1939.
NEW ZEALAND.

STATE IRON AND STEEL DEPARTMENT

(FIRST ANNUAL REPORT OF THE).

Presented to both Houses of the General Assembly by Command of His Excellency.

Wellington, 23rd August, 1939.

YOUR EXCELLENCY,—

I have the honour to submit for your Excellency's information the report of the State Iron and Steel Department for the year ended 31st March, 1939.

I have, &c.,

D. G. SULLIVAN,
Minister in Charge of the State Iron and Steel Department.

His Excellency the Governor-General of the Dominion of New Zealand.

The Hon. D. G. Sullivan, Minister in Charge of the State Iron and Steel Department.

SIR,— Wellington, 18th August, 1939.

I have the honour to submit the first annual report of the State Iron and Steel Department. For the sake of continuity this report covers a period prior to the actual formation of the Department in June of last year, and also in certain instances refers to developments since the 31st March, 1939.

I have, &c.,

G. A. PASCOE,
Commissioner.

REPORT.

IRON AND STEEL INDUSTRY ACT, 1937.

The Iron and Steel Industry Act, 1937, was passed in March, 1938, during the second portion of the 1937 parliamentary session. It provides authority for the establishment, as a State undertaking, of an industry for the production of iron and steel and iron and steel products, and for this purpose the Minister of Finance is empowered to borrow up to £5,000,000. By the Act the right to mine for iron-ore (including ironsand) in New Zealand is restricted to the Commissioners, for whose appointment provision is made.

DEPARTMENT ESTABLISHED.

For the purpose of carrying out the administration of the Iron and Steel Industry Act a new Department, known as the State Iron and Steel Department (Iron and Steel Commission), was established on the 1st June last year. As disclosed in the Department's estimates for this year, the present staff of the Department is small in number. The basis of the organization, however, will permit of its ready expansion as required to meet the needs of the construction programme, which has now been determined upon. During the period of preliminary investigation, which covers the whole of the year under review, the staff of the Department was recruited mainly by obtaining the necessary officers on loan from other Departments.

Preliminary.

Shortly after the passing of the Act Mr. G. A. Pascoe, who was appointed as Acting-Commissioner (following the principle that was adopted in the establishment of the Department), was instructed to proceed to London for the purpose of completing negotiations that had been commenced with the firm of H. A. Brassert and Co., Ltd. This firm had previously examined the question of establishing the steel industry in New Zealand, and in 1937 had made a report to the Government. The Government, through the High Commissioner, also notified the British Iron and Steel Federation of its intention to establish the industry. The Federation was advised that the New Zealand Government desired to co-operate with the United Kingdom industry, and requested the latter's co-operation. Mr. Pascoe had many discussions with members of the Federation, which body expressed its appreciation of the New Zealand Government's action in advising it of the proposals. As a result of those discussions the British steel industry, through the Federation, gave an undertaking of continuing co-operation with the New Zealand Government in the latter's project.

Testing of Ore-bodies.

During the year under review the activities of the Department have been confined mainly to the necessary preliminary work of proving the quantity and quality of the raw materials available, particular concentration having been given to the ore-bodies in the Golden Bay area. Up to the time of the passing of the Iron and Steel Industry Act it appears very little confirmatory work in regard to the availability of raw materials had been undertaken, although rights over the ore-bodies had been privately held for more than a quarter of a century. The practice in the past had been apparently to accept at their face value such estimates of quantity as had been made mainly from surface indications. The work carried out by the Department during the year under review strongly exemplifies the weakness of this method of procedure. The quantities of ore reserves claimed by the previous leaseholders have been found in some cases to be more than 75 per cent. overstated. Because there had been no serious attempt to carry out underground investigations into the extent of the ore-bodies much of the orefield was still almost inaccessible, due to heavy bush. No contour surveys had been carried out on a workable scale, and access tracks had to be constructed. During the year the complete area carrying the ore-bodies has been opened up. It has been surveyed, and an average of eighty men have been provided with constant employment during the period under review. Some idea of the extent of the work undertaken may be gathered from the following: Contour tracks and other access roads totalling 15½ miles have been constructed; 10,000 ft. of underground tunnels have been driven; 4,000 ft. of drilling has been carried out. More than a thousand samples have been analysed by the Dominion Laboratory. The orefield has been divided into six blocks, and the amount and quality of the ore in the various blocks now reliably estimated is as follows:—

Estimate of Iron-ore Reserves.

Area.	Average Iron Content.	Assured Ore.	Probable Ore.
	Per Cent.	Tons.	Tons.
Rinonui	48·0	6,079,000	1,500,000
Rinopai	42·5	1,000,000	..
Onekaka North	34·0	1,100,000	100,000
Onekaka Centre	34·5	590,000	Not sufficient data available.
Onekaka South	33·6	3,300,000	
Tukurua	37·0	1,000,000	
Iron-ore	42·0	13,069,000	1,600,000

The work to date, having established that ore-reserves used in conjunction with that proportion of ironsand stated by our consultants to be within practical limits, ensures a supply of raw material sufficient to meet our projected demand for a period of approximately seventy years. Further development work, but mainly by the method of drilling, will still be carried out to complete the survey of the field. The cost of exploratory work is only a fraction of 1d. per ton of ore proved, a result which reflects credit on those responsible.

Taranaki Ironsands.

With like thoroughness to the investigation that has been carried out in connection with the ore-bodies in Golden Bay, a survey of the available ironsands in the vicinity of Patea has been carried out during the year. Systematic drilling and testing has been undertaken, and it has been definitely established that ironsand in the proportion required for the steel-manufacture at Onekaka is available on the Patea Beach sufficient to meet the requirements of the blast furnace for very many years.

Visit of H. A. Brassert's Experts.

About the end of the first quarter of the present year a visit to the Dominion of representatives of H. A. Brassert and Co., Ltd., was arranged. The delegation comprised one of Brassert's directors, Dr. T. P. Colclough, who has special knowledge of every phase of steelmaking, and also on the

qualities of coal for the manufacture of metallurgical coke, and Mr. H. K. Scott, M.I.M.M. (London), a mining engineer of high standing. After spending some three months in the country they reported to the Government. During their stay in New Zealand they paid special attention to the reserves of raw materials, and the figures set out as representing the available ore now proved are the same as appears in their report.

Coking-coal Resources.

The visiting consultants in the review of the coal-supplies were assisted considerably by advice and information available to them from the Coal Survey Committee, which was established last year for the purpose of surveying the coal resources of the Dominion. The Committee's work at the present time is only partially completed, but such information that it was able to give proved of great assistance to the visitors. The reserves of coking coal appearing in the report of Brassert's are as follows:—

Reserves of Coking Coal.

	Coal in Ground.	Recoverable Coal.
	Tons.	Tons.
Greymouth		
Strongman Mine	8,626,000	4,313,000
Liverpool Mine	5,228,000	3,114,000
Paparoa Mine	4,526,000	2,569,000
Dobson Mine	17,472,000	9,200,000
Wallsend Mine	6,000,000	3,715,000
Other areas	4,600,000	2,300,000
	46,452,000	25,211,000
Westport—		
Denniston	12,000,000	7,000,000
Millerton and Stockton	Not suitable coal.	
	58,452,000	32,211,000

Limestone.

Limestone is required as a flux in the furnaces, and considerable deposits occur in the Golden Bay District. The limestone varies considerably in chemical composition, and further work is being undertaken at the present time to test out the qualities of various deposits adjacent to the orefields with a view to determining the most economical source of supply.

Dolomite.

Dolomite also is found in large quantities at Mount Burnett, and preliminary investigation work into the most economical sources of supply is also receiving careful attention.

Harbour Facilities.

The establishment of an iron and steel works in the Onekaka District will result in a considerable amount of sea-borne traffic. A preliminary estimate indicates that, once the works are established, Onekaka as a seaport will become probably the fourth and not less than the fifth in importance in the Dominion from the viewpoint of tonnage. Investigations are being carried out at the present time with a view to providing berthage facilities for overseas vessels.

Effect of the Establishment of Steel-manufacture on Employment.

The establishment of an iron and steel industry in New Zealand to manufacture the proposed quantities of steel products will have a very beneficial effect on the employment position. The direct employment in the steelworks will be about fifteen hundred, whilst the indirect employment associated with the manufacture of iron and steel will be quite substantial. The necessary labour for the provision of accommodation to house the workers, to build the wharf, and to provide the social amenities will also provide employment for a considerable number. It is anticipated that during a portion of the period whilst construction is in progress not less than two thousand male workers will be engaged.

Acknowledgments.

In conclusion, we would like to take this opportunity of placing on record our appreciation of and indebtedness to the staff of the Dominion Laboratory, the Geological Survey Branch, the Mines Department, and also to the Patea Harbour Board for its ready co-operation in the work carried out in that district.

APPENDICES.

APPENDIX A.

PRELIMINARY EXPENDITURE ACCOUNT FOR THE PERIOD ENDED 31ST MARCH, 1939.

Expenditure.	£	s.	d.	*Income.*	£	s.	d.
Salaries	1,590	9	8	Miscellaneous receipts	28	17	11
Books, maps, &c.	38	10	4	Balance	26,841	13	1
Fuel, light, power	19	17	2				
Motor-car running-expenses	6	9	10				
Office cleaning	42	4	1				
Office fittings	13	18	2				
Postages, telegrams, &c.	136	14	10				
Printing and stationery	52	12	8				
Rent	186	8	4				
Survey and other preliminary work—	£	s.	d.				
(*a*) Onekaka	23,746	6	11				
(*b*) Taranaki	131	9	9				
	23,877	16	8				
Telephone services, &c.	39	11	10				
Travelling-allowances and expenses	195	1	8				
Depreciation	669	0	7				
Miscellaneous	1	15	2				
	£26,870	11	0		£26,870	11	0
	£	s.	d.				
Balance	26,841	13	1				

BALANCE-SHEET AS AT 31ST MARCH, 1939.

Liabilities.	£	s.	d.	*Assets.*	£	s.	d.
Capital Account	65,500	0	0	Hutments, plant, and equipment, Onekaka	2,791	19	8
Creditors—				Equipment, Taranaki	58	19	3
Departmental (928 7 8)				Motor-vehicles and tractors	953	14	10
Sundry (1,419 8 4)				Office furniture and equipment	582	11	7
	2,347	16	0	Typewriters	38	13	4
				Library	32	14	7
				Stamps	6	9	6
				Stores, tools, &c.,	461	4	11
				Preliminary Expenditure Account	26,841	13	1
				Debtors—	£ s. d.		
				Departmental	3 4 4		
				Sundry	48 8 0		
					51	12	4
				Cash in bank	35,652	1	10
				Payments in transit	376	1	1
	£67,847	16	0		£67,847	16	0

G. A. PASCOE, Commissioner.
J. L. JENKINS, Accounts Clerk.

(Subject to audit.)

APPENDIX B.

H. A. Brassert & Co., Limited,
Granite House, Cannon Street, London, E.C. 4, 14th June, 1939.

The Hon. D. G. Sullivan,
Minister of Industries & Commerce,
Wellington.

DEAR SIR,—

In accordance with your request, we have pleasure in submitting herewith our Report on the establishment of an Iron and Steel Industry in New Zealand.

This Report embodies the results of our investigation into the reserves of coking coal and iron ore, our recommendation for the location of the proposed Iron and Steel Works, a summary of the estimated manufacturing costs and the earning power of these Works operating on the agreed programme of production, together with a brief reference to the effect of the establishment of the industry on the problems of employment, sterling reserves and national defence.

We have every confidence in reporting to you that there are in New Zealand, the materials required for the proposed manufacturing programme for the desired period of seventy years, and that under present conditions, this production of steel can be established on a sound economic basis.

Respectfully submitted,

Yours faithfully,

T. P. COLCLOUGH, Director,
H. A. Brassert & Co., Limited

H. A. Brassert & Co., Limited,
Granite House, Cannon Street, London, E.C. 4, England, 8th June, 1939.

REPORT ON THE ESTABLISHMENT OF AN IRON AND STEEL INDUSTRY IN NEW ZEALAND.

IN accordance with the instructions received from the High Commissioner in London, 31st December, 1938, an investigation has been made of the quality and reserves of raw materials available in New Zealand for the production of iron and steel, the location for the establishment of the iron and steel works, and the economics of steel manufacture on a scale commensurate with the internal steel demand of New Zealand.

Previous discussions have established that the steel demand of the country covers such a wide range of sizes, shapes and types of product, that any attempt to establish a steel works to supply this entire demand would be definitely uneconomic owing to the small tonnage required for many of the individual types or size of product. This situation is found in all steel-consuming countries and the problem presented is to determine how far the steel imports can be classified into groups suitable for economic production in the same rolling mill equipment. The first installations should be designed to supply those sizes and types of product which are consumed in sufficient tonnages to enable the manufacturing operations to be carried out on an economic basis, and the demand for small tonnages of certain types or sizes should be met, as in the past, by importation. Once the steel industry has been established, the works should be enlarged and extended in scope as soon as the demand for any particular product is sufficient to justify the installation of the necessary equipment.

Examination of the Import Statistics shows that the New Zealand steel demand gives an excellent basis for the establishment of such an industry, and the following manufacturing programme has been agreed as the basis for the first stages of production.

Manufacturing Programme.

Coke	120,000 tons per year.
Pig Iron	120,000 ,,
Steel Ingots	130,000 ,,
Steel Products :—	
Rails	11,000 ,,
Blooms and Billets	2,000 ,,
Sections	21,500 ,,
Merchant Bar	28,500 ,,
Sheets	26,000 ,,
Wire Product	15,000 ,,

Raw Materials.

In establishing an iron and steel works, the first step must be to secure a supply of the necessary raw materials in sufficient quantity to maintain the works in regular production and to ensure an adequate length of life to the plant installed. While various parts of the plant are repaired or replaced from time to time in the normal operations, it will be clear that, with modern developments, the main factor in determining the economic life of a steel plant must be that of obsolescence and it is generally accepted that provision should be made for a forty year life of the general installation.

The first object of the present investigation has been to determine whether there are available sufficient quantities of these necessary raw materials to guarantee this life of forty years, and to what further number of years this period will be extended by the reserves in sight.

The main raw materials required for the manufacture of iron and steel are coal of suitable coking quality, iron ore, limestone and dolomite. The results of the investigations made to determine the extent and quality of the reserves of these materials, are summarized herein and given in detail in the Appendices which accompany this report.

Coal.

The amount of coking coal required for the manufacture of the proposed 120,000 tons of coke per year, will be about 180,000 tons per year, or for a life of forty years, *7,200,000 tons*.

The examination of the coalfields in the Greymouth and Westport districts, shows that there are large deposits of coal in these areas which have good coking properties, and while in some cases the sulphur content is too high to permit the use of this coal for making metallurgical coke, yet the large proportion of the reserves are of excellent quality as regards both coking properties and sulphur content.

To obtain the most economical operation, the coals should be drawn from more than one mine and blended so that full advantage can be taken of the particular properties of the different types of coal, in order to give the most suitable quality of coke, to utilise a proportion of the higher sulphur coals, to minimise the excessive swelling properties in some of the coal, and also to facilitate the rapid assembly at the ports and dispatch of the coal required.

The present estimated reserves of the coals suitable for the manufacture of metallurgical coke are shown in the following table :—

New Zealand Iron and Steel Works.—Summary of Estimated Coal Reserves.

District.	Mine.	Coal in Ground.	Recoverable Coal.
		Tons	Tons.
Greymouth	Strongman	8,626,000	4,313,000
	Liverpool	5,228,000	3,114,000
	Paparoa	4,526,000	2,569,000
	Dobson	17,472,000	9,200,000
	Wallsend	6,000,000	3,715,000
	Other areas	4,600,000	2,300,000
Total Greymouth	..	46,452,000	25,211,000
Westport	Denniston	12,000,000	7,000,000
	Millerton and Stockton ..	not suitable coal.	

Total Recoverable Coal suitable for Metallurgical Coke, 32,200,000 tons.
Coking Coal required—
Per year .. .. 180,000 tons.
For 70 years .. .. 12,600,000 tons.
or 40% of Recoverable Coal in areas covered by the Estimates.

These estimates show that there are adequate reserves of coal of good coking quality and suitable sulphur content to give security to the establishment of the Iron and Steel Industry and to meet the normal requirements of other industries demanding this type of coal.

It is our opinion that this estimate is conservative and that further reserves will be found as exploratory work continues, but even on this basis, there are reserves of recoverable coal of the desired quality equivalent to over one hundred and seventy years of the steel works demand. There is no doubt that there are ample reserves of coal of excellent quality, but it is recommended that the Government should consider a long-term policy for conserving these high quality coals for use in those industries in which they have special value and utilising the large resources of lower-grade coals to meet the market demand where the ordinary qualities are quite satisfactory.

Iron Ore.

The quantity of metallic iron required for the manufacture of 120,000 tons of pig iron is about 115,000 tons. The quantity of iron ore which must be used will naturally vary according to the quality of the ore, ranging from 287,500 tons per year with ore of average 40 per cent. iron to 230,000 tons per year with ore of 50 per cent. grade. The total quantity of ore required for forty years' life of the works, therefore, lies between 9,200,000 tons and 11,500,000 tons, or for seventy years' life, between 16 and 20 million tons.

The two main sources of iron available in New Zealand are the iron ore deposits at Onekaka and the iron sands of Taranaki.

The iron sands hitherto have not proved of economic value owing to the difficulties which have been experienced in the attempts made to produce pig iron or steel, using this material alone, due to the presence of titanic acid in the sands. Recent developments show, however, that these difficulties can be readily overcome when the iron sands are mixed with iron ore in such quantities as to eliminate the bad effects of the titanic acid and smelted under acid slag conditions. It is recommended that the iron sands should be used in the proportions of one part iron sand to four parts of iron ore in the mixture of ores charged into the blast furnaces.

It can be assured that one-fifth of the iron required can be drawn from the iron sand deposits, leaving four-fifths to be supplied as iron ore. Investigations are now being carried out to determine how far this proportion can be further increased.

The quantity of iron sand available amounts to many million tons. The Geological Survey have made an examination of the Patea district and estimate at least 16 million tons in this area alone. This raw sand can be readily concentrated and will yield from 4 to 5 million tons of concentrate with 55 per cent. iron. This quantity will be adequate to meet the requirements of the proposed programme for a period of seventy to ninety years, without attacking the reserves in other areas.

The exploration work carried out at Onekaka has shown that the estimates based on the surface exposure of ore are greatly in excess of the tonnages of ore which will be realized in mining. In several cases, massive outcrops have proved to be merely large blocks of ore resting on the surface and in other cases the ore exposed consists only of boulders scattered over the surface and with no continuity of ore. This work has, however, proved the existence of large blocks of ore of good quality and established the persistence of the ore body to considerable depth.

The main purpose of this investigation has been to establish the presence of reserves of ore to guarantee the supplies required for the period of seventy years' operation of the steel works. The work already done has been mainly confined to the more easily accessible blocks at Rinonui, Rinopai

and Onekaka North, and these three areas have been examined in considerable detail. Owing to the difficulties of access and limits of accommodation and time, general surveys and a less amount of detail work have been carried out at Tukurua and at the Onekaka Centre and South ridges which rise to an elevation of over 2,300 feet.

The work has now proceeded to the stage where a definite assurance can be given that the ore deposits are adequate to meet the requirements of the steel-making programme proposed. This assurance is based on a general examination of the entire area, study of all the tunnels which have been driven, the analytical data derived from the samples taken and on general experience with deposits of similar type in other parts of the world.

In preparing the estimates of ore reserves, two classifications have been made,—ore which is "assured" by the surface indications correlated with the tunnels driven, and "probable" ore based on the position of the tunnels, local indications and general experience.

Iron Ore Reserves.

The amount and quality of ore in the various blocks are estimated as follows, together with the proportion of iron sand concentrate recommended to be used in the blast furnace.

Estimate of Iron Ore Reserves.

Area.	Average Iron Content.	Assured Ore.	Probable Ore.
	%	Tons.	Tons.
Rinonui	48·0	6,079,000	1,500,000
Rinopai	42·5	1,000,000	..
Onekaka North	34·0	1,100,000	100,000
Onekaka Centre	34·5	590,000	Not sufficient data available.
Onekaka South	33·6	3,300,000	
Tukurua	37·0	1,000,000	
Iron ore	42	13,069,000	1,600,000
Proportion of Iron Sand Concentrate	55	3,267,000	400,000
Total Iron-bearing Materials	..	16,336,000	2,000,000

The average iron content stated above does not represent the quality of the ore itself but is representative of the ore and the foreign material which is associated with the ore, and as allowance has been made for this associated mineral in calculating the tonnage of ore, these estimates are definitely conservative. No estimate has been included for the "probable" ore in the Tukurua, Onekaka Centre and South areas, owing to the fact that sufficient work has not been done to give a satisfactory basis for estimation in these blocks, but there is every indication that considerable additional tonnage of ore will be exposed by further work.

Combining the above tonnages with the average iron content of the material in the ground, the metallic iron content of the "assured" reserves of 16,336,000 tons is 7,196,000 tons of iron. The amount of metallic iron required per year is 115,000 tons and on this basis the "assured" ore ensures a life of 62·6 years.

Similarly, the 2,000,000 tons of "probable" ore contain 971,000 tons of metallic iron or a further 8·5 years' supplies, giving a total reserve equivalent to seventy-one years of manufacturing operation.

Limestone and Dolomite.

Investigations have been made and confirm that there are available large quantities of these materials of good quality on the Tukurua stream, near the Parapara river, Mount Burnett, and near Takaka. No difficulties should be experienced in securing the required supplies.

Location of the Steel Works.

The establishment of adequate reserves of iron ore, limestone and dolomite in the neighbourhood, confirm the previous recommendation that the steel works should be erected as near the ore-body as possible and therefore on the coast at Onekaka. The principal factor in making this recommendation is the cost of assembling the raw materials required for the manufacturing process.

The Westport district does not possess the necessary reserves of suitable coal to supply all the coal required, and as a result, freight charges would be incurred in the assembly of coal, ore, and dolomite. In addition, Westport would be less favourable for the distribution of the various products to market.

Greymouth has the definite disadvantage of its difficult harbour conditions and the handicap of the port being unusable for an average seventy days per year, as well as its unfavourable position for the market.

With the steel works established in Wellington, the freight charges will be increased by the greater distance over which the coal must be carried from the West Coast, and by the loading costs, freight charges from Onekaka to Wellington, harbour dues and unloading charges, on the whole of the iron ore, dolomite and limestone required. These materials, apart from coal, will amount to about 300,000 tons per year which at a freight and handling cost of 5/- per ton, represents an annual charge of £75,000.

It should also be pointed out that the existing harbour facilities at Wellington are not of the type desired for the low-cost handling of large quantities of coal and iron ore. A new wharf would be required at a point adjacent to the proposed steel works and the same handling equipment must be installed whether the works are built at Onekaka or Wellington.

In addition to its favourable position for the assembly of raw materials, the Onekaka location has the advantage that there are available, at a very low cost compared with the Wellington district, large areas of land suitable for the erection and extension of the steel works, the establishment of ancillary industries based on steel, and for the erection of the houses which must be erected for the accommodation of the staff and workmen. The area required for the first installation of the steel works will be in the neighbourhood of 200 acres and the differential in favour of the Onekaka location in cost of the land required for various purposes, will amount to a large item in the total capital expenditure.

It is also considered that with the erection of a suitable wharf, Onekaka will compare favourably with Wellington as a distribution centre for the disposal of the steel and by-products to market.

Extension of the Steel Works.

In planning the lay out and equipment due regard should be paid to the extension of the industry in future years. It is inevitable that with the continuous expansion of the country and the establishment of more industrial activity, the demand for steel will show a progressive increase, and this increased demand should be met by a corresponding development of the production.

This development may proceed along two lines, either separately or in conjunction, according to the conditions. Alongside the mining of the assured ore reserves, a continuous exploration programme must be carried on to direct the mining operation and to determine the total amount of ore which can be economically won. If, as is anticipated, further quantities of ore are revealed or a greater proportion of iron sands can be incorporated in the blast furnace burden, the natural trend of development will lie in the direction of increased coke oven and blast furnace plant with corresponding growth of the capacity and scope of the steel-making plant and rolling mills. This is typical of the development in countries which are rich in ore reserves.

If on the other hand, the ore reserves do not show the increased tonnage necessary to justify such development, the further production of steel should develop along the same lines as in countries which do not possess sufficiently large reserves. In such cases, the production of pig iron is limited and a large proportion of the steel is manufactured from scrap and/or a large proportion of the steel demand is met by the re-rolling of billets which are imported from other steel-producing countries more favourably supplied with ore.

This second line of development may be illustrated from the steel industry in Great Britain. The ore reserves in Great Britain, and particularly of high-grade ores, in relation to the magnitude of the industry, are relatively limited. No iron ore exists in Scotland and the whole of the pig iron manufactured in Scotland is produced from imported ore, which owing to freight charges is relatively high in cost averaging at 4½ pence per unit, 18/- to 20/- per ton of 50 per cent. ore. As a result, the pig iron production is small and in the steel-making furnaces the charge melted consists of approximately 70 per cent. of scrap with 30 per cent. of pig iron. Similar conditions, to a lesser degree, apply to the large producing centres of Middlesbrough and South Wales which use only small proportions of British ores. Taking the United Kingdom as a whole, approximately 40 per cent. of the total steel made is produced from re-melted scrap and only in those districts like Lincolnshire and Corby which are built on the ore deposits, is the steel-making based entirely on pig iron and the internal production of scrap.

In addition, a highly profitable industry has been built up in England based on the re-rolling of steel billets and sheet bar imported from abroad. In the post-war years from 1920 to 1935, when tariffs were imposed, an average of 3 Million tons per year of semi-finished steel were imported from the Continent of Europe and rolled in Britain largely into the finished products of wire, sheets and merchant bar. This re-rolling and finishing industry requires more man-power per ton of product than the primary production of semi-finished steel and offers a greater margin of profit owing to the relatively wide differential between the cost of semi-finished steel and the finished product, these differentials being greater as the extent of the finishing work increases.

If the further reserves of ore in New Zealand exposed by development work in the future do not prove adequate for a major extension of the first installation of the coke and blast furnace plants, then the expansion of the steel industry should proceed on the basis of increased steel production from the use of scrap secured largely as in other countries from ship-breaking and similar sources, and on the development of the rolling mills for the re-rolling of imported semi-finished steel. With the present programmes for the increase of capacity in many countries, such as Britain, Germany, France and India, there is every indication that large supplies of these semi-finished products will always be available and could, with advantage, be converted into the finished products required in New Zealand by local labour.

Steps should be taken in the preliminary lay-out of the steel works, to allow for development in either or both of these directions.

Estimates of Manufacturing Costs.

The preliminary estimates of manufacturing costs, submitted previously, have been revised in the light of the increased programme of production raising the quantity of steel products per year to 104,000 tons, and in view of the change in labour rates and conditions of employment.

In preparing these estimates, each grade of workman has been allotted a wage rate varying according to the type of work and skill demanded with a minimum earning of 19/- per day and an average earnings for all types of workmen of about £6 per week. These rates are in accordance with present standards but are higher than for corresponding services in other countries.

The costs at which materials are charged into the plant, are given in the estimates and are in accord with present prices where such information is available.

The estimated manufacturing costs for the different types of product are summarised below and details of the estimates and the necessary labour forces, are appended herewith :—

Summary of Estimates of Manufacturing Costs.

Basis: Coking Coal delivered Coke Plant, 25s. 9d. per ton.
Iron Ore delivered Blast Furnace, 14s. 4d. per ton.

Product.	Tonnage per Year.	Estimated Cost per Ton.
		£ s. d.
Furnace Coke	120,000 tons	1 19 8
Pig Iron—Basic	120,000 ,,	3 3 3
Ingots—		
Basic Bessemer (B.B.)	83,850 ,,	4 3 6
Open Hearth (O.H.)	47,550 ,,	4 19 9
Rolled Products :—		
Rails (O.H.)	11,000 tons	6 12 6
Blooms and Billets (O.H.)	2,000 ,,	6 8 6
Sections—		
4″ to 8″ (O.H.)	2,500 ,,	6 16 0
2″ to 4″ (O.H.)	19,000 ,,	8 0 0
Merchant Bar (O.H. and B.B.)	28,500 ,,	7 6 0
Wire—		
Hard drawn	3,500 ,,	10 6 0
Annealed	500 ,,	11 8 6
Galvanised	8,000 ,,	12 15 0
Barbed	3,000 ,,	14 5 0
Sheets—		
Galvanised, Plain and Corrugated	23,500 ,,	13 10 0
CR/CA Common quality	2,500 ,,	12 13 0
Total Steel Products	104,000 tons	..

In addition to the steel products of the proposed rolling programme, by-products will be recovered from the coke oven gas, and saleable slags and fertilizers will be produced at the blast furnaces and steel works. The blast furnace gas and coke oven gas will be cleaned and used for heating purposes within the works and to supply the township with gas.

The estimated quantities of by-products are as follows :—

Tar for road-making purposes	1,200,000 gallons.
Motor Spirit—high quality	360,000 ,,
Sulphate of Ammonia—fertilizer	1,375 tons.
Coke Breeze	6,000 ,,
Basic Slag Fertilizer—	
Highest grade	16,750 ,,
Medium	4,750 ,,
Blast Furnace Slag (roads)	60,000 ,,

Credit for the value of these by-products and slags has been taken in arriving at the manufacturing costs in the various departments in which they are produced.

Estimates of Earnings.

The estimates of earnings are based on the above estimated manufacturing costs as compared with current prices of the various types of imported steel (c.i.f. and c.) at New Zealand ports. These prices have been ascertained by the officers of your Commission and the values taken are conservative, being either for Australian or British products, whichever is the lower in price.

The gross earnings are estimated at £744,000 per year. From this must be deducted the cost of the Dock Dues at Onekaka, freight to various New Zealand ports, and the cost of administration in the central office of the Commission. No deduction should be made for Sales Expense, Warehousing of Stocks, or Distribution to the individual purchaser as at this stage no decision has been made on the method of marketing to be adopted. For the purpose of this Report, it is understood that marketing will be carried out by the existing distributors' organizations.

The gross earnings are also subject to a charge for the depreciation of the plant. The manufacturing costs include provision for the maintenance of all parts of the plant in good operating condition and for the replacement of parts necessitated by normal operation. Suspense funds are also included for the replacement of mill rolls and the rebuilding of the furnaces. Under such conditions, a charge for depreciation may be regarded as a reserve fund for the amortisation of the capital charge so that by the time the plant becomes obsolete or uneconomic in operation, the book values are reduced to nil. It is suggested that an average charge for depreciation of 4 per cent. is ample for this purpose, since with this amount per year invested in a $2\frac{1}{2}$ per cent. security, the capital value of the plant will be accumulated in a period of twenty years.

The net earnings after making allowance for these charges, but before provision for capital charges or Income Tax are estimated at £455,600 per year of full operation.

Summary of Estimated Earnings.

Materials Produced—		
Coke	[illegible],500 tons per year.	
Pig Iron	6,[illegible] ,,	
Steel Products	[illegible] ,,	
Total	1[illegible],500 tons.	
		£
Estimated Manufacturing Costs after deduction of by-product credits, &c.		1,016,950
Realised Value (c.i.f. and e.)		1,761,124
Gross Earnings		£[illegible]
Less Dock Dues and Freight to Ports—	£	
109,000 tons Iron and Steel @ 19s.	103,550	
Administration	25,000	
Depreciation—4% on £4,000,000	160,000	
		288,550
Net Earnings before Capital Charges and Taxation		£455,624

EFFECT OF STEEL MANUFACTURE ON EMPLOYMENT.

The number of men who will be required as Staff and Workmen for the manufacture of the proposed tonnage of steel and provided for in the estimated manufacturing costs, is about 1,500 in direct employment at the Iron and Steel Works.

Based on an average production of 500 tons per year per man employed in the mines, the new demand of 180,000 tons of coking coal is an increase of approximately 20 per cent. over the production of the West Coast in 1937 and represents an increase of employment in these coal mines equivalent to 300/350 men working throughout the year.

In addition, there will arise a considerable demand for indirect labour in the transport services and in the social services required to meet the needs of the workers in the new township to be erected.

On a conservative basis, it may be estimated that the establishment of an Iron and Steel Industry will furnish permanent remunerative employment for at least 2,000 men. On the basis of four persons per family, the population of the new township, based on the steelworks alone, will be in the neighbourhood of 6,000 persons and this number will steadily increase as the steel industry develops and ancillary industries are established around it.

The addition to the annual Wages Fund of New Zealand may be estimated on the following basis. The estimates of manufacturing cost in the steel works makes provision for staff salaries and wages at approximately £500,000 per year. The Mines Statement for 1937 shows that the average wages paid for winning coal in the State Mines was about 13/- per ton and on this basis, the increase in the miners' wages fund will amount to approximately £100,000 per year even after taking account of the economies which should be effected as a result of the increased production of coal.

The raw materials required in the steel works, apart from the coal used, are estimated at £134,000 per year and on the basis of 40 per cent. of the cost of such materials, being labour, this represents an additional wages fund of £50,000 per year.

These items total £650,000 per year permanent increase in the Wages Fund of the country irrespective of the services arising in the transport and township services and from the labour required to meet the needs of workers employed in the new industry.

EFFECT OF STEEL MANUFACTURE ON STERLING DEMAND.

As stated above, the value at the point of entry of the steel products which are to be manufactured in New Zealand, is approximately N.Z.£1,761,000. To this must be added the value of the by-products and fertilizer which will be supplied from the steel works amounting to N.Z.£128,000, giving a total of N.Z.£1,889,000, or about £1,510,000 Sterling per year.

While the larger part of the raw materials required in the steel works can be supplied from sources in New Zealand, certain materials such as manganese ore, spelter, acid and repair materials, must be imported from overseas. The cost of this imported material is estimated at N.Z.£212,000 or, about £170,000 Sterling per year. This amount could be substantially reduced by the establishment of a plant for the manufacture of sulphuric acid at Onekaka to meet the requirements of the steel pickling plants.

The establishment of an Iron and Steel Works will therefore effect a reduction of about £1,340,000 Sterling per year in the sterling demand even in the initial stages of the industry and this amount should be progressively increased as development proceeds.

Purposes of Defence.

Although the matter does not lie within the normal scope of this Report, it is considered opportune to direct attention to the bearing of an iron and steel plant on the question of National Defence.

As is well known, the iron and steel industry in all countries forms the basis for the manufacture of armaments, and the steel works at Onekaka can, if desired, be utilized as an integral part in any scheme for the production of armaments in New Zealand, both as a permanent feature in the scheme of defence and to make the country less dependent on overseas communications in time of difficulty.

The steel-making furnaces proposed for installation are of the same type as those used by the producers of armament steels, and with the addition, when required, of a small electric furnace, would be capable of producing any quality of steel demanded for this purpose.

The rolling mills, without any modifications, will be suitable for the rolling of steel into rounds or squares up to 8-inch dimension. The rounds would furnish the basis for shells and rifle barrels.

With the installation of a piercing press, billets can be rolled for the production of other types of shell and with the installation of drop-stamping equipment, billets can be forged into aircraft and motor-car crank-shafts, valves and other parts.

It is suggested that before the final lay-out of the works is completed, consideration should be given to the possible correlation of the steel works equipment with the needs of the Defence programme so that provision can be made, if desired, for the installation in correct sequence and without undue expenditure of the additional equipment required for such purposes. With the correlation of the steel-making capacity, the machining equipment of the engineering shops and the establishment of a filling factory, a considerable contribution could be made to meet many of the requirements of the Defence programme.

Summary.

As a result of our examination, it can be assured that—

(*a*) The reserves of the necessary iron-bearing materials, coking coal, limestone and dolomite, are adequate to meet the needs of an Iron and Steel Industry on the scale already proposed for a period of seventy years, and there is every indication that further exploration will establish additional resources of iron ore, for either the extension of the life of the plant or for production on a larger scale.

(*b*) The location at Onekaka offers the most favourable position for the economic production of steel.

(*c*) The market demand and the local conditions are such as to justify the establishment of a steel industry on a sound, economic basis.

(*d*) The manufacture of steel in New Zealand will have a marked beneficial effect on the problem of employment, overseas finance and national defence.

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