on a gradual increase in prices could be traced, especially for the highest grades of fibre, which were then commanding the respective prices of $80.00 and $60.00; while prices ranging from $40.00 to $10.00 were paid for the lower grades[10]. In 1885, it was reported that seven quarries were in operation, which produced during the same season an aggregate of about 2,500 tons, whose value was $142,441.00[11]. The production, for the first time, of such a comparatively large quantity was probably the cause of the slightly lower average price of $58.38. The seven quarries in operation gave employment to 350 labourers[12]; a fact which

[9] In 1883 the price obtained was $72.00 but generally it remained constant at about $65.00.
[10] See Table A.--Appendix I.
[11] E. Cirkel: op. cit.; p. 161.
[12] E. Cirkel: op. cit.; p. 16.

proved that the industry had developed considerably during the early years of its existence. Canadian asbestos had now practically superseded Italian. Thus J. T. Donald, in 1892 wrote, "Canada and Italy furnish the world's supply of asbestos. The Italian mineral was first in the market but now Canada is by far the most important producer. The superiority of the Canadian fibre is clearly indicated by the fact that in 1889 the United Asbestos Company, an organization which largely controls the Italian mines, purchased as a going concern a valuable mine in the Canadian field, and has worked it vigorously ever since; and by the further fact that Canadian asbestos is today sold in Italy itself almost at the pit's mouth. The Italian asbestos which is of very long fibre, occurs in such shape that is difficult to handle it with machinery. The Canadian article is in much shorter fibres, yet long enough for most if not all requirements, and has the immense advantage of being easily worked into the various forms adopted by manufacturers."[13]

During this early period and for several years later, the sole method of producing raw asbestos was the costly and laborious process of hand-cobbing. Milling was unknown and hence in spite of the great development in operation and the extension of the

[13]The Mineral Industry, 1892; Vol. I; p. 30.

quarries, the production was necessarily small owing to the limited capacity.

Dating from 1885, a gradual increase in the prices took place; especially for the first and second qualities. The height of production as well as value of product was reached in 1890, followed by a slight falling off in 1891 and a decided decrease in 1892. Thus in 1890, production reached 9,860 tons, valued at $1,260,240 which meant an average price of $127.81. In the following year it had fallen to 9,279 tons at an average price of $107.76 and in 1892 only 6,082 tons were produced but the average value had now fallen to $64.20 per ton[14]. This decrease was not due to an inferior quality of working ground, but was brought about by the endeavour of the mine proprietors to re-establish with least delay proper relations between supply and demand, between production and potential sales, which had been disturbed by the enormous increase in production of the previous years[15]. Up to that time the mines were hardly able to supply the demand from manufacturers both here and abroad. The rapid advance in prices had been due to the fact that the intrinsic value of the mineral was becoming better known. Certain speculators, recognizing this, purchased and held large quantities--- endeavored, in fact, to corner the market. Then, next,

[14] Consult Table A.
[15] L. A. Klein: Notes on the Asbestos Industry of Canada. The Mineral Industry, 1892: Vol. I.: p. 32.

American manufacturers, who have always been large purchasers of the Canadian mineral, were eagerly competing for the trade in manufactured goods and, thinking that the supply would always be less than the demand, vied with each other in bidding for any crude mineral that was offered. As has been seen, the era of high prices did not last long. The speculators soon began to unload, and broke the market. American manufacturers formed a combination[16], and ceased to bid against one another in purchasing ore; indeed, having a stock on hand and realizing the condition of the ore market, were unwilling to buy at all. In a word, the supply of crude asbestos had, for the first time since the inception of the industry, overtaken, and even run beyond, the demand. The result was a heavy fall in prices, and asbestos-quarrying received a shock from which it recovered only several years later. The consumption of over 6,000 tons in 1889 had meant a yearly increase since 1884 of from 1,000 to 1,700 tons. At this time, however, there were very good reasons to believe that the asbestos manufacturing industry had kept on increasing about the same rate. This being the case, it was obvious that the next few years after,

[16] This comprised the H. W. Johns' Manufacturing Company, and the Chalmers-Spence Asbestos Company, both of New York; the Asbestos Packing Company, and C. W. Trainer and Company, both of Boston; and the Shields and Brown Company.----R. H. Jones: Asbestos and Asbestic: p. 194.

1892 would see the over-production of the years 1890 and 1891 used up, and then enable a progressive policy to be followed once more. This case of over-production was a harmful occurrence for the industry at the time, but it may be regarded as inevitable, inasmuch as the discoveries of the previous few years, in addition to the excessive demand for asbestos fibre, were certain to create over-production sooner or later. During the early nineties, the most prominent companies operating asbestos mines were the following: American Asbestos Company, Limited, Black Lake; Anglo-Canadian Asbestos Company, Limited, Black Lake; Beaver Asbestos Company, Thetford Mines; Bell's Asbestos Company, Limited, Thetford; Glasgow and Montreal Asbestos, Company, Limited, Black Lake; Jeffrey Asbestos Mines, Danville (private); Johnson's Company, Thetford; King Brothers, Thetford (private); Thetford Asbestos Company, Thetford; and United Asbestos Company, Limited, Black Lake[17]. Altogether thirteen incorporated companies and a number of private concerns were engaged in extracting asbestos in Canada. A sum of nearly $2,250,000 had been invested, of which $355,000 represented plant. The industry was now giving employment to about 2,000 men and boys[18]. These figures give a very good idea of the progress of the industry in Canada in its initial stages. In a little over five years, additional

[17] L. A. Klien: op. cit.; p. 33.
[18] The Mineral Industry, 1892, Vol. I.: p. 32.

areas had been taken over, new companies had begun operations, employment had tripled and production increased over sixfold. In 1889, the finest quality or "firsts" found ready sale at from ₱80.00 to ₱120.00 per ton, "seconds" brought from ₱50.00 to ₱70.00 per ton, whilst "thirds" were valued at ₱25.00 to ₱35.00 per ton and "waste" at ₱10.00 to ₱15.00 per ton[19]. The range in price of the different grades was due to the fact that there was no uniform system of grading. Each miner used his own discretion and consequently it happened that "seconds" of one mine would be slightly, if at all inferior to "firsts" of another mine. The boom of the early nineties brought greatly increased prices for asbestos, the first quality selling for as much as ₱250.00 per ton and even more, whilst other grades brought proportionately high figures. The crisis of 1892[20] had disrupted the steady progress of the industry but even then the outlook was hopeful. It had the effect of placing the mining of the mineral on a proper business basis and the only real change was that thenceforth, the miners would have to carry a stock of ore instead of the manufacturers. The effect of this change was later to drive out of business small operators who were able to work when they could sell their output in advance; and to place upon the market good properties, the owners of which

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[19] Ibid.
[20] Supra, p. 24.

did not have the capital necessary to work them under the changed condition of affairs. Since foreign large manufacturers of asbestos were aware of this result, there was, as a consequence, a quiet but continuous purchase of such properties. It was necessary, thereafter, to have ample capital to produce asbestos fibre[21], a fact which was certain to place the industry on a more stable basis.

The state of affairs prevalent at the beginning of the nineties, did not continue long. Prices kept dropping until 1892; when they reached $64.20 per ton; in the next year there was a slight recovery to $86.81 per ton, but afterwards the decline continued until the end of the century. The demand slackened, and it was discovered that the prevailing methods of hand extraction were faulty, inadequate, and expensive, especially with regard to the lower grades. As a matter of fact, under prevailing price conditions only those quarries who were working on rich ground and had a large percentage of crude asbestos, had a chance to live and carry on operations at a profit. The natural outcome of these adverse conditions was obvious; many quarries producing only a very small percentage of the higher grades were forced to shut down; and this, together with serious difficulties accentuated by over-production, caused the industry to receive a

[21] J. T. Donald: Asbestos in Canada. The Mineral Industry, 1892, Vol. I.: p. 31.

severe setback in the middle of the nineties. For some years the industry languished, and this had a depressing effect on all except those who would not be discouraged or who were naturally optimistic. Those engaged in the quarries perceived that only one thing could save the industry, a more economical production; attempts to achieve this were made, the result being that, mechanical treatment of the lower grades of asbestos gradually displaced hand-cobbing; and this method in the course of years was applied which such conspicuous success that, to-day, every quarry in the district is equipped with one or more complete milling and fiberizing plants. By means of this improved process, all the smaller fibre, which in the earlier years was left in the rock and thrown on the dump, was saved[22]; and as new demands for this short material sprang up, the life of a quarry was prolonged, and its operations performed with greater ease, and economy. The installation of mills for the more complete separation of the shorter fibre from rock may be said to coincide with the acute depression that followed the over-production in the early nineties. For this over-production had resulted, as we have seen in circumstances under which only the best locations, producing fibre of the highest quality, had been able to continue profitably.

In 1899, the production of asbestos in the Province of Quebec began once more to increase. In that

[22]Infra: Chapter IV.

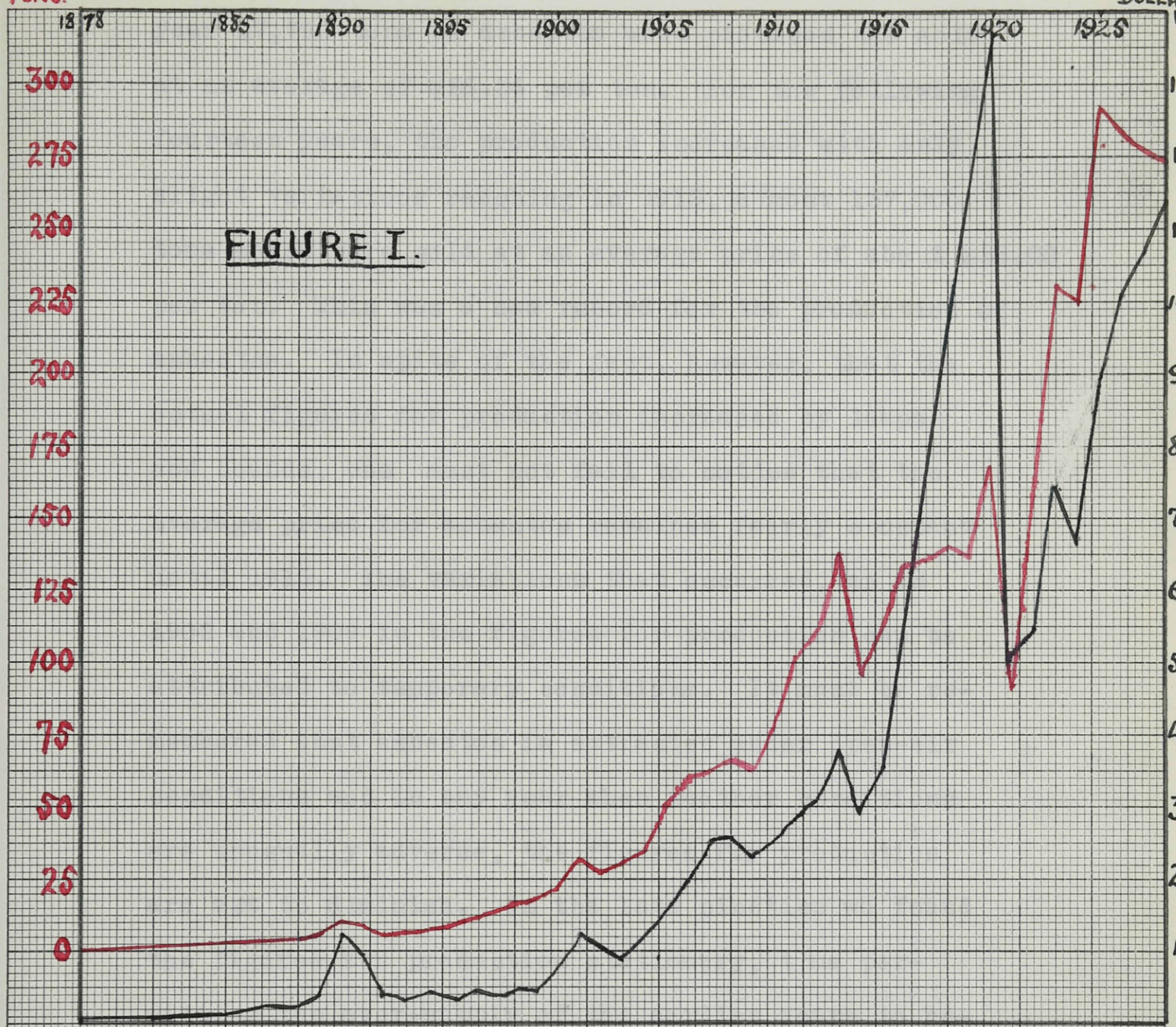
TABLE A IN GRAPHIC FORM.

MANUFACTURED BY, RENOUF PUBLISHING CO., MONTREAL

TONNAGE IN THOUSANDS OF TONS.

VALUE IN MILLIONS OF DOLLARS

FIGURE I.

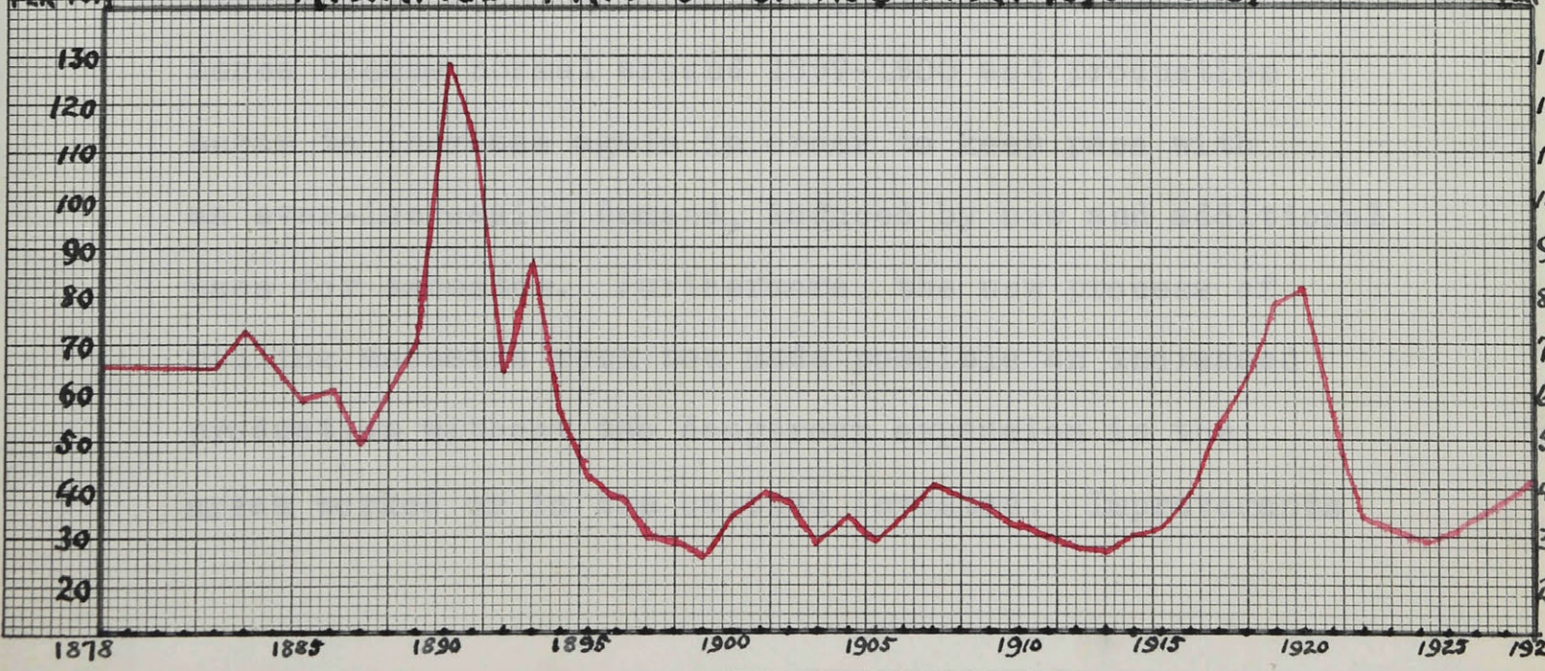


1878-1928. PRODUCTION OF ASBESTOS IN CANADA TONNAGE & VALUE.

DOLLARS PER TON

AVERAGE PRICES OF ASBESTOS. 1878 - 1928.

DOLLARS PER TON



year 17,790 tons of asbestos were produced and sold at an average of $26.34 per ton. For the following fourteen years, the production increased with only slight variations reaching in 1913, almost 137,000 tons which were sold at an average price of about $28.00 per ton. This was a new record for the production of asbestos. In spite of the fact, however, that the actual figures for production increased by leaps and bounds, one must not fail to notice that the average price for asbestos remained fairly constant until 1915. The variations that occurred, as in 1902 and 1909 in the figures for production can be attributed to temporary conditions. It must be remembered that asbestos is extracted under open-air conditions and in any year when weather conditions are unusually adverse, the figures for production are apt to diminish. In the late nineties we found the figures for production stationary, thus permitting the over-supply of the earlier years to become normal once more and the demand which was continually increasing to outstrip it. The situation hence became normal around 1899-1900 and production began to increase again in order to keep pace with an ever-increasing demand, induced by new and additional uses for asbestos. Furthermore, the new process of milling asbestos rock now made possible an increased production without too dangerour expansion in the areas worked or in the capital invested. Improvements

in the installation of separation units were continually made so that their capacity could be increased. More complete separation of rock from the delicate asbestos fibre was effected, while mechanical alterations made possible the production of a higher percentage of superior class of mill fibre[23].

The story of Canada's exports of asbestos is an interesting one. From the earliest days of the industry until the present, the larger part of the asbestos output of Canada has been shipped to the United States. The natural proximity of Canada to this market has played an important part in this situation, the continuation of which is assured by an influence even more potent. More than 50% of the output of this mineral in Canada is American-owned at the source; that is to say, quarries, producing more than half of the output, are owned by American manufacturers of asbestos products. The significance of this fact lies in the assurance to Canada of a future market, inasmuch as it is quite certain that these manufacturers will continue to make use of their Canadian sources of supply. Hence the larger part of the asbestos production of Canada will continue to go to the United States. The more important phase of our export market is the disposal

[23] W. G. Ross, Pres., Asbestos Corporation, Limited: Canadian Mining Journal. March 26, 1929: p. 338

of the balance of the output, that part which does not go to the United States, and which to-day comprises mainly the production of the Asbestos Corporation Limited, and totals approximately one-third of Canada's whole output. Of the total exports of 3,428 tons [24] in 1888, 2,987 tons, or 87% went to the United States, while half of the remainder was shipped to the United Kingdom, and the balance to other countries. Roughly speaking, this percentage was maintained with minor variations for the succeeding forty years. The American allotment has shown an unexpected tendency to decrease, reaching in recent years about 65% to 75% of Canada's total output. The second largest customer is the United Kingdom, where about 7% to 10% is sent annually. The remainder , largly the production of the Asbestos Corporation Limited, is shipped to various European countries, mainly Germany and Belgium. The disruption of the war years naturally closed this market to Canada, but added demands from the United States more than outweighed the loss. Since the war the proportions have now practically regained their pre-war level. Of the 138,732 tons of asbestos that were exported in 1927, 88,638 went to the United States; 8,751 tons to the United Kingdom, and the remainder to other European countries.

[24] See Table B. Appendix II.

A glance at Table A will show the constant position that prices maintained from 1899-1915. Stability in the price level is a very beneficial influence for an industry generally; but when the price of its product seldom exceeds its cost of production, often equals it, and more often does not even reach such a level, then the industry is certainly in a feeble position. This was primarily the cause of the weak and insolvent character of the asbestos industry in Canada after 1915. The maintenance of prices for asbestos at a level which did not repay the cost of production, soon would have produced disastrous effects. The high prices obtained later during the war, for a short time, offset the coming insolvency of a whole industry, but the post-war reaction continued and aggravated the evils present in the industry in 1915. Expansion had rapidly taken place in 1890 when the price obtainable had been an average of $127.81 per ton. What would have taken place in 1915 when the average price for so many years back had been over $100.00 less per ton? It is true that more and more of the lower grades were being produced[25], justifying a lower average price, but our asbestos industry was still producing other qualities than the lowest. As conditions later proved, the industry was not even "paying its overhead"; it was operating at a loss.

[25] Infra: Chapter IV.

The general situation was a gloomy one. As has already been noted, a very low price was being obtained for raw asbestos owing to the fact that during this period right up to the early years of the Great War, the supply of asbestos always exceeded the demand for it. Since many of the present uses for the product had not yet been evolved, the consequent drop in prices remained continuous. Under these low prices prevailing up to 1915, many asbestos properties were subject to a periodic shutting down and reopening. In 1912, only nine producers reported outputs. All of the Broughton district mines were shut down during the year. Installations everywhere were confronted with universal depression, internal distemper, and increasing competition. A spurt in production of over 25,000 tons, in 1913 was insufficient to compensate the capital commitments of the industry. During this period of depression the "marginal producer"either had to perfect his mining and milling practice, reduce costs and increase general overhead efficiency, or drop out of competition, which was often necessitated. Hence the Quebec industry was on the verge of insolvency at the outbreak of the war. In 1914 the average price per ton was $29.96 as compared with almost $40 in 1907; and of the tonnage produced, over 30,000 tons remained on hand in the mines at the end of the year. European

markets were disorganized during the early years of the war and overseas traffic interrupted; which only aggravated the situation. Early in 1915 the Jacobs and British-Canadian mines suspended operations. Most of the other companies worked only to 30% or 50% of their capacity. All told, in 1915, eight companies operated. Yet the advent of the war was probably one of the greatest factors which stimulated the industry since its infancy. For perhaps the second time in its history, demand exceeded supply because asbestos finds many uses in the construction of armaments, and defences, military, naval and aerial. Overseas business being at first impossible, the demand from American manufacturers saved the situation. Production leapt ahead, rising to 167,731 tons in 1920 for which the high average war price of $81.54 was obtained. Prices prevailed which permitted the accumulation of reserve funds. The industry became characterized by large quantity production, modernization of methods and increased standardization of product. Money poured into plants and new installations were made. Only the labour shortage prevented greater returns. The number of operators increased from eleven to fifteen and then to seventeen, all actively engaged. Following the armistice there was a general falling off in demand for asbestos products due to the reaction and consequent lack of activity in the building and manufacturing industries; but subsequent to August 1919, there was

a general resumption of automobile manufacturing and building construction. Hence the year 1920 found asbestos at the height of its demand and the peak of its market value. No. 1 Crude brought from $2,000.00 to as high as $3,000,00 per ton, and the "sands", practically barren of fibre, brought as high as $15.00 per ton. Owing to these high prices the mines worked to full capacity.

Post-war depression set in, in earnest, after 1920. The slackening in demand, combined with overproduction resulted in a drop in prices for the mineral. Competition always very intense among the various companies, accentuated by other factors in the industry, started a period of senseless price-cutting. Business secrecy in the industry was continually maintained because it often gave one producer a handicap over another. There was hence no co-operation among producers. This absence of co-operation continued until 1925. It was a case of "each one for himself"; producers worked independently, produced as much as they could, and then sold their tonnage in the market for the best price they could obtain but at a price which very successfully did not admit of competition. Hence there followed an era of suicidal price-cutting, induced by overproduction in the face of too limited a market. It was the old story once more; supply exceeding demand, and the necessity of marketing the production at the

price obtainable, a price which did not repay the cost of production, and usually yielded no return upon the capital investments of the industry. The limited market was the result of the shrinkage in European demand owing to lack of purchasing power[26], although a few years before, Germany and Austria had absorbed in the vicinity of 10% of Canada's whole output. Now, in the already limited market, there existed both internal and external competition. There was competition among the producers of Quebec who had their usual large stocks to sell, and then there was a new competition in the form of large quantities of asbestos thrown on the market by certain American manufacturers who owned mines in Canada[27]. These manufacturers usually worked their Canadian mines to capacity and, after making use of as much asbestos as they needed, they threw the surplus upon the open market, thereby aggravating the unwholesome conditions which already existed. For, since they had fulfilled their purpose in absorbing what raw asbestos they needed, it was immaterial whether the quantity they marketed yielded adequate revenue or not. Any price was satisfactory provided that they were enabled to sell what was only a useless surplus.. This action, however, continued the demoralizing influences which in the years 1923-24 were affecting the asbestos industry in Canada. Unparalleled mining and

[26] N. R. Fisher: Journal of Commerce, April 24, 1924.

[27] They controlled about 50% of Canada's output; comprising the production of the Bell Asbestos Mine, owned by the Keasbey-Mattison Company; the Johns-Manville mine at Asbestos, Que.; and the mine of the Quebec Asbestos Corporation, also American owned.

milling facilities existed, but there remained an inability to adjust production to markets, a fault from which the industry had suffered since its inception. It seemed that producers were satisfied with tonnage rather than returns upon capital. Competitors were unable to forget their differences, and the earliest suggestions of some form of co-operation or amalgamation were not even considered. Yet here lay the only solution of the problem which threatened to ruin the industry at a time when it should have been prosperous. The solution lay in co-operation, economies in production, decapitalization, the cultivation of broader markets, and the abstinence from new stock flotations. The orgy of capitalization which had begun in 1910 was bearing fruit in 1923 when one company was forced into liquidation[28]; another cut dividends and the remainder struggled along. Prices were at their lowest level. Demands for government aid were heard, as well as suggestions of amalgamation, and of central selling agencies for all producers of asbestos. In one way or another, production and sales had to be controlled.

The severe dislocation in the asbestos industry internally was not its sole ailment. Severe competition from Rhodesia and South Africa in the most profitable market, that for long-spinning grades, was just beginning to be felt seriously; Rhodesian long-fibre was

[28] The Bennett-Martin Company: Financial Post, October 24, 1924.

beginning to displace Canadian fibre in certain markets[29].

Another handicap on the industry was the royalty tax which the Quebec Government imposed upon the extraction of raw asbestos. At this period of stress, this tax was particularly felt to be a burden. There were outcries against a government which instead of providing some means of control and assistance, seemed only to impose added embarrassments upon an industry already encumbered. Suggestions of government control, the imposition of an embargo on the export of raw asbestos, regulation of production and the formation of mergers were continually offered.[30] Finally, the situation reached a point where some constructive plan had to be adopted. Happily, events moved in the right direction. Suggestions for a merger of some kind had already been made, but overtures in the past had met with the same lack of co-operation which had long characterized the asbestos industry in Canada. In every large scale industry, amalgamation and centralization had already manifested themselves as two important movements. They resulted in regulation of output, and a better control of markets, and constituted a means to economical operation of plants. The asbestos industry had long needed such influence. Hence the

[29] Infra: Chapter IV.
[30] Montreal Star, February 16, 1924.

most important development during 1925 was the merger of eleven Canadian-owned asbestos-mining enterprises unter the title of the Asbestos Corporation Limited, which controlled well over one third of the total Canadian production. The merger was effected by the banking house of Dillon, Read and Company of New York, and almost immediately placed Canadian producers in a more suitable position for dealing with problems affecting the industry as a whole, rather than the business of stifling one another. The need for collective action had at last been met and almost immediately beneficial results were accomplished. The merger was finally completed in 1925 and was ratified in January 1926; and from 1925 onwards, the future of Canada's asbestos industry began to look more optimistic. The agreement was between all but one of the largest producers not for the sake of monopoly but for self-preservation; establishing security through reconstructive work. In addition, Europe had once more entered the market as a buyer in bulk. Consequently the tonnage in 1925 was a record for all time and more significant, the average price received was a higher one, in spite of Rhodesian competition and the fact that the Canadian operators were producing more and more lower-grade fibre[31]. Thus with increased production and prices, and with the responsible Asbestos

[31]Infra: Chapter IV.

Corporation at the head, the asbestos industry began to assume a more remunerative aspect, although it was obvious that it would be many years before the problems in the industry would all be solved.

To over come over-production, a move was attempted, at the time of the merger, in the direction of regulating prices. Contracts were negotiated, on behalf of the Asbestos Corporation Limited, with the three American-owned companies, for the purchase at a fixed price, of any surplus of their mills in the United States. These contracts were made each for a period of five years, and do not expire until 1930. Under this condition it was possible to stabilize the prices of the various grades of raw asbestos, and for the first time the Canadian asbestos industry seemd to enjoy fair living conditions. But these conditions meant the cessation of low prices for Canadian raw asbestos to the United States consumers, and recently a protest was made to the United States Government stating that these contracts were in contravention to the Sherman Anti-Trust Act. As a result, the United States Attorney-General has given notice of an action to compel annulment of the contracts, and to forbid the asbestos companies from doing anything to restrict the prices of raw asbestos. Nothing definite, has, as yet, been done, however, as the suit is not likely to be fully settled in the

Immediate future[32].

Production of asbestos in 1926 increased in value once more though the tonnage was slightly less. Thus were the optimistic tendencies continued. In 1927, the tonnage figures were again slightly lower than in 1926 but the price received was the highest since 1920. In both 1926 and 1927 increasing amounts of lower grade asbestos were marketed. The material improvement in values made 1927 a prosperous year for the industry. South Africa continued to be a strong competitor both in the European and United States markets. The merger of 1925 was working satisfactorily, and it is hoped that this arrangement will enable Canadian asbestos to hold its own successfully against the South African product. The year, 1928, was comparatively good for the asbestos industry. No great profits were amassed by any operators, but in the light of former conditions, the situation was becoming more normal. The tonnage produced approximated that of 1927, but the value of this production showed an increase of almost 6%[33]. Poor weather conditions once more handicapped the

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[32] From a legal standpoint, this suit possesses an interesting aspect, inasmuch as the United States Department of Justice is attempting to declare null and void, a contract entered into by a Canadian Corporation for the disposal of a Canadian product. Coercion can only be exercised upon the American parties to the contract for the purpose of its nullification.

[33] Preliminary Report on the Mineral Production of Canada for 1928. Dominion Bureau of Statistics, 1929.

industry, but the outlook for the future is steadily becoming brighter. Current development operations indicate a further increase in production during 1929, while an increasing price-level points to the possibility of profits in an industry which has for a long time failed to show any measure of prosperity.

CHAPTER III

CAPITALIZATION AND CAPITAL CONTROL OF THE ASBESTOS INDUSTRY IN CANADA

The history of the asbestos industry in Canada, and any present-day inquiry into its capital control strengthen the conviction that this industry is, to a very considerable extent, dependent upon the United States. During the early years of its history, it absorbed an undue amount of capital investments, and took part in unwarranted expansion. The result was the over-production and crisis of the early nineties,[1] with the consequent reorganization that such a situation involved. At this time, of the incorporated companies in operation, some had already been producing asbestos for many years, while others had only recently been formed. It is perhaps better to consider first the Thetford Mines, inasmuch as these were earliest in operation and have since remained the most important.

In 1886, the Johnson Asbestos Company was formed, with a registered capital of $250,000 in shares of $500 each, all fully paid up. The company owned as much as 1,000 acres of land, and therefore had an abundance of territory for mining, and every possible requirement. The average number of hands employed were, in the summer season, about 175, and in winter about 100, all of whom were furnished with very comfortable homes, close to their work, at a nominal rent. The whole property was a first class one, consisting of good mineral land lying in the most desirable

[1]Supra: Chapter II.

portion of the district, the south-east. This company, too, claims to be the first producer of ore in Megantic County, having begun operations in 1877 and having been organized for this purpose in 1879. In all it handled about 100 tons of serpentine rock, on a double shift of twenty hours per day, and in 1896 its sales reached more than 2,000 tons, but no classification of grades is mentioned[2].

Messrs. King Brothers, Mine-owners and lumbermen, who were deservedly reputed to be the largest, as they were undoubtedly the wealthiest producers of crude asbestos in Canada, opened and worked the Hampden Mine. They owned about 18,000 acres of mineral land in the Townships of Thetford and Ireland, in one block.[3] The produce of this quarry has always had a specially high reputation on account of the careful way in which the ore is cobbed and prepared for the market, which was in marked contrast with the work done at some of the quarries in the district. They produced 580 tons in 1888, a quantity which was increased to between 800 tons to 900 tons in 1896. The hands employed were from 100 to 120 men in the summer season, and from 80 to 90 men and boys in the winter. The King quarry has always been noted for its great care in the production of very superior quality of fibre, their No. 1 being acknowledged to be the best in Canada for purity and length. It is worthwhile

[2] R. H. Jones: op. cit.; p. 133, et seq.
[3] Ibid.

noting, too, that during the winters of 1895-97 the quarries here were worked during the whole season, but prior to these dates, it was the usual custom to close down during the winter season.

A smaller quarry in the vicinity was the one owned and operated by the Thetford Asbestos Mining Company, and formerly owned by Messrs. Ward & Ross[4]. The property comprised a little over 100 acres and was not quite so advantageously situated for work as those already described, on account of being on a lower level; when at work, however, it turned out very good material. The output for 1886 was returned at 150 tons, probably at that time a fair average of what was being done; but shortly afterwards it closed down and remained idle for some considerable time. The Thetford Asbestos Mining Company whose original property was known as Murphy's mine, was incorporated in 1889 with a capital stock of $200,000, divided into shares of $100 each, all paid up. In the township of Coleraine, adjoining Thetford, its property in all comprised 500 acres of mineral lands. The company, in the first instance, struck some rich ground, but ceased work in 1894, because they had too much over-dirt and water to contend with, insufficient capital, and very poor production. Even a few years later there appeared to be but little chance of resuscitation.

[4]R. H. Jones: op. cit.; p. 137.

Alongside the Johnson quarry and on the same level was one which was formerly sold by the Ward family to the Boston Asbestos Packing Company.[5] In 1888 this was again sold to Mr. John Bell who then transferred it to a London Limited liability company, with an authorized capital of 200,000 pounds, divided into shares of one pound each. It was known as Bell's Asbestos Company Limited, and in 1889 had brought its production up to 1800 tons. In the first two years of its career it maintained its dividends at 22½%. These were reduced to 15% in 1890 and in the following year fell to 10% and afterwards to 3%. In 1897 they rose once more, but only to 5%. The declaration of these dividends is mentioned here because, barometer-like, they represented the company's somewhat erratic course, about which we can otherwise gain no authentic particulars. Its full complement of workers was from 250 to 300 men, boys, and girls in the summer time; and somewhat fewer during the winter.

The Beaver Asbestos Company Limited, was incorporated in 1890, with a capital stock of $100,000, divided into shares of $100 each, all paid up[6]. It acquired and worked asbestos lands in Coleraine, Megantic County. The mine has invariably maintained a very high reputation and ~~hwne~~ when prices sank in 1896, the company resolved to close down and quietly await

[5] R. H. Jones: op. cit.; p. 138.
[6] Ibid: p. 140.

the revival of trade, which they could well afford to do.

A very short run from Thetford on the Central Quebec Railway, brings one to the Black Lake Station. Here the Glasgow and Montreal Asbestos Company was formed to take over the property formerly owned by the Scottish Canadian Asbestos Company, and was registered in Scotland in July 1891, with an authorized capital of 70,000 pounds divided into 35,000, 7% non-cumulative preferred shares, and 35,000 deferred shares of one pound each.[7] Its property included the Martin quarries in Coleraine, Megantic County, and the Frazer quarries in the Townships of Broughton, County Beauce, with all the machinery, plant, and tools of the defunct Frazer, or East Broughton Company. This was the first company which made any attempt to solve the difficult problem of cobbing the ore by the use of machinery, that is, freeing the veins as much as possible from the encumbering rock by means of mechanical extraction. Considerable progress was being made in this direction, when unfortunately the full development was suddenly interrupted by the unexpected closing of the quarries in 1888. This company had had a somewhat variable existence from the beginning. As the Scottish-Canadian it was first bought in 1886 from Mr. Lionais. In 1891, it was bought by the Glasgow and Montreal Company

[7] R. H. Jones: op. cit.; p.140

which commenced working it in the spring of that year, but continued for only two seasons. In 1893, the quarries were again at work until about the close of 1896, when they were shut down.

In the Black Lake District quarries, the much larger percentage of No. 3 than at Thetford made some arrangement for machine cobbing especially desirable. As has been later, this was at last successfully accomplished.

The American Asbestos Company, formerly known as Wertheim's, occupied about 104 acres, purchased by Mr. L. Wertheim from Dr. James Reed in 1888, and afterwards by him transferred to a company under the above name. In 1890-91 experimental crushing was begun and continued on a limited scale until 1897, when the company was forced into liquidation and later offered for sale.[8]

In 1889 the United Asbestos Company bought an asbestos property from Messrs. Frechette and Deauville, containing about 75 acres and commenced operations. The company also in 1895 operated on the Broughton Asbestos property (the Frazer quarry) under lease from the Glasgow and Montreal Asbestos Company.[9]

Adjoining this property was one belonging to the so-called Anglo-Canadian Company which has no interest with the general public, being privately owned. Then, near the boundary of the most western part of the

[8] R. H. Jones: op. cit.; p. 154.
[9] Ibid: p. 155.

Eastern Townships of Quebec, 97 miles from Black Lake, is situated one of the most important quarries in Quebec. This is near Danville; it was opened in 1879 by Mr. Jeffrey who commenced work on a sufficiently small scale, but gradually increased his operations until the mine became well known throughout the asbestos country. He carried on the work of the Danville mines somewhat spasmodically it is true, and like most of his fellows in the early days when the nature of the mineral was much less known than it is now, worked practically without system. He never attempted to do more than simply quarry out the rock "en masse", removing the seams by hand and dumping all the remainder in prodigious masses, until, in the end, he had piled up many thousands of tons of what he called waste or refuse; having not the remotest conception of the special nature of the mineral he was dealing with, or its great economic value. After many financial struggles, he was forced eventually to assign his property to trustees for the benefit of his creditors, soon after which the mines were closed. The property was taken over by Mr. Boas, of St. Hyacinthe, who soon changed the appearance of the mine. He discovered that the whole of Danville rock is of so extraordinarily fibrous a character that every part of it can be used. After yielding from 20 to 25% of Nos. 1 and 2 merchantable asbestos, the whole of the remainder, which was formerly treated as waste,

was then found to consist of fibrous material of extraordinary value. It became known as asbestic, which is simply short, unweavable asbestos, the like of which is to be found in no other part of the country. Thus in 1896 began the production of asbestic, a by-product of asbestos and a new source of revenue. Moreover, at Danville, there followed no necessity for providing space for dumpage since this was henceforth used as asbestic. This new material, asbestic, was found to be of very great importance to all connected with the building trades, and especially to architects and contractors for extensive works. Instead of the tedious and elaborate preparation formed by the use of the ordinary dirt-creating mortar, with the after-scoring necessary to give cohesion to the final coat of plaster of Paris, a single coat of asbestic is laid on. In use this is perfectly flexible when dry, so that, while presenting a smooth, glossy surface, it will neither crack or break and in a room the walls of which have only been built in the morning; before night it will acquire a smoothly finished surface as hard as marble and as polished as a sheet of glass. It is a non-conductor of sound, is absolutely vermin-proof and sanitary, containing no organic matter. It is the most economical plaster in existence for it results in a saving of labour. Its use in the form of pulp for the manufacture of paper, for which purpose it has been found to be vastly superior to any other kind of pulp, is rapidly growing;

its cheapness also tending to bring it into general use. In order to promote its more efficient development, a limited liability company was speedily formed under the title of the Asbestos and Asbestic Company with a capital of 500,000 pounds divided into 50,000 shares of ten pounds each. These were easily disposed of and the company entered upon a period of comparative prosperity.

The above concludes a short description of the early history, and importance of the asbestos-producing companies which were in existence in the Province of Quebec during the nineties[10]. In most cases, as has been seen, this history has not been a steady or successful one, and the industry generally has not pointed towards a highly prosperous future. The late nineties, however, and the early years of the twentieth century brought many changes to the industry, both internally and externally. The first twenty years of its existence in Canada had placed it upon an unstable foundation. Properties had been opened and operated with an over-abundance of capital. Investments had been made which only enjoyed returns in the most profitable years. Outlays of $500,000, $1,000,000, and even more had been made, when only fractions of these amounts were required to operate a quarry efficiently. It was only reasonable, therefore, to expect that the

[10] A fuller history of the earliest companies producing asbestos in Canada can be found in R. H. Jones: Asbestos and Asbestic, p. 131-190, from which the foregoing summary has been made.

industry was inequipped to meet an adverse situation. It will be remembered how in the earlier years, those companies incorporated for the purpose of extracting raw asbestos, had been able to market their product easily and in many cases to indulge in expansion. The depression of the nineties, consequent upon the over-production of the preceding years somewhat changed this successful aspect of the industry. During the subsequent period, with prices for asbestos remaining at an unprofitable level up to 1915, the industry languished in the depths of a stagnant depression. The era was marked throughout by a cessation of production by various companies, by the closing and reopening of quarries, and by chronic insolvency. The outlook at the time was very depressing, and was only relieved by the extraordinary demand for asbestos which the war created. In the meantime many of the earlier companies had undergone reorganization; some had permanently ceased operations, while others had changed hands; in many cases, more than once. The situation in 1909, therefore, so far as the operators were concerned was a radically different one from that of years earlier[11]. In 1908, there were 27 companies engaged in producing asbestos fibre in Quebec.[12] In 1909 the

[11] Supra: p.44-55.
[12] Alex. Gray: Montreal Gazette, November 5, 1924.

Amalgamated Asbestos Corporation was formed[13]. This corporation bought all the assets and stock in trade of the quarries then being worked under the following n names: King Asbestos Mines, and Beaver Asbestos Company, at Thetford; and the British-Canadian Asbestos Company, Limited, whose operations had been successful from the start, and who took over the assets of the American Asbestos Company in the beginning of 1908. The latter had been founded in 1903, and in 1907 had absorbed the properties of the Glasgow and Montreal Asbestos Company; the United Asbestos Company, the Manhattan Asbestos Company; Dominion Asbestos Company, Limited, and the Standard Asbestos Company, Limited, at Black Lake. The capitalization of the new corporation consisted of an authorized bond issue of $15,000,000 of which only $7,500,000 were issued, as well as $1,875,000 of 7% cumulative preference shares and $8,125,000 common stock, all of $100 par value. This corporation held 8,091 acres in the Thetford and Black Lake asbestos areas, and proposed in the following years to enter upon a plan for greater efficiency and expansion. The organization of this corporation was an attempt at stabilizing the industry in its operating phase. Though reduced, the capitalization had not been sufficiently dewatered and hence, during

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[13] F. Cirkel: op. cit.; p. 175 et seq. The history of asbestos producers in Canada during the first decade of the twentieth century is mainly taken from this work on "chrysotile asbestos".

the succeeding years the industry still suffered from financial instability.

It was at this period that one of the most important factors in the capital control of Canadian asbestos quarries, first appeared. To what extent American capital had been invested in the production of Canadian asbestos up to 1910, is difficult to determine. At this period, however, there began a distinct movement on the part of American manufacturers of asbestos, to acquire ownership in Canadian quarries. Under the existing United States customs tariff, asbestos was admitted free into that country, and since the ownership of Canadian quarries by American capital has been extended, asbestos continued to remain on the free list. This explained the course begun by American manufacturers in the first decade of the twentieth century. Since then the flow of American capital into the production of Canadian asbestos has been continuous. Such procedure ensures American manufacturers, a price, which is equal to cost of production, thus obviating the payment of any profits; and it also guarantees a satisfactory supply of the raw material.

A good example of the ownership of Canadian mines by American asbestos manufacturers at this early date is the Asbestos and Asbestic Company Limited, located at Asbestos, Quebec, five miles from Danville. It

had been capitalized at 500,000 pounds, since it was, originally, an English concern. At this period, however, it was understood to be in the hands of the Johns-Manville Company, of New York; perhaps the largest corporation manufacturing asbestos on the continent.

The Belmina Consolidated Asbestos Company, a smaller concern, comprised the properties belonging originally to the Belmina Asbestic Company, and to the Asbestos Mining and Manufacturing Company, the consolidation of which was, a step in the right direction. Ownership of this company also resided in American hands, as did that of various other producers, such the Beaudoin and Audette Asbestos Company, controlling 200 acres in Thetford and capitalized at $500,000.

One of the oldest and also one of the most successful companies working in this district was the Bell Asbestos Company which was also originally an English Company, capitalized at 250,000 pounds but had since changed hands, and was owned by the Keasbey and Mattison Company of Ambler, Pa., another huge American manufacturing concern.

In 1910, the Black Lake Consolidated Asbestos Company, was formed under Dominion Laws, with a capitalization of $4,000,000, common and preferred stock, and an authorized bond issue of $1,500,000. This company bought all the properties belonging to the Black Lake Chrome and Asbestos Company; the Union,

and Southwark Mines; and a controlling interest in the Imperial Asbestos Company. The Union and Southwark quarries had been worked intermittently for the preceding twenty years. An efficient policy, however, soon launched the new company upon a more successful career.

Of the older companies, the Broughton Asbestos Fibre Company, had been in existence for over twenty years. It had suspended operations from 1891 to 1901 owing to slack demand and then had recommenced on a small scale, gradually expanding as time went on. Other companies in existence in 1910 included the Coleraine Exploration Company (operations suspended), the D'Israeli Asbestos Company, the Eastern Townships Asbestos Company, the Frontenac Asbestos Mining Company, the Jacobs Asbestos Mining Company of Thetford, recently formed, the Ling Asbestos Company, and the Robertson Asbestos Company.

Of all producers, the Johnson Asbestos Company was the pioneer in the Asbestos industry, having commenced operations in 1878 and been incorporated in 1885. They held over 100 acres of mining lands, and two quarries, one at Thetford and one at Black Lake. This company is perhaps the only one which has survived the troublesome history of the asbestos industry, and which is profitably extracting asbestos at present.

The foregoing constitute the operators who were engaged in the production of asbestos fibre in 1910.

The list is larger than that for 1895 and forms a picture of the expansion that had taken place since; an expansion that had been, undoubtedly, too rapid. One of the outstanding consequences of such headlong expansion was the over-capitalization that then existed. In many cases the capitalizations were disproportionate to the earnings. Under a lower capitalization, these earnings might have been deemed profitable, but, under existing circumstances it would have taken the sale of far more than the 77,500 tons of asbestos which were produced in 1910, to yield a reasonable profit. Thus, in 1912, when certain reorganizations were taking place, the Amalgamated Asbestos Corporation became the Asbestos Corporation of Can. Limited. The recapitalization was severe but beneficial. Instead of $8,125,000 common stock, $1,875,000 preferred stock, and $7,500,000 bonds, the new capital liabilities were $4,000,000 preferred, $3,000,000 common and $5,000,000 in bonds[14]. It was evident that the over-capitalization in the industry was being slowly overcome, although it could not be eliminated at one stroke. The new capitalization of the Asbestos Corporation of Can. Limited placed the finances of the corporation on a sounder basis and made the outlook more hopeful.

The situation that existed during the first decade of the present century, continued without great change

[14] A. Gray: Montreal Gazette, November 5, 1924.

for the succeeding years. The year 1914, however, once more ushered in a period of stress for the asbestos industry in Canada. The Great War disorganized markets, cut off overseas trade, and within the industry itself, brought many changes. In the first place the demand for asbestos increased beyond any former level, insofar as export trade was concerned. The latter, of course, was practically confined to the United States until 1919. At Home, the domestic market, small as it always was, was greatly disrupted by the disorganization in the building and automobile industries, with which the asbestos industry is closely connected. Production at home increased tremendously[15], and was hampered only by a lack of labour. Many companies which otherwise would have been compelled to shut down, were able to continue operations at a profit, owing to the high prices, and the excessive demand for asbestos. The close of the war, however, soon brought a reaction. Many asbestos producers faced ruin in the short interval which elapsed between the close of the war and the resumption of activities in the building and automobile industries. The latter tendency staved off disaster for a short time, but the years 1923-24 saw the industry once more upon the verge of insolvency[16].

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[15] See Table A.
[16] Supra: Chapter II.

It was necessary that some reorganization be made with a view to obtaining a greater degree of centralization. After negotiations, which covered a period of almost two years, the present Asbestos Corporation was formed. By this merger the corporation was placed at the head of the industry, for it comprised all but one of the Canadian-owned quarries. Hence it owns the quarries of the following companies, which have now lost their identity, though some of the old names still cling to the quarries: The Asbestos Corporation of Canada, Limited; Consolidated Asbestos, Limited; Federal Asbestos Company; Thetford-Vimy, Limited; Maple Leaf Asbestos Corporation, Limited; Asbestos Mines, Limited; and the Black Lake Asbestos and Chrome Company, Limited[17]. These companies comprised those in existence in 1926, except the Johnson Company and those which were American-owned. Many had undergone reorganization during the war, and hence possessed different names. The properties, however, were the same, for the most part, as those worked in 1910; though the latter are found under different names in the foregoing outline. The new corporation was formed through the financial house of Dillon, Read and Company, of New York, who found that there was drastic necessity for decapitalization, a process which was carried out as far as

[17] Moody's Manual, 1926.

possible at the time, the final capitalization of the new Asbestos Corporation being approximately one-half the total capitalization of the constituent companies. It consists at present of 74,564 shares of 7% preferred stocks, issued out of an authorized issue of 120,000 shares; as well as 200,000 shares of no par value common stock, on which, incidently, no dividend has ever been paid; instead, a small amount of surplus profits has been carried forward each year since 1926, thus placing the company in a strong financial position, in spite of contrary stock market fluctuations. The Asbestos Corporation, Limited, also has a large funded debt, consisting of $3,000,000 authorized fifteen year 6% Sinking Fund Gold Bonds, a first and refunding mortgage, due 1941. In addition there have been issued $4,239,000 General Mortgage thirty year 6% Sinking Fund Gold Bonds, due 1956, out of an authorized issue of $10,000,000. There remained also approximately $1,000,000 in bonds underlying certain of the properties acquired. Thus the total funded debt approaches $8,000,000; making the company's capitalization about $23,000,000.[18] When one realizes that the average net income of the corporation, less annual depreciation, amounts to slightly over $1,000,000, one can readily see the obvious overcapitalization. The profits from operations proved sufficient only to

[18]Annual Reports of the Asbestos Corporation, Limited, 1926--1928.

pay bond interest and preferred dividends. Under existing circumstances, It is hardly likely that dividends on the common stock can be expected during any but very prosperous years.

Of the remaining companies in operation at présent, two are large American manufacturing corporations, the Johns-Manville Company, of New York, and the Keasbey-Mattison Company of Ambler, Pa., while the Quebec Asbestos Corporation is also American-owned. Finally there remains the A. r. Johnson Company, the only other Canadian company from the point of view of ownership. This company has remained in the Johnson family since its inception, and is still owned by decendants of the original owner. A good deal of rivalry between this company and the Asbestos Corporation still exists, a reminder of the period a few years before. The potential danger of this, however, has been appreciably lessened. It is unfortunate that the Asbestos Corporation, when formed in 1925, did not include the Johnson Company. Such a measure is to be recommended, for it would completely centralize the Canadian asbestos interests in Canada. Such centralization and unified control would decrease competition to a minimum, and enable a more efficient invasion of foreign markets. The Johnson Company, however, is in private hands; it is a wealthy company and does not lack resources. Hence it unlikely to

expect that it would favour a union with the Asbestos Corporation unless circumstances were more compelling. Such a merger, however, would unite the all-Canadian interests in asbestos production under one head and would enable unified operations to be carried on in an industry which is only now, after fifty years of its existence, beginning to enjoy the benefits of centralization.

CHAPTER IV

THE PRODUCTION OF ASBESTOS

Canada is the largest source of raw asbestos in the world, mainly because the methods of production in Canada have attained the greatest economy and efficiency. Although asbestos occurs in most parts of the world, Canada has been able to maintain her supremacy through superior modes of extraction. In Canada deposits have been found in Ontario[1] and British Columbia[2], but those of real commercial value are confined to the Eastern Townships of the Province of Quebec, from which 65% to 75% of the world's supply of asbestos is annually produced. The asbestos veins which yield this ore are contained in the great serpentine belt which extends from southern Vermont to Gaspé, in the Province of Quebec. This belt may be divided into three areas:-

1. The area covering part of the townships of Balton, Oxford, Brompton, Melbourne and Danville.

2. The Thetford-Black Lake Area, covering part of the townships of Hamilton, Wolfestown, Coleraine, Thetford and Broughton.

3. The area covering a part of the Gaspé peninsula.

In the first area, which crosses the international boundary between Canada and the United States, asbestos only occurs at several points as in the townships

[1] Engineering and Mining Journal, April 25, 1925; Vol. 119; p. 700.
[2] Heaton's Handbook, 1927; p. 395.
[3] F. Cirkel: op. cit.; p. 41.

of Balton and Brompton. Moreover, the value of the deposits here must remain unknown for some time as

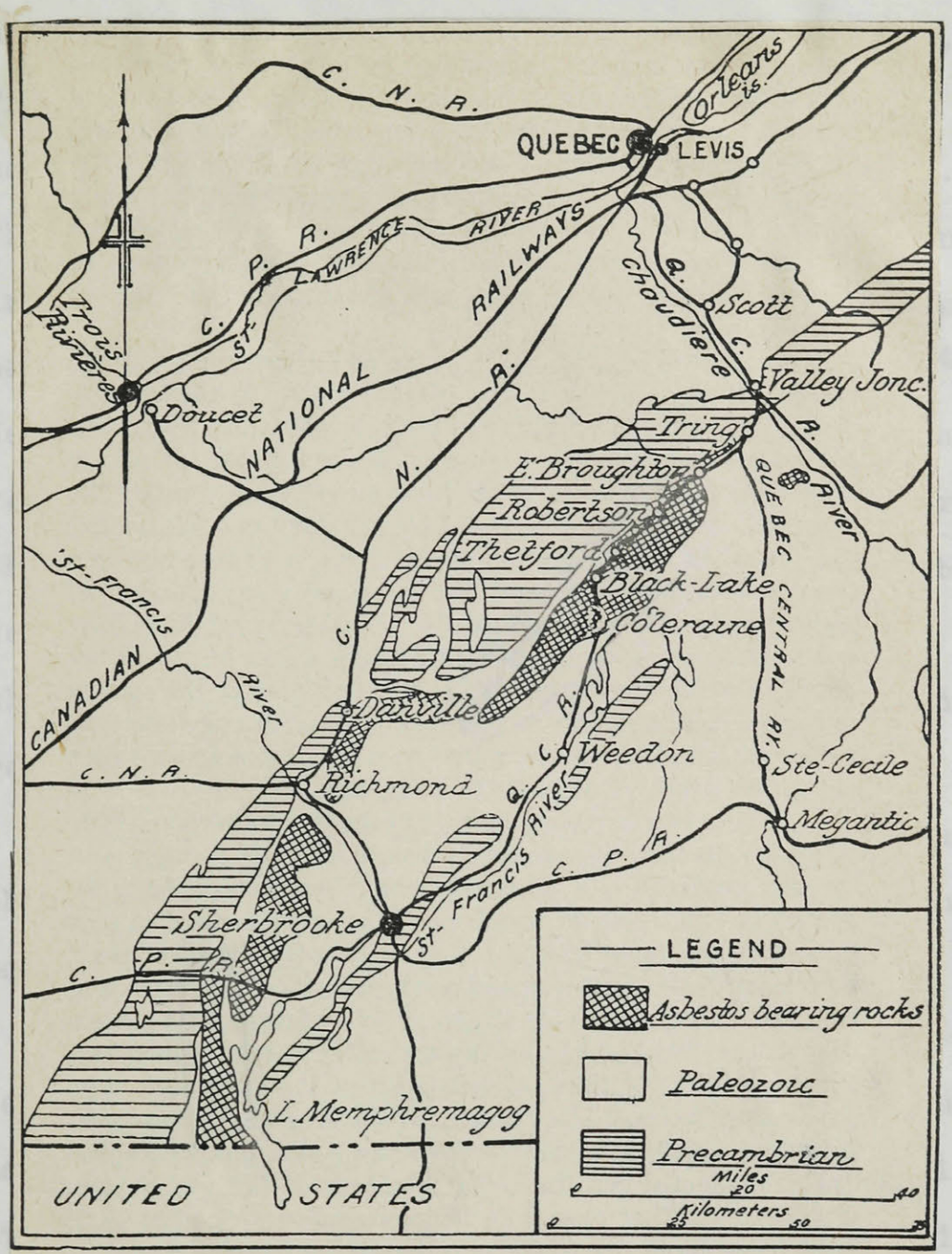

Figure 2—Sketch map of the "Serpentine Belt", Quebec, in which occur the deposits of Asbestos.

a large part of the area is covered with heavy forest growth.

The second, or what is generally termed the

Thetford-Black Lake area is the most important asbestos field from an economic point of view. It begins between the villages of St. Joseph and St. Francis with several small knolls of serpentine, north of the Chaudière River and in its vicinity. This field of serpentine is the most important one in Canada since it contains all the productive asbestos and chrome iron ore mines in the Dominion[4]. Nearly all the productive mines are located in this region, more especially in the townships of Coleraine, Thetford, and Broughton. The only, large, workable deposit outside this area, is at Danville, about thirty miles southwest of the Black Lake-Thetford region.

In the third area, that of the Gaspé Peninsula, the geological formation is too hard and siliceous to give much promise of asbestos[5].

It is thus easily seen that Canada's asbestos deposits are not widely scattered, a fact which has meant much in bringing the industry to the position it holds to-day. The centralized geographical situation of these asbestos deposits, and a close proximity to the boundary of the United States who have proved to be Canada's greatest customer for asbestos, have been great and important factors in the attainment of a premier position in the world in the production of raw asbestos.

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[4] F. Cirkel: op. cit.; p. 42.
[5] F. Cirkel: op. cit.; p. 42.

Asbestos deposits, however, are not confined to Canada. They occur in almost every part of the world and while all countries are not engaged in its production, many possess supplies, and it can confidently be expected that in the not far distant future, such countries will enter into production, in proportion as the need and widespread use of this indispensable safeguard increase.

In addition to Canada; the United States, Rhodesia and British South Africa, Russia, Cyprus, and other countries are producing asbestos in varying comparatively small quantities. More recently Australia, New Zealand, Finland and Japan have begun production. There are also deposits of asbestos in Brazil, British India, Cuba, France, the Italian Alps, Mexico, Persia and the Philippine Islands[6]. Most of the States of the United States of America possess asbestos but production is confined to Arizona and Georgia, the former being the greatest producer. As a matter of fact, the United States only produces about 1% of the raw asbestos that it absorbs[7].

One of the commonest illusions about the production of raw asbestos is the thought that is mined. Raw asbestos is not mined; it is quarried, for the most part. And although a common expression in connection with the industry is "asbestos mining", this

[6] W. A. Rukeyser: "Asbestos Mining and Milling in Quebec." In Engineering and Mining Journal, April 15th, 1922, Vol. 113; p. 618.
[7] U. S. Tariff Bulletin on Asbestos.

is a misnomer. Raw asbestos is extracted by open-air work in large pits, like quarries, which are often 400 feet or more in depth, and which are continually growing deeper and deeper as operations are extended. Generally there are three methods for obtaining raw asbestos; open pit work, "glory holes", and combined open and underground workings.

The asbestos of the Thetford-Black Lake area occurs in narrow vein-like bodies traversing the serpentine in which it is found. Most of these "veins" are less than a half-inch in width though "veins" two to three inches wide are not uncommon and some have been found five or six inches wide. The asbestos is of the flexible, chrysotile variety, and the fibres are disposed at right angles to the walls of the "veins". These veins are sharply defined and are bounded on both sides by serpentine of essentially the same composition as asbestos. They are very irregular, often intersecting one another at various angles, and continue for diverse distances. Although the fibre, when found, appears to be solid rock, it may be pulled apart in fine shreds, which resemble carded wool.

Methods of recovering and preparing the fibre are usually clouded in an air of mystery and the consequent lack of co-operation has hindered proper development of processes. This is in striking contrast to conditions in metal mining and refining. The

Canadian asbestos field, being the pioneer, has been the scene of the gradual evolution of methods of lifting the rock, separating the fibre, and preparing it for the use of the manufacturer. Other countries which have progressed beyong the simple handcobbing of crude fibre have adopted some form of Canadian practice so far as they could learn it[8]. In the mining of asbestos-bearing rock, standard methods applicable to taking out rock containing any mineral, are in use. These vary, however, with topography, location, and the extent of the deposit. The most economical system for any given deposit is, however, not always employed. Once a method has proved successful in one location it is often copied in another where a more economical system might be in use. The low value per ton of rock, prohibits the use of too expensive methods. Consequently, in Canada, open quarrying is the popular method.

The primary mode of extraction is handcobbing, which was the sole method practised for the first fifteen years after the beginning of the industry in Canada. This method is now in practice, only for the extraction of the "crudes", the longest grades of asbestos. Large masses of mineral-bearing rock are first dislodged with charges of dynamite, after which workmen descend into the pit and carefully select the long fibre. The rock is separated from this by means

[8] J. C. Ross: "Asbestos Mining and Milling"; p. 11.

of small hand hammers and the ore is then bagged and shipped. Rock containing shorter fibre, at first unprofitable to treat at all, is now sent to the admirably-equipped mills which any large company has on its location. Here practically the same process is carried out but in a more detailed way. Aerial scoops or inclined railways are loaded with ore-bearing rock which is transported to the primary crushers in the mills. Here several crushers pulverize the rock and ore, and then by means of vibrating screens and electrical suction fans, the asbestos fibres are separated from the rock sand which is consigned to the "dump". Recently, however, this sand has found value as a construction material and thus has become a small source of revenue instead of a complete loss as formerly. Thus in 1928, 22,787 tons of asbestos sand and waste were sold at a value of almost $15,000.[9] Drying operations to eliminate moisture are also carried on while the screening and suction processes are repeated again and again so as to obtain the largest possible yield of asbestos fibre per ton of rock quarried. After the milling operations, the milled fibre has the appearance of raw cotton; it is then bagged and ready for shipment to manufacturers.

Perhaps the greatest factor in the efficiency of Canada's asbestos industry is the fact that here what

[9]Canadian Bureau of Statistics, Ottawa, Canada, 1929.

is essentially a mining industry, can by profitably carried on when the yield per ton of rock mined is approximately $2.00 to $2.50.[10] Only the greatest economy in operations and the use of the most modern methods of extraction have made possible the profitable continuation of such an industry. Milling methods and technique are continually being improved and greater efficiency instilled so that no opportunity of increasing the yield per ton may be lost. The yield per ton of rock is an item that may interest engineers rather than economists. It is worthwhile noting, however, that in this industry in Canada which has been pursued with a fair measure of success, the yield per ton of rock handled is so low. More important, however, is the fact that improved methods and greater efficiency continually make possible the increase of this yield per unit. As has been seen[11], however, all these efforts having barely sufficed to make the industry payable and it has never been what could be called highly profitable. A survey of Table C gives a true picture of conditions in the industry itself, so far as the technical aspect is concerned. Thus in 1927, the last year for which figures are available, 274,778 tons of fibre were shipped from the mines at a value of $10,621,013. This means an average value per ton of $38,65. It must be remembered, however,

[10] See Table C.
[11] Supra: Chapter II.

that this valuation means only what it says, the average value; for it is, by no means, the price of asbestos. As will be more clearly seen later, there are many grades of asbestos, bringing varying prices in the market, prices which range from $423.65 per ton for No. 1 Crude to $21.34 per ton for the shortest mill fibre[12]. To produce this 274,778 tons of asbestos fibre, however, 4,834,761 tons of ore-bearing rock had to be quarried. The total rock handled, therefore, yielded abour 5.7% fibre. Inother words, a ton of rock, after being quarried and milled, yielded about 114 pounds of asbestos, worth roughly $2.13. It must be noticed, too, that this value per ton of rock handled varies from year to year but shows a consistent tendency to increase; thus, from 1910 till the outbreak of the Great War, which created abnormal conditions[13], the average value per ton of rock, remained steady at about $1.50. During the war and until 1920, when this value reached their $4.50. Since 1920 it has regained constancy, the yield of asbestos per ton being from $2.00 to $2.25. This figure is determined by two factors; first, the prevailing price of asbestos, and secondly, the degree of efficiency which is maintained in extracting the fibre from the rock.

Consideration of the price of asbestos involves a careful study of the prices for the various grades

[12] See Table D.
[13] Supra: Chapter II.

and the proportion of these grades to the total produced. For these reasons, a discussion of average values per ton of asbestos is wholly inadequate, because it disguises only too well, the various price movements for the different grades of asbestos fibre, and the scarcity or abundance of certain qualities of fibre at different periods. Moreover, the presence and effect of competition in the production of asbestos, can only be significantly determined by more detailed study inasmuch as such competition up to the present, has been largely confined only to certain grades. Rhodesia, for example, has now been producing and exporting asbestos for about fifteen years; [14] constituting competition which has been felt hammful to Canadian producers. Yet this competition is confined to the higher grades, inasmuch as costs of transportation prohibit the shipment of Rhodesian short fibre to foreign markets. The general trend of average prices for asbestos can best be traced throughout the history of the industry in Canada[15]. Only as an aid in tracing this history have these values any great significance, but for the purpose of studying the real movements in the prices of asbestos, those of the various grades must be taken.

The quality of asbestos depends in the main upon length of fibre, the longest fibre drawing the highest

[14] Infra: Chapter V.
[15] Supra: Chapter II; and Table A.

market value and the shortest, the least. Prices are quoted per ton f. o. b. Quebec mines, tax and bags included. The grades include Crude No. 1, Crude No. 2, spinning stocks, paper stocks, short fibre, and floats. It is needless to dwell upon the different between these. The grading depends, primarily, upon length of fibre and secondarily upon the use to which the fibre is to be put, which is, in turn, dependent upon its adaptability for spinning. The foremost grades, the crudes, are not milled at all; the fibre is extracted from the rock by hand labour or handcobbing which consists of knocking away the useless rock from the fibre by means of small hand hammers. These crudes, being the most valuable, and the least abundant[16] draw the highest prices. The average price of Crude No. 1 for the year 1928 was $534.87[17] which is an increase of over $150.00 above the price for the previous three years. From 1910 till the outbreak of the war, this grade brought from $175.00 to $300.00 per ton. During the war, subject to great fluctuations, the price of Crude No. 1 varied from $275.00 in 1915 to almost $1500.00 in 1920. These are yearly average prices and conceal the fact that at the peak in June, 1919, Crude No. 1 was sold for as high a price as $3,000.00 per ton[18]. Other

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[16]It often requires the quarrying of as much as 1,000 tons of rock to produce one ton of No. 1 Crude.
[17]See Table D.
[18]Engineering and Mining Journal, October 1, 1921. Vol. 112; p. 559.

grades of asbestos bring proportionally lower prices; thus for the next four grades average prices for 1928 were respectively $296.76, $256.63, $148.70 and $73.80.[19] The history of these prices is similar to that described for Crude No. 1, as a glance at Table D will prove. For example, prices obtainable for all grades now seem to be approximately double those prevailing in 1910. Thus, although the war saw an unprecendented rise in the prices for asbestos, which was finding more and more uses daily in armaments and military equipment, the post-war reaction has brought these prices to a level, which is roughly double that of the pre-war level. It will be apparent, however, that not only the increasing number of uses for asbestos, but also other influences, such as the Quebec Merger of 1925-26, have been potent in the maintenance of more stable and more remunerative prices than formerly. For, with the control of properties now in the hands of a small group of operators, instead of each property being operated as a separate unit as in the early days of the industry, the number of grades of fibre produced and marketed has been reduced from fifty to less than a dozen[20]. Formerly, every mine had its own distinctive methods of grading fibre with the result that the total number of grades of asbestos marketed

[19] Report on Mining Operations in Quebec, 1927.--Quebec Provincial Government, Quebec, Canada.
[20] J. G. Ross: op. cit.; p. 26.

was a large one. The modern trend of standardization in production, however, has revealed itself in the asbestos industry also, so that, at present, a certain standard of uniformity has become the rule, with the result that asbestos is now generally graded as described below[21].

Perhaps more significant than a discussion of the prices for asbestos, is that of the proportion of the various grades to the total annually produced. If the

[21] The grading of asbestos for market varies in different districts and at different plants. In Canada there are two main grades, crude and fibre, each of which are divided into sub-grades, in each case bases on length of fibre. Crude, produced entirely by hand-picking and cobbing, consists of all cross-fibre asbestos three-eighths of an inch long. No. 1 Crude consists of fibre over three-quarters of an inch long, and No. 2 Crude consists of fibre three-eighths to three-quarters of an inch long.

Mill-fibre grades have not been well standardized. They are based on screen tests but different producers use different classifications. Screen tests are made in a standard testing machine, which consists of four trays, 24 by 14 by 4 inches. The top, or No. 1 tray is fitted with a screen bottom of 2 mesh (No. 2 wire); No. 2 screen is 4 mesh (No. 17 wire); No. 3 screen is 10 mesh (No. 18 wire), and the bottom tray is a solid pan. The nest of screens is fastened to a frame so arranged that it may be vibrated horizontally with a 1½ inch throw by an eccentric revolving at 300 revolutions per minute. In making a test, one pound (16 ounces) of fibre is placed in the top tray and shaken for exactly two minutes. The residue in each screen and on the bottom pan is weighed separately and the weight recorded in ounces. Thus, a fibre testing 0-8-6-2 (total 16 ounces) is one of which 8 ounces is retained on the second screen, 6 ounces on the third, and 2 ounces of shorts in the pan.

According to the Engineering and Mining Journal-Press, August 12, 1922, the following fibre tests may be taken as averages:

number of tons of asbestos produced in Quebec in 1928 consisted wholly of Crude No. 1 at a price of about $535.00, we would suddenly find that the asbestos industry had developed into one of Canada's greatest industries instead of merely being one of its most important. By far the larger part of the production of the Quebec mines consists of short fibre or milled fibre instead of the valuable handcobbed crudes. Mr. J. G. Ross in his invaluable essay on "Asbestos Mining and Milling" drew up a table in which he computed the percentage value of sales of the highest grades of fibre to total sales[22]. It is best here to consider the handcobbed grades, No. 1 and No. 2 Crudes, combined, as opposed to the total mill stocks. Thus in 1911, the handcobbed grades consisted of 25.4% of the total and the mill stock 74.6%. This proportion, rising in 1917 to 38.2:61.8, was generally maintained until 1920, when the percentage of crudes fell to about 11% of the total, which, although it rose to 16.4% in 1924, seems to be the new normal percentage for the proportion of No. 1 and No. 2 Crudes to the total sales. It must be remembered, however, that the

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Long-spinning fibre. 2-8-4-2
Medium-spinning and compressed sheet fibre , , , , , , ,0-8-6-2
Pipe-covering fibres 0-5-8-3
Shingle stocks 0-1½-9½-5
Paper and Millboard Stocks . .0-0-10-6
Cement Stocks. . . . . .0-0-5-11#

#"Asbestos"--National Resources Intelligence Service--Department of the Interior--Ottawa, Canada, 1926.

[22] See Table E for replica of this table brought up to date.

figures in Table I represent values, and not tonnage. This is unfortunate inasmuch as the picture presented is not quite a true one owing to the fact that the values for the higher grades far outdistanced those for the lower grades during the war and hence, this fluctuating proportion is really a steadily-decreasing one on the part of the quantities of higher-grade asbestos[23]. Milled fibre is gradually becoming a larger and larger part of the production of raw asbestos in Quebec. This is to be regretted in the light of the fact that the market for the longer grades of asbestos is always a readier one, and that at certain times it proves difficult for a mine to sell its complete stock of milled fibre. In such a case it is compelled to carry over the surplus of such stocks from one period to another, which only increases the amount ready for market in the succeeding sales campaign.

The labour used in the asbestos mines of Quebec forms the subject of amost interesting question. In this important industry which consists of the extraction of one of the most interesting and most important raw materials that Canada possesses, it is perhaps curious that the question of labour has hardly ever been a dangerously controversial one, more especially as the industry until recently, has shown itself an extremely unstable one[24]. The conditions

[23]See Chapter V for the causes of this decrease in proportion.
[24]Supra : Chapter II.

of labour in these mines is all the more important, too, because of the fact that labour costs are by far the largest item of expenditure in the financial statements of asbestos producers. Thus, for example, one estimate for 1919 placed labour costs, as more than 75 % of the total costs of production[25]. The men employed are practically all French-Canadian unskilled labour. They reside in the locality, forming the towns of Thetford, Black Lake, Coleraine, etc.[26] There is very little fluctuation in the supply of labour since the population is by no means floating; in fact, the labour turn-over is practically negligible. Moreover, owing to the natural stability of this French-Canadian labour, with its conservative outlook upon life, there remains that individual and personal element around the mines which their presence creates[27]. Whole families are to be seen at work and it is not uncommon to find men whose fathers, and some, whose grandfathers, were doing the same work which occupies their descendants to-day. Devout Catholic followers, the labourers obey the local curé who is all-powerful, pervading all the daily life of the inhabitants. Their character makes them wary of innovation and generally they are loyal to their employers and well-satisfied with their lot.

[25] W. A. Ruckeyser: "asbestos Mining and Milling in Quebec". Engineering and Mining Journal, April 22, 1922; Vol. 113; p. 676-7.

[26] See Map p. 67.

[27] R. C. Rowe: "The Bell Asbestos Mine at Thetford Mines". Canadina Mining Journal, February 17, 1928, Vol. 49; p. 147-8.

Though the workers have many bonds which unite them, and many ideals and practices in common, trade unions, in the ordinary sense of the word, do not exist. For the most part, the men own large, clean homes with the benefits of church, school, and hospital always nearby. Large families are popular, as the increasing population of this section of the country adequately proves. Briefly, the labour situation is a very satisfactory one and asbestos operators are to be congratulated upon the fact that they have thus avoided the possibility of having to fight "red" propoganda, which undoubtedly would not survive a day in this home of tradition and conservatism.

A few statistics[28] pertaining generally to the asbestos industry in Canada will found illuminating. Thus, for the year 1927 we find that the fifteen mines in operation were controlled by seven operators. In 1925, there were nineteen mines under fourteen operators, but owing to a merger[29] this was reduced. The reduction in the number of mines was due to the cessation of work in those which proved unprofitable. Capitalization around the years 1923-24, was over $40,000,000, a sum which represented a great deal of over-capitalization which was to a considerable extent the cause of the instability of the industry till that period. It has now (1927), however, been reduced to about $35,000,000

[28] In conjunction with the following statements, it would be well to consult Table F.

[29] Supra: Chapter II.

as a step in the general policy of the New Asbestos Corporation. Further reduction would proportionally increase the stability of the industry but apparantly this policy is not being pursued farther as yet, inasmuch as the capitalization has remained around the $35,000,000 level for a few years. There are, roughly, about 3,000 employees at the mines, both wage-earners and salaried workers, whose remuneration totals over $3,700,000. An interesting fact reveals itself here, for, although both the number of workers and their remuneration, have increased in the last five years, the latter tends to increase more rapidly, showing an increase in the salaries or wages paid per person. It is impossible to say, however, whether this is general or not, as the increase is not sufficiently great to warrant the deduction that all wages and salaries are on the increase.

Another important item is the cost of fuel and electricity, which generally approximates about 10% of the net value of the ores shipped from the mines and to about 12% of the total expenditure. The Asbestos mines and mills in the three producing fields of Thetford, Danville, and East Broughton now require for their operation about 1,800 electric horse-power, practically all of which is transmitted at 50,000 volts over a transmission line of 110 miles long from Shawinigan falls on the north side of the St. Lawrence River.

The line crosses the St. Lawrence between two steel towers 350 feet high and 5,000 feet apart[30].

One more point is worthy of mention under the head of the production of asbestos. Continual efforts on the part of the various operators, especially the Asbestos Corporation are made to insure complete safety and cleanliness. Mills are continually being swept clear of the dust and sand that cover the floors. Cleanliness, safety, and labour-saving machinery are insisted upon. In visiting the various parts of the mills very few workmen are seen and most of these are busily sweeping floors. They have time to do this because the machinery is doing the work. Consequently the mills are always singularly free from accumulations on the floor. Every possible means is taken to prevent accidents. Particular attention is paid to the pit where continual blasting goes on. All loose rock is scaled from the faces so that there may be no danger from falling fragments. Only experienced men are permitted to have anything to do with the blasting. Other precautions include weekly inspections of all cableways and sheaves. In the mills a minimum of belting is used and all machinery and belting are enclosed. Even with all these precautions, not the smallest item of expenditure by any means is insurance[31], which is usually carried against fire, accident, etc.

30 "Geology, Mines, and Metallurgical Industries." Department of Mines, Ottawa, Canada. Second (Triennial) Empire Mining and Metallurgical Congress, 1927.

31 F. A. Westbrook: "Mining Asbestos on a Large Scale." Pit and Quarry, October 27, 1926.

against fire, accident, etc.

It requires no more than the briefest knowledge to show that Canada's asbestos industry is beset with many problems, of which perhaps the greatest is the fact that this industry has always been unstable and far from attaining the prosperity it deserves. Certainly, however, the above description of the processes of the actual extraction, can leave no doubt that the solution does not lie here. Our asbestos deposits are being worked in a most economical, efficient and beneficial way. In other words, the actual productive processes, can now safely be discarded as a source of the troublesome problems which afflict the industry. Not within the four walls of production can a solution be discovered which will serve to place the industry on a basis from which it will be hard to dethrone it, and certainly one which it deserves. Since a search within the actual production therefore has not led us to the sources of these problems, let us glance at some of the outside problems and questions which, at present, beset the asbestos industry in Canada. This will immediately bring to the fore, the question of growing foreign competition, and of the possibility of more extensive manufacture of asbestos into finished products in Canada.

CHAPTER V

CANADA'S DIMINISHING "MONOPOLY" IN ASBESTOS

Canada is now becoming one of the world's most productive sources of minerals, and in the case of many non-metallic minerals, such as asbestos, has, for a long time, been the largest producers. Only a few years after the industry made its inauspicious beginning in the Eastern Townships of the Province of Quebec, the production of asbestos in Canada exceeded that in any other country of the world. As time went on, this premier position was strengthened, until the general consensus of opinion was that if Canada did not produce all the asbestos used in the world, she certainly produced most of it. School geography books extolled this fact, and Canadians were proud to know that Canada maintained, if not a complete monopoly at least a ratio which was equal to from 85% to 90% of the world's production of asbestos. That Canada possessed some of the largest and most productive asbestos deposits in the world was well known but one was apt to overlook the importance of the widespread occurrence of the mineral. Moreover, it was not the productivity of the deposits, but rather the more advanced methods of working them that placed this country at the head of the asbestos producers of the world. One was apt to overlook, also, the fact that as soon as other countries attain a similar level in the technique of producing asbestos, they at once assume the position of potential competitors of Canada in this important field. Most countries of the world as has been seen,

possess deposits of asbestos; and it is only a case of overcoming certain handicaps to production and merketing before Canada's monopoly of asbestos is threatened. These impediments include difficulties in actual production caused by situation, climate, etc.; inaccessibility to the markets of the world, which can be overcome through the medium of favorable freight rates, and finally, the problem of adequate labour supply. Up to the present day, these difficulties have not been wholly overcome in countries other than Canada, but the tendency to do so is becoming more apparent. The history of Canada's asbestos industry for the last few years clearly shows the presence of outside competition which, up to the present, has had its origin in another section of the British Empire; Rhodesia, and the Union of South Africa. Before dwelling more fully upon this case of actual competition, it is better to trace the progress in the production of asbestos in other countries, and hence find the sources both of potential and of actual competition.

When Canada entered the field as a producer of raw asbestos it was as a competitor of Italy, which prior to 1880, was the world's sole source of the mineral. Because the uses of asbestos were very limited, on account of the exorbitant prices asked for good fibre, the production fluctuated very little,

Italian asbestos mining may be considered to have commenced with the nineteenth century. We find that about that time, two citizens of North Italy undertook experiments to see whether what had been done in ancient times might not be undertaken for modern requirements. Although these experiments were satisfactory, asbestos, for some considerable time afterwards, seems to have been looked upon as a material of some interest to the minerologist and the geologist, but of little or no practical commercial value. In 1866 Signor Albonico with Canon del Corona and the Marquis di Baviera attempted to develop the economic uses of asbestos. This attempt was a failure, however, because any prospects that these men might have had were frustrated by the outbreak of the Franco-Prussian war of 1870-71. The first district in which asbestos of commercial value was obtained, was the Susa Valley where the first work done was in 1876. At about the same time, work was also begun in two other districts, the Aosta Valley and that portion of Lombardy known as the Valtellinal. Italian asbestos, hence, was the predominant factor in the asbestos market when operations were begun in Canada. But Italian producers soon found that they could not compete with the Canadian mineral for various reasons[2]. Moreover, the quantity of better class fibre was limited, so that production soon declined. By 1910 there was very

[1] F. Cirkel: op. cit.; p. 232 et seq.
[2] Supra: Chapter II.

little asbestos being mined in Italy; in fact, the Italian manufacturers of asbestos imported Canadian fibre. The United Asbestos Company of London, England, was about the only company that used Italian fibre to any extent. None was sold in the United States of America at that time though a few carloads were still annually used by manufacturers in Germany. By 1913 production had declined to 172 long tons, remaining at a similarly low level until 1922 when Italy seems somewhat to have recovered in its production of asbestos, shipping 492 long tons from the mines. This has gradually increased in recent years until, for 1926, production stood at the somewhat high figure of 2,500 long tons[3]. Although the tendency for the future seems to show an increasing productivity of asbestos, Italy can never be a source of competition for Canadian asbestos, owing to the fact that the two varieties are so dissimilar and for other reasons already mentioned[4]. Italian production of asbestos in future years is hardly likely to exceed more than 1% of the total world production.

From Italy, let us turn to Russia, the largest producer of asbestos on the Continent. Before the Great War, Russian (Ural) asbestos was becoming a small competitor with Canadian asbestos; but only in the spinning quality. The freight charges from the

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[3]Dominion Bureau of Statistics.
[4]Supra: p. 88.

Russian mines to the seaboard were so high, namely, from $30 to $35 per ton that the lower grades could not be shipped economically, and therefore did not compete with the Canadian fibre. The Russian lower grades were used, like the Thetford mill fibre, for the manufacture of shingles, and were absorbed principally in home consumption. The history of Russian asbestos is not generally known. Asbestos was discovered in the Ural Mountains in 1720 and forty years later, a factory for the manufacture of asbestos

PRODUCTION OF ASBESTOS IN RUSSIA#

Year	Short Tons	Year	Short Tons
1910	12,944	1918	1,488
1911	14,078	1919	746
1912	22,389	1920	1,595
1913	24,719	1921	1,999
1914	17,473	1923	5,377
1915	12,077	1925	11,200
1916	13,376	1926	22,400
1917	6,886		

articles was established; but the applications and uses for the mineral were very limited; hence the industry almost disappeared. It was not until more than 100 years later, after the discoveries in Canada had become known, that asbestos mining in the Urals was revived. The principal quarries were then established near the station of Baskenovo. Here are the largest deposits, those which have been worked since 1886[5], and whose estimated reserves are over 1,000,000 tons. Smaller deposits have also been

#Dominion Bureau of Statistics for years after 1921.
L. Berlinraut; Engineering and Mining Journal, January 23, 1926; Vol. 121; p. 164-7.
[5]Ibid.

discovered in Siberia and the Caucasus. Up to 1914, merchantable Russian asbestos found a market not only locally but also abroad, particularly on account of the hardness, purity, and elasticity of its fibre. Russian production consists of a large percentage of high-grade fibre--about 35%--and this tends to give it a marketing advantage. At this date (1914) five thousand workmen were being employed in the production of Russian asbestos which was ever on the increase, and approximated about 16% of the world's production. The war caused a sudden decrease in the available number of workmen, and the consequent lower productivity of those employed. In addition, the upheaval of world markets brought about a cessation of asbestos exports, most of which had formerly gone to Germany. In 1918 the Soviet decreed that the asbestos mines should become state property. Owing to faulty organization, lack of fuel and food, only 1,595 short tons were produced in 1920, including over 75% of inferior grades. To stimulate asbestos mining, the Supreme Board for National Commerce and Industry established in 1921 a special trust called "The State Union of the Asbestos Mines". This did not function efficiently at first owing to a lack of working capital; but the situation improved later. Wages were increased though they still remained a low level, the average being about 25% of the wages paid to Canadian workers. Before the war the lower grades of asbestos were worked into manufactures in domestic

factories, while the better grades were shipped almost exclusively to European countries, 65% of the tonnage being conveyed to Austria-Hungary and Germany. In 1914-15-16 England was the principal buyer and for the following four years practically no asbestos was shipped. Since 1921, exported Russian asbestos has been carried almost exclusively to Hamburg, and then distributed to Germany, Austria, Belgium, Holland, and Italy. There is some sent to London and to the United States, but in almost negligible quantities. The revival of Russian asbestos production began in 1921 with the production of almost 2,000 short tons. The industry in Russia had been subsidized, and from that date on production increased every year, until in 1926, the 20,000 metric tons of asbestos that were produced closely approached the pre-war figure. Taking the progress of the past few years into consideration, it becomes a possibility that Russia may once more regain her pre-war status of being the secong largest producer of asbestos in the world. Although the successful production of asbestos in Russia is mainly dependent on cheap transportation one must not forget that she always finds a ready market in Germany, and has not yet experienced any difficulty in marketing. Lower labour costs and state subsidies, too, give Russia's industry an advantage over Canada, which until recently suffered from a provincial royalty tax. Moreover, in view of the

fact that Canada enters European markets, she may well expect to meet keen competition on the part of Russian asbestos. It is only too true that in the near future, Canada may well fear Russian competition, revived and strengthened since pre-war days.

Other producers of asbestos in Eurasia include Finland, France, China, and Cyprus. At the beginning of 1904, attention was called to the occurrence of asbestos of commercial quality in central Finland. A company was organized, and operations were subsequently carried on for some time. Production is being carried on at present, but the tonnage is so small as hardly to require mention. A mill at Helsingfors manufactures a few asbestos products. For this purpose, some fibre is even imported[6].

- Another small producer of asbestos is France where before the war, small deposits were worked in the Pyrenees, in Dauphiné and in the island of Corsica. Production has always been less than 1000 tons; in 1926, for example, 600 long tons were quarried.

More recently, China has become a producer of asbestos, which has been known for a long time past to exist in this country. It occurs in a number of provinces in China and at present the deposits are being worked by four companies. Both the raw asbestos and the manufactured products, also made at home, are mostly for domestic consumption, though

[6]The Mineral Industry, 1927; Vol. 36; p. 47.

some of the products are shipped to Japan. China, in 1926, produced over 2,000 long tons of asbestos, almost double the quantity produced by her neighbour, Japan.

Before leaving this field, one must not forget that Cyprus has long been an important factor in asbestos production. Operations were begun in 1908 and in this year, 370 short tons were produced. The first shipments of the product being of good quality, found a ready market. By 1913, exports were well over

PRODUCTION OF ASBESTOS IN CYPRUS#

Year	Short Tons	Year	Short Tons
1908	370	1924	4,372
1912	963	1925	3,608
1922	1,710	1926	6,885
1923	1,743	1927	12,544

#The Mineral Industry; Vols. 1-37.

1,000 tons with the outlook very promising. The war and the subsequent years gave the industry added impetus and production increased in 1926 to 6,885 long tons, practically double that of 1925. In 1927, production was doubled once more, being over 12,500 tons. Thus, for two years in succession, production has nearly doubled. With large, well-equiped mills and a satisfactory transportation system, the industry is now established on a sound and profitable basis. Entire costs of transportation to the seaport, including interest on investment and complete amortization of the plant in ten years is given at $1.65 per ton over an 18-mile aerial ropeway. Formerly,

motor wagon or animal transport increased these costs to from $5.00 to $6.00 per ton. With the effect of such economies, Cyprus is well launched upon a successful asbestos industry. Having produced in 1926 2% of the total world's production and in 1927, 4%, it is becoming increasingly evident that Cyprus will soon hold a more important position among the asbestos-producing countries of the world.

One of the smallest producers and at the same time the largest consumer of raw asbestos in the world to-day is the United States. The production of asbestos there is less than 1% of the Canadian and becomes wholly unimportant when we consider that this low percentage consisted at first only of a low grade material, a grade which was not produced in any of the Canadian mines. The total output of the United States once consisted of the variety which is generally known, mineralogicallym under the name of "amphibole" the average price of which is usually less than half of that for Canadian "chrysotile". Asbestos has been produced in the United States for almost fifty years, but up to 1902 the largest part of it consisted of this low grade amphibole variety. The earliest record of the discovery of asbestos deposits was in 1861 in the annual report of the United States Geological Survey, referring to the Vermont deposits[7]. Until 1899, however, most of the production

[7] "Asbestos", September, 1927; p. 8.

came from Georgia. After the comparatively high production of the early eighties, the industry seemed to languish and it was only in the early years of the twentieth century that, with the discovery of additional deposits in Virginia, Georgia, and Arizona, the industry took on a new lease of life. In 1903 chrysotile

PRODUCTION OF ASBESTOS IN THE UNITED STATES#

Year	Short Tons	Year	Short Tons
1900	1,054	1914	1,247
1901	747	1915	1,731
1902	1,005	1916	1,638
1903	887	1917	1,958
1904	1,480	1918	998
1905	3,109	1919	1,161
1906	1,695	1920	1,648
1907	653	1921	831
1908	936	1922	67
1909	3,085	1923	310
1910	3,693	1924	473
1911	7,604	1925	1,258
1912	4,403	1926	1,358
1913	1,100		

#United States Geological Surveys.

deposits were discovered in Arizona and production in this district began shortly afterwards. Until the end of 1906 the average annual production was about 2,000 tons, a larger quantity than usual. Owing to the universal depression prevalent in 1907 and 1908, production declined but in 1909, progress once more began to be manifested and in 1911, 7,604 tons of asbestos were produced, the highest figure for all time. Since then and up to the present day, the production of the United States has constantly moved about the figure of 1,000 tons; in 1926, 1,358

short tons being produced. The absence of any large production of asbestos in the United States has been one of the main reasons for the importance of the larger deposits in Canada whose proximity to the world's largest market for raw asbestos, has helped to make it the foremost producer in the world. The absence of large deposits of suitable quality in the United States has made them dependent upon Canada for their supply of this mineral, and this situation can confidently be expected to continue in the future. The hope frequently expressed that the United States will some day be able to furnish its own supply of raw asbestos can be discounted in view of the facts that its supplies are not of syitable quality; they do not occur in sufficiently large quantities; and furthermore, they have far greater difficulties of transportation to overcome than the asbestos which is shipped from the Eastern Townships of Quebec, where more adequate shipping facilities are provided in relation to New York, now one of the world's largest asbestos markets.

In 1926, as Figure 23 shows, Canada produced 77.35% of the world's asbestos, while the British Empire was responsible for the production of over 92% of the raw asbestos that was consumed. As will be shown shortly, it is far safer to assert that the British Empire in the future rather than Canada only, will monopolize this industry, for Canada in recent years has had to make room for Rhodesia, and the Union

of South Africa on her throne of asbestos monopoly. Competition from the African divisions of the Empire has only made itself felt in comparatively recent years, but so great has been the progress of the industry in these countries that outside competition has now been loomed up for the first time as an added problem upon the already clouded horizon of Canada's asbestos industry. The history of the production of asbestos in Rhodesia is a comparatively brief one, having commenced shortly before the war.

The Rhodesian industry to-day is centered so far in two fields, Shabani and Mashaba, from which the bulk of the output is being secured. There are other deposits also, whose extent has probably not been fully determined although to date the big mines have been fully exploited, and their life is estimated fairly conservatively up to fifty years. It also seems likely that other deposits will be found as the country is opened up. The ownership of the principal mines is British in its capital control, or joint British and South African. While Canadian short fibre asbestos finds a ready market at home and in the United States of America, the South African fields, being so far removed from the world markets and having no domestic outlet of any consequence, can only market profitably the higher grades, which will bear the costly transportation. It is understood that the best or longest

fibre mined in Rhodesia comes from the Shabani district where the fibre content of the tonnage mined runs from 2% to 3% compared with the Canadian 5% to 8%. The difference in length and quality in favour of the

PRODUCTION OF ASBESTOS IN RHODESIA AND THE UNION OF SOUTH AFRICA#

Rhodesia		South Africa	
Year b	Short Tons	Year	Short Tons
1913	325	1918	2,645
1914	545	1919	3,932
1915	2,251	1920	7,112
1916	6,895	1921	5,122
1917	10,709	1922	4,389
1918	9,603	1923	8,392
1919	10,974	1924	7,241
1920	21,082	1925	10,167
1921	21,871	1926	14,097
1922	15,959	1927	22,133
1923	22,808		
1924	29,278		
1925	38,471		
1926	37,345		
1927	37,153		

#The Mineral Industry, 1927, Vol. 36; p. 45-47.

Shabani fibre fully equalizes this apparent handicap; for the quality is usually superior to any produced in Canada[8]. South Africa, generally, excels all other countries in the variety of the asbestos it furnishes for the world's market from Rhodesia and the Union of South Africa[9]. The discovery and production of asbestos on the continent of South Africa began during the last years of the nineteenth century and from the first, it was obvious that the greatest

[8]P. J. Stevenson: The Asbestos Industry in British South Africa. (Special report dated August 9, 1922.
[9]Mineral Resources of the United States, 1918; PartII; p. 555.

problems to be overcome were those of transportation. These deposits were so far removed from world markets that the costs of carriage for a long time offset any advantage which might have been otherwise enjoyed. Happily, however, labour can be obtained in Africa at less cost than in any other country; this offered asbestos producers an advantage which they were not slow to grasp. With use of black labour largely, production there has increased to such an extent that Rhodesia and the Union of South Africa together produced in 1926, over 13% of the world's production. In 1927, this percentage became even more formidable from the point of view of Canada's so-called monopoly. The asbestos industry was well established in South Africa at the time of the beginning of the Great War[10]. Production of asbestos in 1915 was greater than in any previous year. Two types of asbestos were being produced in South Africa, crocidolite or blue asbestos in Cape Colony, and chrysotile or serpentine asbestos in the Transvaal and Rhodesia. It must not be forgotten, moreover, that the latter is of the same standard as is found in Canada and of a superior quality. Thus in 1915, only a few years after operations had been begun in Rhodesia, the production amounted to 2,251 short tons valued at

[10]Mineral Industry, 1915; Vol. 24; p. 47.

32,190 pounds or about $72.00 per ton[11], whereas the value of the 1914 production had only amounted to 8,612 pounds. Exports from British South Africa, which has been producing asbestos longer than Rhodesia, increased from 305 tons in 1903 to 1,605 tons in 1908. It was in 1908, too, that the Transvaal, South Rhodesia, and Natal for the first time contributed to this production[12]. Most of the asbestos produced in these countries at this time was shipped to the United Kingdom. By 1913, the output from Rhodesia itself was only 325 short tons, valued at about $78.00 per ton. In 1917, four years later, the output had increased to 10,709 short tons, valued at $91.00 per ton. Owing to the war, however, production decreased about 10% in 1918. In that year the total production of the Union Of South Africa, including the 9,603 tons produced in Rhodesia, was 12,248 short tons. The larger part of this quantity was mainly crude fibre, much of which rivaled Canadian asbestos[13]. By 1920, the output of British South Africa had risen to 12.4% of the total world production of asbestos, from 8% in 1913. The outstanding features for 1921 were the great decline in Canadian production which was about one half the quantity for

[11]In Canada, in 1915, asbestos brought the average price of $31.97 per ton.
[12]Mineral Resources of the United States, 1918; p. 556.
[13]Ibid.

1920, and the maintenance of the Rhodesian production, which is mostly chrysotile. This was in spite of the fact that the total world's production in 1921 was the smallest since 1914. Rhodesia in particular, and South Africa in general were undoubtedly becoming the future competitors of Canada in the production of asbestos. In fact, toward the end of 1922, competition between Canadian and South African "crudes" became particularly keen, Canadian "crudes" having to compete with Rhodesian chrysotile, and the longer grades of mill fibre having to compete with Cape crocidolite, which was finding an increasing use in pipe covering, and in other products. As a result, prices for these qualities were depressed and this trend continued into 1923, the decline in the prices of the longer grades being offset by the increase in those of the short grades on which such competition did not exist.[14] By the end of 1922, the asbestos industry, in British South Africa, though yet on a small scale, was firmly established and its stability was noteworthy. The industry was affected far less by the post-war depression than that in Canada. Indeed, it was the ability of the South African producers to undersell the Canadians that contributed largely to the great post-war slump in prices in 1920. The rise

[14]Mineral Resources of the United States, 1922; Part II; p. 34.

of this industry continued in 1923, when production was increased by almost 5,000 tons. In this year competition between Canadian and Rhodesian chrysotile continued so keen as to bring the price of Canadian "crude" to the point where there was little, if any, profit in mining it. The result of this competition placed the Canadian industry in an extremely precarious position[15], which could be remedied only by an advance in the prices of the shorter grades of "milled" fibre with which there was no foreign competition. Here, however, the very keen competition and the lack of co-operation between Canadian producers themselves practically prevented the concerted use of such an obvious remedy. By 1926, when the Asbestos Corporation had already been formed in Canada, market conditions were more satisfactory. Prices generally were firmer and for some of the better grades, higher. Competition from South Africa, however, was not less keen; for, in 1926, its production was over 50,000 metric tons, a quantity which in that year made up 13.13% of the total world's production. To this, Rhodesia contributed over 30,000 tons of chrysotile asbestos, the quality most similar to the Canadian No. 1. Production in Rhodesia in 1927 fell a little below that of 1926 just as the 1926 production was a little short of the figure for

[15]Supra: Chapter II.

1925. The production value, however, was the second highest ever reached. Conditions in Rhodesia showed almost the same trend as in Canada -- a slight falling off in volume of production, but an increase in value reflecting the higher price per ton. The average price per short ton of Rhodesian fibre in 1927 on the basis of normal exchange was $104.10, while the Canadian average was $38,65 per ton[16]. The great difference in price is due to the fact that the shorter, low-priced fibres, although sold in great quantities in the United States, cannot be shipped profitably from Rhodesia. Consequently the African trade is confined to asbestos commanding a sufficiently high price to justify the long haul. The chief producer, the Rhodesian and General Asbestos Corporation (Ltd.), reports steadily improving conditions. Increased plant capacity, especially at the Shabani mine, greatly increased the output, beginning about March 1928. Completion of the new railway line to Shabani was expected by February or March 1928. The former 56-mile journey by ox wagons was a severe handicap to marketing and the completion of the railway shall have marked a new era in the asbestos industry. As a matter of fact, even under conditions existing in 1927, profits were said to be very satisfactory. During 1928, and

[16]The Mineral Industry, 1927; p. 45.

the subsequent years, it may be expected that Rhodesia's production will increase even more rapidly than in the past owing to the progressive policy adopted, which by the early months of 1928, shall have included the completion of a modern railway and an increase in the capacity of several plants. Rhodesia in the future will prove a formidable competitor against Canada in the asbestos markets of the world. Another outstanding feature during 1927 was the notable increase in production in the Union of South Africa. Both tonnage and value increased more than 50% over the 1926 figures. A greater demand for the distinctive qualities produced, and the high percentage of long fibre per ton were directly responsible. The prosperity of the industry in this country moreover, gives great hope of continuing indefinitely. Here, too, then, looms a source of competition for Canadian asbestos.

A glance at Figure 33 seems to show at once that the effects of competition on the production of Canadian asbestos are negligible. A few years ago, to have in the least way doubted the absolute supremacy of Canada in the production of asbestos would have been termed heresy. Even the latest figures available, those for 1926, as graphically drawn in Figure 34 reflect nothing but optimism if taken into consideration alone. To have produced 77.35% of the world's asbestos is an impressive if indicative of a rising tendency, or even a constant one, there would be ample cause

for pride and optimism. But the facts must be faced squarely. For years now, in spite of firm declarations to the contrary, doubts as to Canada's absolute future supremacy in the production of asbestos have been raised[17]. Pessimistic predictions have been, and are being made regarding the future trend of the production of asbestos in Canada in relation to that in other countries. The foregoing outline does not conceal the fact that the potentialities of a competition, which is very real at present, are not to be in any way minimized. Rhodesia has shown that in spite of the handicap of transportation, she can still compete successfully with Canadian fibre in the higher grades; she has proved that this handicap affects only the production of the lower and cheaper qualities of asbestos, and it is not improbable that, even where these grades are concerned, the problem of inexpensive transportation may be solved. One must not forget that, although hitherto the United States has been Canada's largest customer for raw asbestos, attempts not unsuccessful, have been made to enter the British and European markets. Here, asbestos from Rhodesia is at a still smaller disadvantage, for the European market is more accessible than the American. It is hardly likely that a large measure of success will attend efforts to sell Rhodesian fibre in the United

[17] Cf. Dr. Mattison's (of Keasbey-Mattison's) letter to the press, which reflected great doubt as to the continuation of Canada's supremacy.

States on a large scale. Canada's proximity will undoubtedly secure for her the majority of orders from the world's largest consumer of asbestos; unless the quality produced in Canada will in the future prove still inferior to that produced in Rhodesia. In the European markets, Rhodesia has already shown conclusively that it can compete successfully with the Canadian. Furthermore, the Union of South Africa will have to be contended with as soon as the problem of securing cheaper transportation is solved. For then, Canada will have to meet competition not only in the scarce higher qualities as at present, but also in other grades as well. In Canada itself, the real effects of the competition have perhaps been concealed by the fact that only the higher grades have been concerned. The percentage of such fibre obtained in Canada is so low[18] and the total quantity produced so small that stocks of this grade are always completely sold. Thus the competition has manifested itself mainly in a lowered price. Its real effects will be felt when stocks of this high-priced fibre are not marketed at all, owing to the presence of sufficient quantities at a price so low as to jeopardize the industry in Canada once more.

Another important factor is the return of Russia

[18]Supra: Chapter IV.

as an asbestos producer. In 1926, 5.58% of the world's asbestos came from that country and aside from a small percentage used for the domestic manufacturing industry, was marketed through Hamburg, in various European countries. Russia's production to date has not assumed very imposing proportions, especially if placed in juxtaposition to the figures for the production of asbestos in Canada. Yet Russia is only beginning to produce asbestos, as it were. During the years immediately preceding the war, Russia was second only to Canada in the production of raw asbestos. The dislocation of the industry during the war and its cessation, obliterated the fact that this country possessed large deposits of asbestos, capable of being profitably worked. Now Russia has resumed operations in this field and her progress, has been rapid. With trade relations firmly established with the other countries of the world, Russia will once more attempt to regain her position in the production of asbestos.

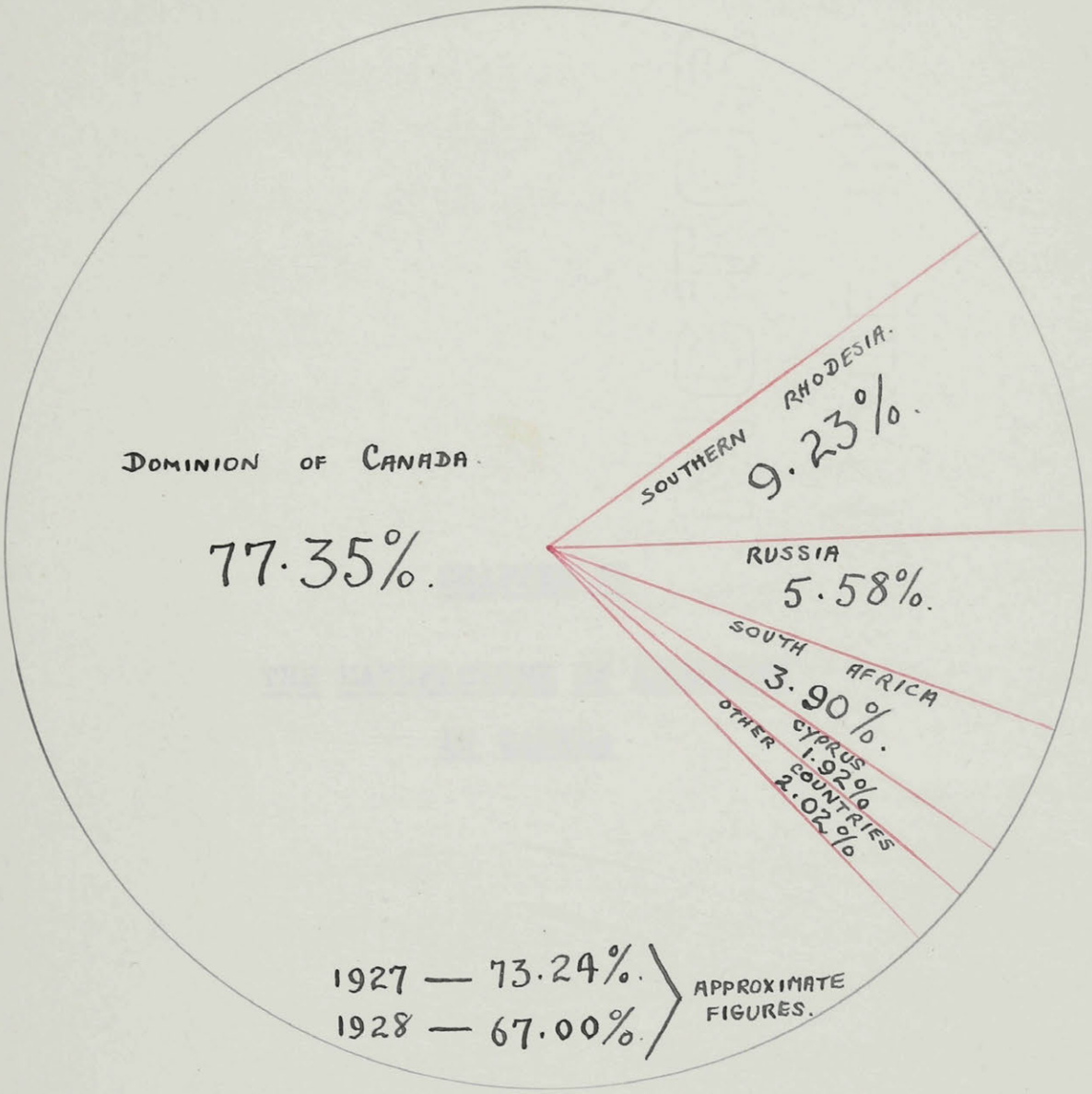
Canada has now for a long time produced more asbestos than any other country in the world. She is doing so now and in the future, will continue to show her supremacy in this field. This is obviously due to the fact that her asbestos quarries lie closest to the world's largest market, the United States. It

is not due to any superiority of quality, and only partly to the fact that, having been first in the field, with a suitable quality of asbestos, methods of production in Canada have now been developed to such an extent that they have placed this country in the leading position in the world in this production. Canada will undoubtedly retain this position but it will be a less predominant one than hitherto. Canada's 77.35% of the world's production of asbestos in 1926 is the result of a steady decline in this percentage for many years. In the early twenties, Canada was producing 86% and over, of the world's asbestos. In 1927, it became 73.24%[19]. Herein lies a dangerous tendency; not the danger of failing to produce the larger part of the world's asbestos in the future, but that of failing to retain what has been so commonly called her "monopoly". Tentative figures for 1928 disclose the fact that Canada's production of asbestos is roughly equal to about two-thirds of the total world's production[20]. If Canada is to maintain her supremacy, this ratio must not decline farther though it is not expected that it will. The past few years, however, has shown a steadily decreasing proportion, which proves that Canada is no longer the sole important factor in the worlds production of asbestos.

[19] Dominion Bureau of Statistics.
[20] Preliminary Report on the Mineral Production of Canada--Dominion Bureau of Statistics, 1929.

WORLD'S PRODUCTION OF ASBESTOS.[a]

1926.



CANADA	249,467	LONG TONS.
S. RHODESIA	29,771	" " .
RUSSIA	18,000	" " .
UNION OF S. AFRICA.	12,586	" " .
CYPRUS	6,197	" " .
OTHER COUNTRIES.	6,502	" " .
Total World Production	322,523	LONG TONS.

FIGURE 3.

"ANNUAL REPORT ON MINERAL PRODUCTION IN CANADA, 1926."
DOMINION BUREAU OF STATISTICS — OTTAWA, CAN.

CHAPTER VI

THE MANUFACTURE OF ASBESTOS IN CANADA

From the foregoing analysis, it is evident that insofar as the asbestos industry in Canada is concerned, its importance is derived from the extent of operations carried on in the quarrying of raw asbestos. A survey of the asbestos-manufacturing industry in Canada will only bear this statement out, for the simple reason that the latter has, in no measure, kept pace with the more basic operation. The undeveloped state of asbestos-manufacturing in Canada only proves more clearly that, in this industry too, there is a complete analogy to the situation in other Canadian ventures. It is only another example of the development of a rich natural resource and the export of its product. The actual manufacturing is carried on to a large extent, in the United States, while Canadians import the larger part of the finished asbestos products that they use. The asbestos-manufacturing industry in the United States has attained great importance. The facility of obtaining the raw material from Canada and the growing demand for asbestos products, soon led to the growth of one of the largest manufacturing enterprises in that country. This industry, from its meagre beginning in 1868, was producing in 1925, products to the value of over $35,000,000. In that year there were forty-nine establishments, engaged in this industry, who employed 6,129 workers, earning $7,692,000. Cost of materials totalled $19,225,000,

while the value obtained for the finished products was $36,274,000. Thus the very considerable importance of this industry to the country in which it exists, is evident. The manufacturing process in 1925 increased the value of the turn-over in asbestos by $17,049,000.[1] Thus the presence of the asbestos industry in the United States, that is, the secondary or manufacturing industry, means the added diffusion of over $17,000,000 purchasing power annually, a significant factor in the progressive development of any country. The capital commitments, too, indicate the highly-important character of the industry, comprising as they do over $150,000,000. Such is the extent of the asbestos industry in the United States; an industry which has, until quite recently, been almost wholly dependent for its existence upon the trade in asbestos with Canada. This dependence is exemplified in the fact that, although in 1919, the value of asbestos manufactures the United States was $23,978,000; in 1921, when asbestos production in Canada fell below normal, it was immediately reflected by the decreased value and quantity of American asbestos manufactures, whose value in that year fell to $13,030,000. General business depression, aggravated by post-war conditions, intensified the situation, but insofar as the asbestos

[1] These figures, which are the most recent, are obtained from the "Statistical Abstract of the United States of America for 1928"; p. 768.

industry was concerned, the falling-off in activity was due, to a considerable extent, to the shortage of raw materials from Canada. The production of raw asbestos in the United States itself, is negligible[2], so that the industry has, hitherto, been dependent upon the supply from Canada. One must add "hitherto" because there have now appeared, or re-appeared, other producers of raw asbestos, in quantities of commercial value, who have not been unsuccessful in marketing their product in the United States. This will in the future, have the effect of lessening the completeness of the dependence on Canada. Yet so long as Canada will continue to ship raw asbestos to the United States under conditions similar to those existing, her product will be preferred; owing to the lower cost of obtaining it. Furthermore, one of the most important factors in this question is the ownership of several Canadian asbestos quarries by American manufacturers. To ensure a satisfactory and continuous supply of raw material, some of the largest manufacturers of asbestos in the United States entered the field of production in Canada. The Johns-Manville Company, of New York, and the Keasbey-Mattison Company, of Ambler, Pa., are two of the most important now owning quarries in Canada. As a matter fact, over 50% of the asbestos production in Canada is due to the operation of American-owned quarries. In this light the situation suddenly

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[2]Supra: Chapter V.

becomes reversed, and the Canadian asbestos industry now seems dependent on the American for its continuation.

An export duty on raw asbestos would not fail to injure the American industry, but as will be seen, would probably harm the Canadian industry even more. The salient fact, however, is that here an industry of such great importance, and with such large ramifications obtains, to such a large extent from Canada, the raw material which it uses. The second largest manufacturing country in regard to asbestos is the United Kingdom, who as well as the United States is largely dependent upon Canada for raw material; although British imports of South African and Rhodesian asbestos have grown considerably since 1913. The European market has always been one of the most important to Canadians, inasmuch as the largest independent producer of asbestos in Canada, the Asbestos Corporation, ships most of its production overseas. It is in this market, too, that Rhodesian fibre is popular, and hence it constitutes, from a Canadian point of view, a dangerous competition. Consideration of the United States asbestos-manufacturing industry must not conceal the fact that it is not an old industry. In pre-war days its dimensions were by no means as large as at present. In the same way as the raw industry has advanced in Canada, the secondary has developed in the United States. In the last fifteen years it has made phenomenal progress, reaching its present position after the most rapid

expansion from the level of an industry producing $2,814,000 of finished products. Thus, in these years its production has increased thirteen-fold, while the number of establishments has grown from 32 to 49.

To turn from the United States to Canada, it immediately becomes obvious that the industry in Canada does not nearly approximate in extent, that in the United States. In 1910 there were nine establishments in Canada manufacturing asbestos products[3]. These employed about 150 wage-earners and represented a capital investment of $867,750. The cost of materials in that year was $191,625 while the gross value of the finished products totaled $468,614. Thus the value added by the manufacturing process was $276,989, which constitutes a very high percentage. In the succeeding five years, great expansion took place though there was no increase in the number firms engaged. In 1915 there were still nine firms but the capital investments had increased to $2,434,116 while the value of the finished products was $1,410,661 of which a value of over $1,000,000 had been added by manufacture. Till 1915 then, the asbestos-manufacturing industry in Canada enjoyed a period of progressive expansion, but the years of the war changed the trend. In this industry which should only have received added impetus from the Great War, the very contrary took place. The occurrence of the

[3] For these figures and those which follow, consult Table [illegible].

Great War greatly disrupted the building construction and automobile industries. Upon these the asbestos-manufacturing industry depends a great deal, inasmuch as these industries absorb the largest part of asbestos manufactures. It was not until 1920 that the asbestos-manufacturing industry for this reason, began to operate normally once more[4]. In 1918 the situation was at a lower level than it had been in 1910. Only eight firms were engaged in the manufacture of asbestos, and although the capital invested in the industry was $1,253,580, the gross value of the finished products was $317,066; over $150,000 less than in 1910, though capital commitments had increased almost 50%. Clearly the industry was already on anything but a sure and profitable basis. In 1919 there were further recessions, marking probably one of the weakest years in the history of this manufacturing industry. Only five asbestos-manufacturing concerns were now in existence, whose total capital was only $878,398 which approximated that of 1910. In this year, too, the salaries paid were still at a high level owing to war conditions and an inflated currency. In spite of high values prevailing generally, however, the value of finished asbestos products in 1919 was $546,870, a sum as low as the pre-war level. Happily the situation brightened

[4]Table H, Appendix VII contains a record of building operations in Canada. This serves as a good estimate of the fluctuations in the asbestos-manufacturing industry, inasmuch as the latter is so dependent on the building industries.

in the very next year and from then onwards, the asbestos-manufacturing industry seemed to be destined for a more fortunate existence, than in the years immediately preceding. Two years later, in 1922, there were eleven firms engaged in the manufacture of asbestos products. Capitalization was double the figure for 1919, while the value of the finished products reached the figure of $615,160. Thus, during this period of great stress and post-war reactions the asbestos industry showed great recuperating power. The only dangerous symptom which it exhibited was the fact that although capitalization had been so greatly increased over that for 1919 (100%), the gross value of the finished products had been barely augmented. Of course, prices in 1922 were showing the usual post-war, downward, tendency. Discounting this fact, there still remained the great growth in capitalization with less than proportionate increase in the magnitude of operations. During the next few years, the position was ameliorated. It is true that capitalization increased as expansion went on, but the magnitude of operations kept pace to such an extent that in 1925, the twelve firms who were engaged in the manufacture of asbestos products, were selling their products for $1,344,097, an increase of over 140% of the figure for 1922. More significant, however, was the fact that in 1925, capitalization stood at $2,624,260 which meant

any increase of only 80% since 1923. Thus the industry now exhibited a firmer tendency which meant greater security in operation, as well as ability to meet competition and overcome industrial problems. Though by no means, one of the largest industries in Canada, it began to show itself one of the most secure, and hence a great asset to the Dominion. In 1926, the manufacture of asbestos products included the following commodities, asbestos paper and millboard, asbestos roofing of all kinds, asbestos rigid shingles, asbestos building materials, asbestos cellular, and sponge-felted pipe insulation; insulating sheets and blocks; asbestos brake linings and clutch facings (woven on special looms) and asbestos packings for steam, oil, and hydraulic operations[5]. It is immediately obvious that in Canada the manufacture of asbestos is confined to the larger and cheaper products. The more highly-specialized type of finished asbestos product is not manufactured in Canada to any great extent, and requires importation from the United States of America. Of the asbestos manufactured in Canada some is exported even to the United States, but this forms only a very small proportion of the figures for the importations from the United States to Canada.

It was inevitable that with the general growth of the asbestos-quarrying industry the opportunity for the local manufacture of several products should have arisen. Two special plants have existed for

[5]Mineral Production of Canada, 1926; Dominion Bureau of Statistics, Ottawa, Canada.

some years, The Asbestos Manufacturing Company, Lachine, Quebec, and the Canadian Brakeshoe Lining Company, East Broughton, Quebec, and a larger more general manufacturing plant is now operated by the Canadian Johns-Manville Company at Asbestos, Quebec. The asbestos-manufacturing industry in Canada has now been carried on for some time and it has always exhibited a remarkable stability and security, if not a large measure of prosperity. But the manufacture of asbestos has always remained in Canada a small industry with small-scale operations, and a restricted group of products. Moreover, although stable and secure, this industry has not shown any remarkable progress. We have seen how over a number of years it has developed little, if at all; while its relation to the sister industry in the United States is certainly that of a pygmy to a giant.

With such splendid resources in raw asbestos available in Canada, the restriced size of the manufacturing industry has often been the cause of much inquiry, and much dissatisfaction. Power in Canada, or rather in the Province of Quebec, is available at reasonable rates; shipping facilities are adequate; and yet the manufacturing industry shows no great progress. Probably the answer to this question is the answer to the general problem of more extensive manufacturing in Canada of all products, and not only of asbestos.

Of course, the presence of such abundant asbestos resources, their export to the United States, and then finally the importation from the United States of certain finished products necessitates the immediate consideration of this question. There seems to be no reason why the asbestos industry in Canada should be confined to a splendid raw industry, and a small-scale, restricted manufacturing industry. Naturally, there are influences operative which are pertinent to this industry alone, in addition to the general influences which affect manufacturing in Canada. First, two important factors must be kept in mind while this problem is considered. The size of the asbestos-manufacturing industry in the United States has already been described, and it must not be forgotten that such a highly developed industry is prepared to cope with competition successfully. The asbestos-manufacturing industry in the United States is highly centralized. It is not an industry composed of small units, scattered throughout the country, and independent of one another. A small number of large-scale manufacturers are engaged in the industry, controlling branches established all over the country. Standardized mass production is the rule, with costs reduced to a minimum. Markets to a large extent are already controlled by these manufacturers, and the entry of new competitors would prove difficult. Moreover, the

size of the market for asbestos products in Canada is not one to admit of the presence of a large-scale industry for this market alone. In addition, the interdependence of both Canada and the United States in the production of raw asbestos in Canada is an important factor. Over 50% of Canada's raw asbestos is produced by American manufacturers for their own use. This alone operates against the possibility of a great increase in the operations of the manufacturing industry in Canada, since the larger part of the raw production not only goes to the United States but must continue to do so. The control of the latter country in this respect is complete.

One of the remedies frequently suggested as an aid to the more extensive manufacture of asbestos in Canada is the imposition of an embargo on the export of raw asbestos from the Dominion. By this means it is hoped, that as a result of confining raw asbestos to Canada, the home manufacture of this material would be fostered. This remedy, however, would more surely operate in Canada's disfavour. In the first place, it has already been seen that Canada is not the sole source of asbestos in the world. It would not be difficult for American manufacturers to find other sources of this raw material if the Canadian source were shut off. The ultimate result would be that Canada's primary industry would injured while the manufacturing industry would not develop very extensively.

The question of entering markets now held by American manufacturers is not one easily solved. America is not only the largest producer of finished asbestos products, but it is also the largest consumer in the world of the same products. Customs duties of 25% and 30% on the importation of finished products prevent the entry of these and only increase the difficulty of marketing such products in the face of a strong home industry. Moreover, in Canada or in any other country, a large-scale manufacturing industry is not born in a day, and if the method of imposing an embargo were employed, it would surely operate to the detriment of Canada's raw industry. Certainly while a manufacturing industry was thus being fostered, the primary industry would languish, for although it is now in a sounder position than formerly, our raw industry is by no means in a position to withstand the force of an embargo on its product. It is true that the Canadian operators in Canada might seek other markets but they are already doing so. With the advent of Rhodesia and Russia, however, difficulty is being experienced in this direction, too, inasmuch as the competition from these sources is keen, and frequently successful. Hence in the suggestion of aids to our manufacturing industry, one must omit that of an embargo; certainly until the time when this industry is capable of absorbing the largest part of the production of Canadian asbestos operators. It would

otherwise only prove a hindrance or a boomerang.

Another important factor in this question is the fact that whatever manufacturing is done in Canada is being done wholly out of asbestos; that is to say, that the manufacturing industry in Canada is not only confined to the products outlined above, but that these products are made wholly out of asbestos. The majority of finished asbestos products in use in the world to-day, are composed not wholly of asbestos but of asbestos and other materials, such as magnesia, etc.[6] Hence the suggestion of extensive development of asbestos-manufacturing in Canada is at first sight altogether impracticable, owing to the fact that the great bulk of asbestos is only a small portion of the raw material used; and the range of such articles is so extensive as to preclude any scheme of this sort[7]. This arises out of the fact that, although asbestos itself is so easily available in Canada, other raw materials which are in use in conjunction with asbestos are not. This only brings to light another difficulty in the way of the way of the development of an industry so well beset with hindrances already. We see now that the very nature of the industry whose development is being considered, precludes the possibility of such development.

Since the United States is the largest consumer

[6] Thus, many important asbestos products consist of 85% magnesia.

[7] Journal of Commerce, May 1, 1924.

of manufactured asbestos products in the world, it constitutes the foremost market. But it is not the only manufacturer of asbestos. The United Kingdom and Germany have for many years been manufacturing asbestos products and some of the finest plants in the world for this purpose have been erected in these countries. In their efforts to enter the American market, however, they have met with failure, for the American tariff on asbestos proves an almost insurmountable barrier. This tariff makes it impossible to compete at a profit with the domestic product[8].

The plants in Canada supply most of the home demand. Beyond that they cannot develop, inasmuch as conditions in other markets do not admit of competition. One must add, too, that were it not for the Canadian tariff on finished asbestos products, the industry in Canada might not have reached its present level. Under cover of this tariff, it has been possible for the industry to develop, but it seems that the highest stage in this development has been reached or is approaching. Its progress, since it supplies the home market to a considerable extent, will depend mainly on the growth of this market which, in turn depends upon the growth in the number of uses for asbestos. Only added uses for such products can increase the scale of operations in the industry. To raise the tariff further, while it would

[8] The United States tariff on manufactured asbestos products is 25% to 30%.

not tend to increase the size of the industry materially, would mean only higher prices to the consumer.

Thus not only the potential embargo, but also higher tariffs would fail in their object. It is apparent that the asbestos-manufacturing industry must rely upon its own resources, inasmuch as government aid will not help. Its development must come with the natural course of events. Generally, however, with an increasing number of new uses for asbestos products, the outlook is not gloomy, for it can be expected that this industry will continue to furnish consumers in Canada with these products. To expect to develop it into one of the modern giant industries with ramifications throughout the country, and branches elsewhere, is now hopeless, since the time has passed when there might have been room for such development. It has been pointed out how useless artificial aids would prove. Within the industry itself, the economic motive which leads to profit and furthers self-interest, will always stimulate asbestos manufacturers to watch the growth of the home market, and continue to retain their control of it. Since no immediate increase in the export market can be expected, only an efficient production and a careful understanding of the Canadian market will induce growth. Canadian manufacturers must make such creeds, their mottos. That is all they can do.

CHAPTER VII

SUMMARY AND REMEDIAL MEASURES

To summarize briefly, one finds that the asbestos industry in Canada is engaged in the production of one of the world's most important commodities but in spite of this fact, is in anything but a prosperous condition. Asbestos is one of the world's greatest safeguards, it finds many uses and has no substitutes. Because of its manifold uses, its utility increases daily as it becomes more widely known. New uses are being found, increasing its importance proportionately. In the fields of commerce, industry and progress, it plays a notable part. One of the most curious substances known, its production in commercial quantities heralded the birth of a modern industry, with wide ramifications throughout the world. The history of this world-wide industry has shown that it has, until recently, been to a large extent dependent upon the Dominion of Canada as a source of raw material, This thesis having been concerned with Canada, has developed largely into a discussion of the world's sources and Canada's relation to these.

The history of the asbestos industry in Canada has shown how during its early history, operations were rapidly extended, until Canadian asbestos became supreme in world markets, displacing the Italian fibre. During these early years, too, high prices were obtainable, owing to the limited capacity of the operators in Canada, resulting in 1892 in overproduction. The reorganization which followed involved new

ownership of certain quarries, as well as improved methods of production in the actual extraction. This was the era which saw the use of milling machinery at the quarries, machinery which soon proved indispensable. During the first decade of the twentieth century, the prices for asbestos remained at a level, unprofitable for the producer, forecasting the troublesome days ahead. In the meantime, Canada was sending her asbestos mainly to the United States while the United Kingdom absorbed the larger part of the remainder. The United States usually received from 65% to 75% of Canada's total output, owing to its proximity to Canada, and to the fact that over 50% of the asbestos produced in Canada is American-owned at the source. About 10% is now usually shipped to the United Kingdom, while the remainder is distributed among European countries, especially Belgium and Germany. The influence of the Great War on the asbestos industry was remarkable. The impetus which the war period gave it staved off the coming insovency of a whole industry. Prices rose; expansion took place; and the industry assumed a more prosperous aspect; but only for a short time. Post-war depression was only aggravated by the unwholesome influences which had been present before the war. There was overproduction in the home industry,

and competition internally and externally. Home producers slashed prices; American owners sold surplus production at ridiculous prices; while other countries were beginning to add to the world's production of asbestos. In addition, the effects of undue expansion and over-capitalization were beginning to be felt. Out of this gloomy period emerged the Asbestos Corporation, comprising all but one of the Canadian operators. With its formation a comparatively prosperous period began for the industry. There was more unified control of production and markets, as well as a greater capacity to cope with the industry's problems.

Thus the history of the raw industry in Canada proved that with the discovery of the mineral, and the consequence knowledge of its great importance, there set in periods of undue expansion. The over-capitalization that took place brought the industry to an unstable position; a position which has involved the unprofitable operation of asbestos-quarrying as a whole. Returns from operation have been insufficient to cover fair dividends on the capitalization at its present level. The tendency to overcome this handicap was manifested in the capitalization of the Asbestos Corporation, Limited, in 1925 when a drastic reduction of 50% in capital commitments

was made. This shows that the evils of the industry are not unknown to those engaged in it, and that measures have been and will be taken to overcome the handicaps that hinder this important Canadian enterprise. In the meantime, for the immediate future, one cannot expect too optimistic reports from asbestos producers until this evil has completely eliminated, or the world demand for asbestos has increased to such an extent as to yield fair returns on the capital invested in the production of raw asbestos.

The inquiry into the actual technique of producing asbestos has proved conclusively that it is indeed a difficult task to make the quarrying of raw asbestos a very profitable operation. This became obvious when one considered the extent and cost of the machinery necessary for the operations involved, and then ascertained the low net value per ton to the operator of the rock handled. In spite of this, however, it has been conclusively demonstrated that the industry itself is being conducted in an economical and efficient manner, and that it is not in the actual productive processes that problems exist. In fact, it was this ability to excel in methods of production that first gave Canadian asbestos producers their early supremacy in world markets, a supremacy which was instrumental in maintaining Canada's so-called

"monopoly" of asbestos.

The occurrence of asbestos is wide-spread. For this reason it is hardly possible to term Canada's production of asbestos a monopoly. Many countries throughout the world, are contributing to the world's annual supply of asbestos while several are now proving themselves worthy competitors of Canada in the supply of world'markets. Rhodesia and the Union of South Africa have already proved that they can successfully compete with Canada in the marketing of this product. Moreover, Rhodesian asbestos is usually sold in the European market which means that it competes mainly with the production of the Asbestos Corporation which consists almost wholly of asbestos produced by the use of Canadian capital. In addition, Russia has reappeared as a producer of asbestos. The second largest source before the war, Russia is rapidly regaining her position, and once more, threatens European markets. The production of asbestos in these countries, and its export from them, is increasing appreciably every year while that of Canada is maintaining a smaller rate of increase. Thus it is that the growing production of foreign countries throughout the world, as opposed to the smaller growth in that of Canada forbids the application of the term"monopoly" to the asbestos output in Canada. Canada does not control the world's supply of asbestos and hence has no monopoly. The imposition of a tax on the export

from Canada would, in its effects, soon prove that no monopoly exists. The levy of such a tax would result in an immediate decrease in the asbestos exports from Canada inasmuch as the markets of the world would be supplied from other sources, such as Rhodesia and Russia, especially the former.

The problem of increasing the extent of operations in the asbestos-manufacturing industry in Canada proves barren of real solution. To attempt to confine the production of the raw material to manufacture in Canada is obviously impossible because of the fact that more than half of the asbestos is extracted from American-owned quarries. Thus the interdependence of Canada and the United States is strengthened, while the flow of asbestos to the latter country cannot be interrupted. The size and importance of the secondary industry in the United States demonstrated clearly the value of such an industry to the country in which it exists, while the smaller extent of the same industry in Canada, where the raw material is produced, leads to inquiry. One would like to know why asbestos-manufacturing is not pursued on a larger scale. The reasons for such restricted growth lie in the very nature of asbestos-manufactures which do not consist wholly of asbestos. Hence the problem becomes one not only of the manufacture of asbestos but of other products as well. Furthermore, the industry in the

United States is now so well entrenched, and exercises so great a control over the markets in that country that it would prove impossible for Canadian manufacturers to enter such a stronghold. An embargo or tax on the export of raw asbestos would only react against the primary industry, inasmuch as the producers of Canadian asbestos would obtain supplies from other sources, while the manufacture of this material in Canada would not increase appreciably, if at all. The industry in Canada supplies the home market and will continue to do so. A little export trade is carried on with Newfoundland which, for this purpose, may be considered a part of the Canadian market. It can confidently be expected that home manufacturers will continue to supply, to a large extent, the home markets; although the importation of certain asbestos products must go on. Artificial aids to such manufacture would prove futile; consequently the growth of the Canadian asbestos-manufacturing industry depends almost wholly upon efficient production, and careful study of the home market as it expands.

General suggestions and remedial measures which may improve the situation in the asbestos industries in Canada include the following:

I. Decapitalization in the finances of operators engaged in the quarrying of raw asbestos;

II. A union of the all-Canadian interests in the primary asbestos industry; namely, the Asbestos Corporation and the Johnson Company;

III. More complete control of the United States market for asbestos fibre, this being the world's largest market and the most suitable for the absorption of Canadian asbestos;

IV. Expension of the Canadian market for asbestos manufactures by home manufacturers;

V. A general policy of "laissez-faire" in the home manufacturing industry.

APPENDIX I

TABLE A

PRODUCTION AND PRICES

OF

ASBESTOS IN CANADA

PRODUCTION AND PRICES OF ASBESTOS IN CANADA[1]

YEAR	TONS[2]	VALUE	PRICES[3]
1878	50	$ 3,250	$ 65.00
1880	380	24,700	65.00
1885	2,440	142,441	58.38
1890	9,860	1,260,240	127.81
1891	9,279	999,878	107.76
1892	6,082	390,462	64.20
1893	6,331	310,156	86.81
1894	7,630	420,825	55.15
1895	8,756	368,175	42.05
1896	10,892	423,066	38.84
1897	13,202	399,528	29.99
1898	16,124	475,131	29.47
1899	17,790	468,635	26.34
1900	21,621	729,886	33.76
1901	32,892	1,248,645	37.96
1902	30,219	1,126,688	37.28
1903	31,129	915,888	29.42
1904	35,068	1,154,566	34.08
1905	50,670	1,486,359	29.33
1906	59,283	1,970,878	33.52
1907	62,018	2,482,984	39.99
1908	66,548	2,555,361	38.40
1909	63,349	2,284,587	36.07
1910	77,508	2,555,974	32.98
1911	101,393	2,922,062	28.82
1912	111,561	3,117,572	27.94
1913	136,951	3,830,909	27.97
1914	96,542	2,892,266	29,96
1915	111,142	3,553,166	31.97
1916	133,439	5,199,797	38.97
1917	135,502	7,183,099	53.01
1918	141,462	8,936,804	63.17
1919	136,199	10,658,946	78.26
1920	167,731	13,677,841	81.54
1921	92,761	4,906,230	52.89
1922	163,706	5,552,723	33.92
1923	231,482	7,522,506	32.50
1924	225,744	6,710,830	29.73
1925	290,389	8,988,360	30.95
1926	279,403	10,099,423	36.15
1927	274,778	10,621,013	38.65
1928	273,947	11,238,360	41.16

[1] F. Cirkel: op. cit.; p. 161.
Canadian Statistical Records and Canada Year Books.
[2] Including asbestic after 1920.
[3] These are average prices only.

APPENDIX II

TABLE B

EXPORTS OF ASBESTOS FROM CANADA

EXPORTS OF ASBESTOS FROM CANADA[1]

Fiscal Year	TONNAGE				$ VALUE $			
	United Kingdom	United States	Others	Total	United Kingdom	United States	Others	Total
1888	326	2,987	115	3,428	17,829	203,231	7,295	
1890	686	5,781	96	6,563	36,459	403,800	3,900	
1895	2,202	5,993	398	8,593	118,852	343,277	30,946	
1900	1,732	13,477	2,955	18,164	70,749	322,984	97,173	
1901	3,324	18,117	5,274	26,715	136,294	447,086	281,193	
1902	4,088	25,053	3,931	33,072	201,474	743,763	185,965	
1903	2,813	24,867	2,981	30,661	98,167	757,724	99,514	
1904	4,375	24,980	5,281	34,636	116,866	709,381	158,589	
1905	7,132	26,784	7,211	41,127	243,249	768,130	300,145	
1906	8,614	38,896	9,565	57,075	262,774	1,036,648	278,715	
1907	9,129	26,821	5,058	41,008	292,620	759,907	154,249	
1908	5,349	46,846	6,840	59,033	237,152	1,322,890	170,533	
1909	5,626	48,915	5,166	59,707	233,653	1,294,568	229,427	
1910	5,550	51,710	6,778	64,038	283,367	1,300,457	302,789	
1911	6,843	56,036	6,950	69,829	208,499	1,548,456	319,522	
1912	7,314	63,353	5,649	76,316	168,424	1,772,474	156,916	
1913	8,802	72,570	10,448	91,820	211,450	1,965,246	310,073	
1914	7,937	78,650	19,384	105,971	255,067	2,087,750	548,852	
1915	14,726	51,447	8,731	74,904	513,877	1,437,653	275,857	
1916	18,461	63,538	6,834	88,833	642,865	2,007,994	311,151	
1917	15,378	70,608	10,008	95,994	682,601	3,002,861	456,506	
1918	9,830	78,203	10,626	98,659	636,220	3,966,649	728,724	
1919	10,594	104,041	10,726	125,361	899,559	6,890,724	1,119,927	
1920	7,594	84,224	13,876	105,694	768,456	6,506,629	1,256,942	
1921	12,467	113,985	27,700	154,152	1,337,357	8,036,276	2,882,160	
1922	2,288	47,178	13,821	63,287	311,357	2,397,609	1,688,366	
1923	2,827	82,652	19,857	105,336	261,725	4,578,470	1,646,145	
1924	3,761	112,355	25,072	141,188	260,791	5,546,769	1,833,363	
1925	7,403	70,566	30,276	108,245	453,790	3,852,209	2,107,406	
1926	6,266	96,759	36,098	139,123	551,254	5,165,997	5,717,251	
1927	8,751	88,638	41,343	138,732	650,069	5,184,119	2,857,849	

[1]Reports of the Department of Trade and Commerce, Ottawa, Canada.

APPENDIX III

TABLE C. CANADIAN PRODUCTION STATISTICS

APPENDIX IV

TABLE D. AVERAGE PRICES OF ASBESTOS PER TON.

TABLE C. CANADIAN PRODUCTION STATISTICS[1]

YEAR	FIBRE SHIPPED (TONS)	TOTAL VALUE (DOLLARS)	AVERAGE VALUE PER TON	ROCK MINED (TONS)	ASBESTOS PER TON ROCK(lbs.)	AVERAGE VALUE PER TON ROCK	%FIBRE PER TON ROCK MINED
1911	102,224	3,026,306	29.60	1,583,076	107.8	1.59	5.39
1912	111,175	3,059,084	27.52	1,870,608	108.6	1.49	5.43
1913	136,609	3,830,504	28.04	2,527,410	105.4	1.48	5.27
1914	107,401	2,895,935	26.96	2,127,395	111.4	1.50	5.57
1915	113,115	3,544,362	31.33	2.134,073	96.9	1.51	4.85
1916	233,339	5,182,905	38.87	2,291,087	102.6	1.99	5.13
1917	137,242	7,198,558	52.45	2,634,410	108.7	2.84	5.43
1918	142,375	9,019,899	63.35	2,445,745	117.3	3.72	5.87
1919	135,862	10,932,289	80.47	3,961,690	100.8	4.02	5.04
1920	179,891	14,749,048	81.89	3,123,370	109.1	4.47	5.45
1921	87,475	5,199,789	59.44	2,224,138	107.2	3.18	5.36
1922	160,339	6,053,068	37.75	2,920,280	102.0	1.92	5.10
1923	216,804	7,364,260	33.97	3,747,576	117.0	2.08	5.82
1924	208,762	6,561,659	31.37	3,324,727	124.0	1.94	6.20
1925	273,322	8,976,645	32.82	4,121,258	132.6	2.17	6.63
1926	278,689	10,095,487	36.22	4,479,138	120.4	2.25	6.02
1927	274,772	10,621,013	38.65	4,834,761	113.7	2.13	5.69

[1] J.G.Ross: Asbestos Mining and Milling; Page 33.
Annual Reports on Mining Operations in the Province of Quebec: Department of Mines: Quebec, Que.

TABLE D. AVERAGE PRICES OF ASBESTOS PER TON[1]

YEAR	CRUDE NO. 1	CRUDE NO.2	FIBRE NO.1	FIBRE NO.2	FIBRE NO.3
1910	$ 259.57	$121.57	$ 60.88	$ 25.48	$ 10.46
1911	177.30	113.68	65.54	20.33	13.57
1912	263.16	100.76	64.42	31.17	13.21
1913	175.00	134.00	59.00	27.75	13.75
1914	301.96	131.85	60.40	24.93	11.18
1915	274.36	122.44	64.32	26.84	12.57
1916	422.76	219.66	77.57	28.46	14.84
1917	778.38	381.46	99.90	36.77	17.75
1918	937.92	424,74	163.87	57.17	26.36
1919	1256.74	618.77	222.15	53.02	19.40
1920	1475.07	811.41	279.63	110.35	35.49
1921	1281.32	446.91	263.09	101.75	31.19
1922	548.68	265.32	207.71	81.00	21.65
1923	472.60	225.90	123.37	57.05	22.01
1924	365.97	215.27	110.81	45.12	19.84
1925	364.96	206.22	106.43	50.78	20.38
1926	371.51	229.62	124.22	58.63	21.41
1927	423.65	249.59	129.32	64.81	21.34
1928	534.87	296.76	148.70	73.80	38.75

[1] Annual Reports on Mining Operations in the Province of Quebec: Department of Mines; Quebec, Que.

APPENDIX V

TABLE E.

PERCENTAGE VALUE OF SALES OF ASBESTOS TO TOTAL SALES

TABLE E.

PERCENTAGE VALUE OF SALES OF ASBESTOS TO TOTAL SALES [I]

YEAR	TOTAL CRUDE & MILL STOCKS	NO.1 AND NO.2 CRUDES COMBINED	CRUDES AND SPINNING, COMBINED	TOTAL MILL STOCKS	SHORT FIBRES ONLY COMBINED
1911	100%	25.4%	39.2%	74.6%	60.8%
1912	100	29.0	37.0	71.0	63.0
1913	100	25.4	47.0	74.6	53.0
1914	100	26.8	48.8	73.2	51.2
1915	100	30.2	59.9	59.8	47.1
1916	100	37.4	55.5	62.6	44.5
1917	100	38.2	56.6	61.8	43.4
1918	100	27.8	52.3	72.2	47.7
1919	100	29.6	57.5	70.4	42.5
1920	100	25.8	52.4	74.2	47.6
1921	100	11.0	38.2	89.0	61.8
1922	100	13.5	36.4	86.5	63.6
1923	100	12.9	32.5	87.0	68.0
1924	100	16.4	32.9	83.6	52.3
1925	100	12.9	32.5	87.1	55.0
1926	100	11.9	31.5	88.1	60.2

[I] Annual Reports on Mining Operations in the Province of Quebec: J.G. Ross: Asbeston Mining and Milling; P.34.

APPENDIX VI

TABLE F. PRINCIPAL STATISTICS OF THE ASBESTOS-QUARRYING INDUSTRY

TABLE G. PRINCIPAL STATISTICS OF THE ASBESTOS-MANUFACTURING INDUSTRY

APPENDIX VII

TABLE H.
BUILDING CONTRACTS IN CANADA

TABLE F.

PRINCIPAL STATISTICS OF THE ASBESTOS-QUARRYING INDUSTRY[1]

YEAR	ACTIVE OPERATORS	NUMBER OF QUARRIES	CAPITAL EMPLOYED	NUMBER OF EMPLOYEES	SALARIES AND WAGES	COST OF FUEL AND ELECTRICITY	NET VALUE OF ORES SHIPPED
1923	14	16	42,715,557	3,165	$3,607,178	$ 920,826	$ 7,522,506
1924	15	15	43,216,966	2,597	2,977,304	760,046	6,710,830
1925	14	19	38,133,046	2,582	2,997,107	923,239	8,988,360
1926	8	16	34,905,096	2,797	3,544,097		10,109,680
1927	7	15	35,316,821	2,976	3,761,192	1,046,541	10,621,013

[1]Canada Year Books.
Labour Gazette, November, 1928, Vol. 28; p. 1309.

TABLE G.

PRINCIPAL STATISTICS OF THE ASBESTOS-MANUFACTURING INDUSTRY [1]

YEAR	NO. OF FIRMS	CAPITAL EMPLOYED	TOTAL EMPLOYEES	SALARIES AND WAGES	COST OF MATERIALS	NET VALUE OF PRODUCTS	GROSS VALUE OF PRODUCTS
1910	9	$ 867,750		$	$191,625	$	$ 468,614
1915	9	2,434,116			379,544		1,410,661
1917	8	1,180,636	142	122,143	130,473		402,277
1918	8	1,253,580	121	100,621	106,708		317,066
1919	5	878,398	114	158,896	214,725		546,870
1921	11	1,351,278	132	273,522	385,810	418,823	804,633
1922	11	1,610,697	156	189,059	271,749	343,411	615,160
1923	9	1,486,589	145	176,986	260,281	322,732	583,013
1925	12	2,624,260	256	282,382	783,063	561,034	1,344,097

[1]Canada Year Books, 1913 -- 1927.

APPENDIX VII

TABLE H

BUILDING CONTRACTS IN CANADA[1]

1913	$384,157,000		
1914	$241,952,000	1922	$331,843,800
1915	83,916,000	1923	314,254,300
1916	99,311,000	1924	276,261,100
1917	84,841,000	1925	297,973,000
1918	99,842,000	1926	324,250,000
1919	190,028,000		
1920	255,605,000		
1921	240,133,300		

[1]MacLean's Building Reports.

APPENDIX VIII

TABLE J.

IMPORTS OF ASBESTOS MANUFACTURES.

TABLE J.

IMPORTS OF ASBESTOS MANUFACTURES INTO CANADA[1]

YEAR	UNITED KINGDOM	UNITED STATES	TOTAL IMPORTS
1910			$ ~~222,047~~ 198,756
1911			254,331
1912			349,655
1913			498,215
1914	$ 49,805	$415,338	474,499
1915	33,501	188,178	226,515
1916	40,921	150,931	191,886
1917	77,910	316,253	394,540
1918	64,233	463,230	528,054
1919	49,522	600,108	649,694
1920	75,566	658,570	734,302
1921	162,065	814,824	977,160
1922	61,992	426,961	491,478
1923	75,431	396,672	472,601
1924	52,721	652,795	706,308
1925	36,281	314,010	353,143
1926	56,029	305,945	376,842
1927	73,380	438,181	526,047

[1]Annual Reports of the Department of Trade and Commerce, Ottawa, Canada.

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