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King, D. I.

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THE CIRCUMSTANCES OF THE BRITISH IRON
AND STEEL INDUSTRY, THROUGH DEPRESSION
AND RECOVERY, 1919-1939, WITH PARTICULAR
REFERENCE TO THE PROBLEM OF LOCATION.

D. I. KING,

3rd Year Honours in Politics &
Economics,

University College, Durham.

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I N T R O D U C T I O N.

The two decades falling between two major world wars are of special interest in the history of the iron and steel (and other) industries for this period covers the evolution from competitive private enterprise to an acceptance of some measure of coercion and control by the state. The issue between those who favour private ownership and those who favour complete state control is still being contested, however, From one side, we are told that "as matters stand in Great Britain today, it is indispensable to raise the steel industry to the highest possible level of efficiency because Great Britain needs extensive capital re-equipment which depends on steel, and must raise exports to the highest possible level in order to procure the means of life. The raising of exports also depends on steel Therefore in the interests both of the export trade and of speeding up the re-equipment of British industries, the nationalisation of steel is an immediate and urgent necessity"⁽¹⁾. But an authoritative voice from within the industry declares the Steel Bill " is a thoroughly bad bill for it interferes with a well organised industry which is securing record outputs and is in the midst of a great development plan. It cannot add to the efficiency of the industry, lead to cheaper steel, or more cordial relations between managements and employees. I do not exaggerate when I say that nationalisation of steel would be a disaster for the country. Not only steel but virtually the whole of British industry would be involved".⁽²⁾ This complex struggle lies beyond the present scope, but a preview of it is given to show that all the hard lessons and bitter experiences of the inter-war years have far from resolved themselves into unanimity of opinion. Probably there

(1) G.D.H.Cole. "Why Nationalise steel?" p.46.

(2) Sir Ellis Hunter, Chairman, Dorman Long & Co. Company Meeting Dec.16th, 1948.

would be universal agreement now that to say "the present distribution of the industries of this country approximates very closely to the distribution which enables each of those industries to operate most economically and efficiently" (1) would be to make a glaring overstatement. Beyond that it would be unwise to go, without bringing in the bias which the student of the location of the iron and steel industry must almost inevitably acquire. The problem of location is of course only one corner of the vast field with which the current controversies about nationalisation are concerned; but it is intimately connected with many of the other problems, and all views acquiesce to its importance. Whether in the light of this intimate connection with other factors, it would be efficacious to abstract and select it as a special object for centralised control, is a question, the answer to which may appear to emerge in the ensuing pages. But even if nationalisation is not carried through " the problem of what to do about steel will remain". (2)

OUTLINE OF THIS SURVEY.

It is proposed, first to give details of the general trends of production and the difficulties connected with international trade during the inter-war years, the former to indicate the scope of the industry's activities at varying levels of demand; the international sequence of events to show how the British industry declined in the world markets. This is followed by a brief description of the geographical layout of the industry in this country at the close of the period. This analysis is intended to place the iron and steel industry in perspective, and to provide a background to the more detailed examination which follows, and which concerns itself principally with the problems of location. No attempt will

(1) Board of Trade. Evidence before Royal commission on distribution of the Industrial Population.

(2) Economist - Nov. 6th, 1948.

be made to give an exhaustive area-by-area survey of present and desirable future locations. The approach is based mainly on the developments which actually took place between 1919 and 1939, with an examination of the locational factors involved in each instance.

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BRITISH IRON AND STEEL PRODUCTION AND
INTERNATIONAL TRADE 1919 - 1939.

Although the capacity of the iron and steel industry can only be increased at a slow rate, the demand for steel tends to fluctuate violently because the industry is engaged primarily upon supplying the capital construction industries, such as Building, constructional engineering and Ship-building. In a period of depression it does not appear profitable to lay out capital in new factories, machinery or ships. Hence within a year or two, demand can halve or double itself, as Table 2 shows. In fact, as one writer has aptly put it: "steel is the boom-and-slump-industry par excellence". (1) From the estimate (2) of the direct consumption of steel by the main industrial groups in this country in 1937, it will be seen (Table 1) that one fifth goes into building and constructional engineering and more than a quarter into making machines, ships and motor cars.

TABLE 1.

	<u>Thousand Tons.</u>	<u>Per cwt.</u>
Building & Const. Engineering	1725	22
Mechanical Engineering	1180	14
Ship-building & Marine Engineering	840	10
Railways & Rolling Stock	760	9
Hardware, Hollow ware	790	9.5
Rivets, nuts, bolts, screws, chains etc.	630	7.5
Motor and cycle	550	6.5
Wire & wire manufactures	500	6
Collieries	360	4.5
Electrical Engineering	235	3
Others	710	8
	8,280*	100

* Equivalent to 11,040 ingot tons i.e. the amount emerging from the steel furnaces.
 (1) Economist Nov. 6th 1948. (2) R.M. Shone, Economic Director of Iron & Steel Federation in paper to Royal Statistical Society 22.5.47.

With such a high proportion of the steel output being consumed by industries which are particularly responsive to general business conditions, it is clear why the industry ⁽¹⁾ "reflects with considerable accuracy the alternations of periods of economic prosperity and depression".

TABLE 2.

IRON AND STEEL PRODUCTION IN U.K.

<u>PIG IRON.</u>	(Million tons)	<u>STEEL.</u>
1919	7.4	7.9
1920	8.0	9.1
1921	2.6	3.7
1922	4.9	5.9
1923	7.4	8.5
1924	7.3	8.2
1925	6.3	7.4
1926	2.5	3.6
1927	7.3	9.1
1928	6.6	8.5
1929	7.6	9.6
1930	6.2	7.3
1931	3.8	5.2
1932	3.6	5.3
1933	4.1	7.0
1934	6.0	8.8
1935	6.4	9.8
1936	7.7	11.8
1937	8.5	13.0
1938	6.8	10.4
1939	8.0	13.2

The production of pig-iron in the period bears an obvious relation to the output of steel, although there has been a growing divergence principally accounted for by the increasing use of

(1) "Britain in Depression". Iron & Steel Industry.
E.D. McCallum, M.A.,

scrap in the steel making process. 1920, 1929 and 1936-7 stand out as boom years for the iron and steel industry. In 1920, the post-war boom was at its' height, but recession was swift and drastic as is shown by the figures for 1921. The three months coal strike of that year accentuated the decline in production. Output rose in 1923 and 1924 under the stimulant of temporary dislocation of continental competition due to the occupation of the Ruhr. This was not maintained in 1925, partly because France and Belgium were again competing strongly in export markets; and also the franc had been depreciated. The General Strike of 1926 explains the severe reduction of output of iron and steel; demand improved after this until it reached its' peak in 1929 - The figures for pig-iron (7.6 million tons) represent the highest output since 1920, whilst the steel production of 9.6 million tons was matched only by the output for 1917 (9.7 million tons). After rallying somewhat in early 1930, the rate of production of both iron and steel fell away in the path of the "Great Depression". It was not until the spring of 1933 that the industry began to revive, by which time the 1932 Tariff was beginning to have significant effect. This revival in production continued steadily until, by 1935, the steel output - 9.8 million tons - had just passed the 1929 figure. 1936 saw the beginning of the re-armament programme and this coupled with the return of normal business conditions led to a boom in 1937, when thirteen million tons of steel were produced. This record-breaking figure was exceeded only slightly in the year 1939, which marks the close of the two decades under review. With the advent of the 1939-45 war, the fears of many leaders in the industry that the increases in steel making capacity during the re-armament period might have proved financially embarrassing, were abated, and indeed, the current problem is principally of under-capacity in the face of an unprecedentedly high demand.

During the pre-tariff and pre-depression years after 1918, British steelmakers claimed that the war had helped their continental rivals in four main respects. These favourable

circumstances to the continental producers, which D.L.Burn discusses in some detail, (1) were:

- (1) Currency deflation in the U.K. and a return to the Gold Standard in 1925 as against the prolonged inflation which obtained in most continental countries.
- (2) The extensive re-equipment made necessary by war-time losses and devastation, which was often financed by the State and which helped to sharpen continental rivalry in those years.
- (3) A permanent increase in the economic activity of the Continental governments, as e.g. through consular services and preferential railway rates for exports.
- (4) Other influences arising out of the war which tended to widen the gap between the price of European and British labour, e.g: The stricter observance of the eight hour day in Britain than on the continent. The claim is not made that the continental producers were devoid of problems; but conditions gave them a stimulus which seems to have been lacking in the British industry, with its heavy burdens of debts and reticence towards dynamic change. As can be seen from Table 3, the annual imports of iron and steel between 1919 and 1927 fluctuated widely, but there was a persistent tendency towards an increase of imports, which at its climax in 1927 reflected the coal strike of the preceding year. The influx came principally from France, Belgium and Germany, and after the abnormal early post-war years, steel "semis" - mass produced billets and bars - were the most successful products to compete with British goods in the home market, accounting for half the total of imports.

(1) D. L. Burn "Economic History of steel making"

TABLE 3.

IMPORTS AND EXPORTS OF IRON AND STEEL.

<u>YEAR</u> <u>1919-1939</u>	<u>IMPORTS</u> <u>(Million tons)</u>	<u>EXPORTS</u> <u>(Million tons)</u>
1919	.5	2.2
1920	1.1	3.3
1921	1.6	1.7
1922	.9	3.4
1923	1.3	4.3
24	2.4	3.9
25	2.7	3.7
26	3.7	3.0
27	4.4	4.2
28	2.9	4.3
29	2.8	4.4
30	2.9	3.2
31	2.8	2.0
32	1.6	1.9
33	1.0	1.9
34	1.4	2.3
35	1.2	2.4
36	1.5	2.2
37	2.0	2.6
38	1.3	2.0
39	1.8	1.6

There was no sudden diminution of imports with the onset of the depression, the volume remaining fairly constant between 1929 and 1931. With the imposition of a protective duty in April 1932 of $33\frac{1}{3}\%$, however, there was a great reduction of imports. Home production of iron and steel was stimulated as a result of partial economic recovery behind the tariff in 1933. In the same year, imports fell to the low level of one million tons, and remained at a smaller volume than before for the rest of

the period under review. As the Import Duties Advisory Committee has pointed out:⁽¹⁾ the average annual imports for 1933-36 were less than half the average volume of imports in the four years preceding the tariff. Nevertheless there is reason to suppose that the British steelmakers resented the increase of imports above even the 1933 level, and a complexity of tariff, quota and licence regulations was developed to cope with the situation.

There is evidence of undue optimism in an article emanating from the "Economist" in 1921.⁽²⁾ It was written that "the iron and steel industry had escaped from the hot-house atmosphere of war conditions to the colder but more invigorating breezes of free competition". The British export figures during the inter-war years seem to indicate rather that the breezes were enervating in effect. E. D. McCallum formulated the opinion⁽³⁾ that the loss of British export trade could be attributed directly to the war having stimulated production in other countries and to the loss of contact between the British industry and pre-war oversea customers. On the other hand, D.L. Burn affirms that⁽⁴⁾ "the degree of change which had occurred in the industry was quite inadequate to restore the competitive strength of common-grade steel-making in Great Britain", although it must be added that Great Britain could hold her own in the tin plate and galvanised sheet trade, although increasingly challenged. By 1925, the total world trade in iron and steel had surpassed the pre-war figure; but whereas the continental exporters had gone beyond their pre-war maximum, the U.K. was still behind except in the export of rolled products. When the depression came, the British industry lost far more than its continental rivals. With the advent of the tariff, the

(1) Cmd. 5507, 1937. The Import Duties Advisory Committee is referred to hereafter by its initials - I.D.A.C.

(2) "Economist" Feb. 19th 1921. (3) Op.cit. p.265.

(4) Op.cit. p.393.

entire external trade in iron and steel became regulated by agreement with the Continental Steel Cartel and a series of subsidiary agreements with such non-cartel countries as Denmark, Norway and Sweden, and also with various international cartels in the tin-plate, rail and tube making sections of the industry. (1) The average annual decline in exports between 1927-31 and 1933-37 amounted to 1.3 million tons. It is interesting to note that the distribution of British iron and steel exports as between British and foreign overseas countries varied only slightly up to the Depression in the 30's. British countries took 50.9% of the British export in 1924 and 50.2% in 1929. The proportion of the export trade held by the U.K. in the privileged Empire markets continued to be fairly constant in the following decade, but was increasingly threatened as the making of iron and steel became more and more dispersed. Canada, India, Australia and South Africa advanced their output slowly; whilst New Zealand, Eire, Turkey, Greece and Brazil were commencing home production at the end of the period. The inter-war years, then, display a picture of steadily declining exports both absolutely and comparatively with those of the other large steel exporting nations of the world.

GEOGRAPHICAL LAYOUT OF

THE IRON AND STEEL INDUSTRY: 1938.

The North East Coast, which is still the main producing district, was originally especially favoured. It had ample good, cheap Durham coking coal, a good supply of Cleveland ore and nearness to the coast giving facilities for export. By 1938, however, the area was importing nearly half the total ore requirements from overseas. Coking coal had also become scarcer and rather dearer than in earlier years. The capacity of the area is about three million ingot tons of steel per year,

(1) Cmd. 5507 1937.

and the output is predominantly structural steel - shipbuilding materials, plates, sheets and rails.

Dorman Long, South Durham steel and Iron and Consett Iron are the principal firms in the area.

Closely following the North East Coast in ingot capacity is the South Wales area. There is an adequate coal supply locally, but the ore has to be imported - from the Midlands and overseas. Pig iron is drawn from Lincolnshire. Ebbw Vale is the only important inland centre of production in South Wales, the other main works being on the coast at Cardiff, Margam, Port Talbot and Newport. Sheet steel and tinplate are the principal products of the industry in South Wales, of which Ebbw Vale accounts for about 30% of the area's tinplate output. Richard Thomas & Baldwins and Guest Keen Baldwins are the largest firms, the latter producing heavy steel, plates, rails, billets and sections.

The coastal iron and steel area in West Scotland has an annual output of about two million ingot tons. As in the North East region, early advantages have now disappeared: the hard splint coal of Lanarkshire, capable of being used uncoked in blast furnaces and the local ore supplies have been largely exhausted. In 1938 all the ore had to be imported from England and overseas; quantities of coke and pig iron were also drawn from other districts. There is an excellent local market in the Clyde shipbuilding and heavy engineering works, and the shipyards are also a good source of scrap which is used by the Scottish steel industry in a very high proportion. The main products are heavy plates, sections and forgings. Colvilles Ltd. and its subsidiaries dominate the Scottish industry.

In the Cumberland and North Lancashire area, are found the only British deposits of hematite ore, now almost exhausted. The ingot steel capacity of the area in 1938 was about 350,000 tons, but in the same year ore imports of 603,300 tons were almost as large as the local hematite output. About half of the pig iron

production is turned into first quality 'acid' steel locally and the remainder of the pig iron is sent to places like Sheffield to be manufactured into special steels. Good coking coal is found in the area, but nevertheless coal comes in from the North East coast despite heavy transport charges. Extensive loading and unloading facilities have been provided at Workington by the United Steel Company, which is the largest producer. The Mállom & Askam Haematite Iron Co. and the Barrow Hematite Steel Co. are the other two firms operating in the area.

Further from the coast than any other steel producing area of comparable magnitude is Sheffield, with a capacity of just over two million tons. Coal, but no ore is found locally, and little iron making goes on there. Pig Iron is supplied from Lincolnshire and Northamptonshire, and in the case of electric arc furnaces, there is a good local supply of scrap - the only charge required for these furnaces. A wide range of specialised steel products characterises the bulk of the Sheffield output; and United Steel, The English Steel Corporation and Thomas Firth and John Brown Ltd. are the principal firms.

Lancashire, Cheshire and North Wales produced about one million tons between them in 1938. The ore was imported from Lincolnshire and Northamptonshire and some pig iron was drawn from Stoke by John Summers Ltd. of Shotton, Cheshire. The latter firm, ~~was~~ one of the largest in the area, specialises in steel sheets, whilst the subsidiaries of the Lancashire Steel Corporation at Irlam produce wire rods. The finished products find a good market locally in industrial Lancashire, but the export trade was becoming more important at the end of the period.

The two remaining areas of iron production in Great Britain are also the newest. By 1938, Lincolnshire had a capacity of about one and a half million tons and Northamptonshire half a million tons. Both these areas are based on

plentiful ore supplies, but coal has to be brought in from South Yorkshire. Pig iron is sent to Sheffield and Scotland, 'Semi' products to Sheffield and South Wales from Lincolnshire; whilst at Corby in Northamptonshire, St^{ew}arts and Lloyds are the centre of a great tube manufacturing works. The distinctive feature of both areas is their adoption of large integrated plants. United Steel (Appleby Frodingham) John Lysaught Ltd. (Scunthorpe) and Thomas Firth and John Brown Ltd. (Scunthorpe) are the leading firms in Lincolnshire.

A glance at a map will reveal that, ignoring the comparatively small producing areas of North West England, the bulk of the iron and steel industry in Great Britain is centred in a broad belt stretching from Llanelli and Cardiff in the South, through Sheffield and Corby, Consett,^{and} Skinningrove, to Glasgow and Coatbridge in the North. This wide arc embraces the backbone of industrial Britain and is of first rate importance to the National economy. In 1919 it included a large number of small inefficient plants, operating with obsolescent equipment and using out of date methods of production. The twenty years of the industry's history which we are about to study exhibit what can perhaps be described in retrospect as the first tentative steps to regain the proud position which the British Iron and Steel industry held in the world for its techniques and skills several decades before World War I.

THE BRITISH IRON AND STEEL INDUSTRY AND ITS

LOCATIONAL PROBLEMS 1919-1939.

"Economic theory reflects the very recent growth of interest in problems of industrial location, for there is little reference to the matter in classical economics, whilst such treatment which developed later is not of a character which can give much assistance in analysing the recent trends of change" (1) The conclusion

(1) S.R.Dennison. "The Location of Industry & the depressed areas" p.2.

reached by Professor Dennison seems to be shared by Professor J.H.Jones, when he wrote several years earlier that (1) "it is, perhaps, idle to search for a theory of location, which may be used to explain the present distribution of industry and the industrial population. The analysis must be descriptive." These theories which have been developed fall roughly into two categories: the inductive or historical and the deductive. Both types of theory have aimed to be of general application, but neither have succeeded. The most that can be said is that the more carefully constructed theories permit of generalisations about the special significance of particular factors. If it were the intention here to provide a theoretical "justification" for the location of the British Iron & Steel industry, the Weberian analysis could be followed with a fair degree of integrity to explain certain aspects of the position of the industry during the 19th century; but it would have to be abandoned for an adequate treatment of the two decades 1919-1939 to be possible. The fact is that we are necessarily dealing with the existence of large quantities of durable capital situated in certain places, so that it would strain credulity to attempt to reduce all the elements which we shall have to discuss to mere technical coefficients operating in an industrial void. The method adopted will be descriptive, then, and no claim of universality is made for the locational factors which are considered to have been dominant in the geographical distribution of the iron and steel industry in Great Britain. A further point to be noted, of especial importance when dealing with a "basic" industry, is that locational change is a gradual process. In the comparatively short period of 20 years, dynamic and far reaching changes are hardly to be expected. The past weighs heavily upon the present, and a balanced picture of locational trends in the industry cannot be depicted. Therefore by the extraction of what occurred between the two world wars alone. This latter period will be discussed in some detail as to the re-organisation and shifts in

(1) Professor J.H.Jones. A memorandum on the Location of Industry. Appendix II. Barlow Report.

location which took place in an attempt to discover the contemporary influences at work determining location, together with some idea of their relative importance; but the first task must be to look back into the 19th century.

"It may be broadly stated that throughout the 19th century coal acted as the great magnet to the industrial population other than that which was concentrated in the chief shipping and commercial areas."⁽¹⁾ Coal was used in the manufacture of coke, which, in turn, was mixed with ore and limestone in the blast furnace. The country was fortunate in possessing ample quantities of good quality ores on most of the principal coalfields. Thus the pig iron industry was attracted to these districts which offered the lowest combined transport costs per ton of pig iron. If the ore had a high iron content and a comparatively large amount of coal was required to produce a ton of iron, the industry was naturally located near the coal; and vice versa. The desire to keep down the costs of transport similarly attracted steel production close to pig iron supplies where, moreover, the necessary coal for the gas-producer plants would be readily available. As the 19th century drew to a close, however, local ores near the coalfields were becoming exhausted, and iron-ore was imported from abroad to cope with the demands of the expanding steel industry. Economies in coal consumption of quite a considerable degree were also important in weakening the hold of the coalfields. Transport costs were now to be reduced by erecting blast furnaces near to the coast, often in close proximity to the coalfields, for dealing with the imported ores. In other places, notably South Wales and South West Scotland, the steel industry developed upon imported pig iron, the ores being smelted abroad. The importance of transport costs is again shown by the process of specialisation within the steel industry. In South Wales for example, steel bars are produced for tinplate manufacture, and a large proportion of the tinplate was formerly exported; the North East coast specialised upon steel for ship and

(1) Royal Commission on the distribution of the industrial population.

boiler plates and girders and other materials required in engineering and shipbuilding. This tendency has the effect of reducing the cost of distributing and marketing the products of the area, and its appearance cannot be regarded as accidental. It will thus be seen that the cost of transport has played an outstanding part in determining the location of the iron and steel industry: part of this cost can be attributed to that of transporting the coal to the ore and the ore to the coal, and part of it to the distribution of the product, the latter influencing the type of product produced in a particular district. This conclusion is deducible from the remarks of the Royal Commission;⁽¹⁾ "in the location of the iron and steel industries natural conditions played a decisive part. Nevertheless, that the markets also exercised an important influence is shown by the line of specialisation followed by the iron and steel industry in different parts of the country." Such an explanation - and it is commonly expressed - cannot be regarded, as complete, however, until it is related to the transport factor.

When the 1914-18 war was over, the geographical distribution of the British Iron and Steel industry remained very much as it had been before. The iron and steel departments of the Ministry of Munitions had been created to ensure an adequate supply of steel for war needs, and its policy was that of increasing production with a minimum of new capital equipment, by extensions and re-conditioning of old equipment. Indeed, Sir John Hunter, the head of the Department from 1916 commented that "no steel-makers expressed confidence in the utilisation of the extensions as commercial propositions after the war".⁽²⁾ This may have been because the steelmakers did not know where the demand would be coming from to utilise the capacity which, as will be seen from Table 4 was greatly increased.

(1) op.cit. paragraph 71.

(2) Iron and Coal Trades Review. September 23rd, 1921.

TABLE 4.

EXTENSIONS ARRANGED FOR 1916-1918. (1)

	<u>New Blast Furnaces.</u>	<u>New Steel Furnaces.</u>	
		Basic	Acid.
Scotland	-	31	8
N.E. Coast	5	21	3
Lincs.	4	8	-
Midlands	5	38	10
South Wales	4	14	5
Cumberland & Lancs.	4	17	10

"It is natural to suppose that the great expansions of steel-making in Sheffield (the "Midlands" refers principally to the Sheffield area) and in Scotland were a response to the peculiarly acute demand for the kinds of steel which these districts made well" writes D.L.Burn. (2) But he goes on to point out that makers of steel in other districts had been proved just as ^{competent} ~~confident~~ as Sheffield to produce shell steel. The building programme included two important projects for the Sheffield area "which must inevitably give new life to mass-production steel making in Sheffield." (3) a new plant at Penistone by Cammell Lairds, and a larger one at Rotherham by Steel Peech & Tozer. Sheffield had become established as a centre of high grade steel manufacture, turning out products such as cutlery, forgings and armaments where the costs of transport of the final product were not a major consideration. Its location was suited to this sort of work as the leading Sheffield makers realised but hardly so for the mass production of steel, which involved the transportation of pig iron from other parts of the country to make a product which could have been produced at lower cost at, say, Lincolnshire or Northamptonshire where much of the pig iron came from. Moreover, "the

(1) F.H.Hatch. The Iron & Steel industry of the U.K. under war conditions (1919).

(2) Burn op.cit. p.359.

(3) Ibid.

leadership in a special industry, which a district derives from an industrial atmosphere, such as that of Sheffield",⁽¹⁾ could not be invoked as legitimate reason for introducing the manufacture of a product for which an adequate supply of suitably trained personnel existed in districts otherwise more favoured for non-specialised heavy steel output.

The wartime developments in the Sheffield area open up an interesting topic: we have already seen that transport costs exercised a great influence during the 19th century upon the location of the industry, but there are figures to show that this factor has been of somewhat diminishing importance during the period under review, although the mere fact that coal, ore and markets are not all found in the same place, makes it inevitable that transport should continue to be a significant factor in the costs of iron and steel. The cost of transporting pig iron and scrap for steel making is a much less relatively important item than that of transporting the materials to make pig iron. The Committee on industry and trade⁽²⁾ quoted three firms in the Cleveland district producing pig iron: in 1925, the average costs of transporting the raw materials was about one fifth of the market price of the product, the number of ton-miles involved being approximately 120 in all three cases. These figures are confirmed by the I.D.A.C's report on the iron and steel industry,⁽³⁾ when the average costs for the whole of the pig iron section of the industry were ascertained. For the same three Cleveland firms, however, the cost of transporting pig iron to the steel works was found to be just over 4% of its price, while an approximate calculation from I.D.A.C's report shows an average figure of a little over 5% of the market price in 1936, as the cost of transporting the materials for steel making. These figures exclude integrated plants of course. The method of charging by the railways has also weakened slightly the locational importance of transport costs. Coal, iron ore,

(1) Marshall "Industry & Trade"

(2) "Factors in Industrial & Commercial Efficiency".

(3) Cmd. 5507, 1937.

pig iron, raw steel and iron and steel scrap - all bulky items in relation to value, are placed in a low class in the railway classification of traffic and charged a relatively low ton-mile rate. In 1935 the iron and steel industries covered 17.4% of the volume of rail traffic but paid only 14.6% of the railway companies receipts from goods traffic. The greater the distance travelled moreover, the lower the rate per ton-mile charged.

That this last factor is "not generally an element of great importance", (1) is borne out by the comparatively high railway rates charged in Britain as against other countries. In 1927-8, the transport costs per ton-mile averaged, for heavy finished iron and steel - USA .45d, Britain .94d, Germany .85d, and for 'semi' products - U.S.A. .43d, Britain .78d, Germany .56d (2) This, however, is germane to the present topic only in so far as the high level of British rates by tending to put up the price of British steel at home and abroad placed an additional burden on the industry and thus hampered the necessary tasks of reorganisation

At the end of the first world war it was said that those four years of intensive activity in the iron and steel industry had led to the establishment of (3) "new works fed by home ores, and self-contained, providing on the same site modern coke ovens equipped with by-product recovery plants, blast furnaces, steel works and rolling mills." In actual fact, excluding the Sheffield developments, there was only one wholly new combined works erected. This was at Redcar, and Dorman Longs used it for heavy plate making: its proximity to shipping facilities must be counted as an important factor in favour of this location, as the North East coast has come to rely increasingly upon imported ores. A similar remark could be applied to Baldwins' Port Talbot Steel Works which was transformed into a combined works by the addition of blast furnaces and coke ovens during the war years. The Port Talbot project provides at least one example of a refutation of

1) Op.cit. Dennison p.50.

2) Burnham & Hoskins "Iron & Steel in Britain 1870-1930.

3) Hatch op.cit. p.42.

Sir John Hunter's earlier quoted remark, in that the combined works was obviously intended to make pig iron from imported ores, being situated at the docks where mechanical unloading gear was available. There is just one other case to note: at Scunthorpe, where a steelworks was added to a blast furnace plant operating without coke-ovens; but elsewhere in the words of D.L. Burn "where disintegration was normal it remained substantially this exemplified the Ministry's policy; there was no effort to concentrate production ..." (1)

The previous paragraph gives an intimation of what has been a material technical change in the iron and steel industry during the present century; a change which has exercised a profound influence on recent geographic trends. Blast furnaces and steel producing plants have been erected as a single establishment and pig-iron conveyed in molten form to the steel furnaces. The effect of this integration has been to conserve heat in the steel-making process and to reduce the amount of coal required to produce a ton of steel. "Much of the steel industry grew up at a time when the need for such practices was not realised, or the opportunity of them did not exist; and the result is still seen in the faulty location or in the divorce of processes which can best be carried on together in the same establishment" (2)

As a result of the integration of processes it has become profitable to develop the ore-fields of Lincolnshire and Northamptonshire, using the local ores of low iron content, which are plentiful although 'lean'. No coal is found in these areas, and it therefore has to be transported from elsewhere - notably from the South Yorkshire coalfields. Lincs. and Northants. are usually singled out as being outstanding examples of the locational shift made possible by these economies of technical integration, but it should not be overlooked that in other parts of the country as well there has been a marked movement towards the location of coke ovens beside the steel works, the additional costs of transporting coal instead of coke being outweighed by the economies

(1) Op.cit. p.361.

(2) G. D. H. Cole. "Why Nationalise Steel?"

of integration even, though the transport cost of sending coke from pithead to furnace is 30% lower than that of sending the coal necessary to produce a similar amount of coke. This latter movement had not gained much ground at the beginning of the inter-war period, however: most of the new war time coke-ovens were erected, as in earlier days, close to the coal mines and entirely divorced from the subsequent stages of blast furnace and steel works, and the surplus gases which could have yielded great fuel economies in the transfer process from blast furnace to coke-ovens, and from coke-ovens to steelworks were consequently wasted.

In 1918, a Departmental Committee of the Board of Trade appointed "to consider the position of the iron and steel trades after the war" issued its official Report, which endorsed, amongst other things, a policy of re-organisation within the industry to concentrate production in large efficient plants each capable of producing 300,000 tons of steel a year or more. "... it was possible at one time, to produce steel strip economically at the rate of 10,000 tons per annum" state the writers of a P.E.P. Report (1) "but with modern plant the economic minimum is nearer 250,000 tons per annum;" and they conclude therefore that "such changes obviously have a profound effect on location" by superseding smaller units. But opposition from within the industry three decades ago was sufficient, and competition between ^{firms} ~~them~~ was imperfect enough to over-ride the recommendations of the Committee: such combinations among firms which did arise did not lead to the construction of new plants on modern lines, and the prevailing tendency was towards vertical integration, although not unfortunately with an eye on the technical advantages which might have been gained thereby. To illustrate this point: firms located on the North East coast, in Lancashire and South Wales bought up mines and quarries in the East Midlands towards the end of the war in order to safeguard themselves against a shortage of iron ore. More might have been expected of the newly formed United Steel Company - a horizontal amalgamation consisting at

(1) Report on the Location of Industry, 1937.P.54.

first of the two Sheffield firms, Samuel Fox & Coy. and Steel Peech & Tozer, and later absorbing the Workington Iron and Steel Coy. in Cumberland and the Frodingham Iron & Steel Coy. in Lincolnshire, but as Burn points out (1) "it did nothing commensurate with its size to reduce the subdivision of production", and the ambitious plans of the Departmental Committee may be said to have fallen on stony ground, at any event temporarily, until the keen winds of foreign competition and economic depression brought back some of their ideas to a more impressionable iron and steel industry.

The next factor which we have to consider is the system of a uniform delivered price for Plates and Sections which was established among the regional associations of heavy steel-makers in the United Kingdom after the 1914-1918 war. By the end of 1923 the organisation had more or less stabilised itself and Great Britain and Northern Ireland were divided into seven regions: in each of these regions, which were fairly extensive, a "delivered" price was fixed. Consumers were at liberty to obtain supplies of steel from any region, but with whatever firm they placed an order, the same regional price would be charged, although prices might, and often did, vary from region to region. This policy of delivered prices for certain grades of steel was continued in the 30's by the Iron and Steel Federation under the supervision of the Import Duties Advisory Committee. The principal objections to it seems to be ^{the} hindrance to locational shifts of the steel consuming industries which might be occasioned by such a system. Obviously from the nature of the regional divisions the delivered price arrangement encouraged the dispersion of the consuming industries, as there was no cost advantage to be gained by situation close to a steelworks. At the same time, if it should be found that low cost production was possible in a previously undeveloped area the iron and steel industry would be unable to attract consumers close to the point of production, by virtue of the size of the regions. That such a locational shift might be mutually advantageous becomes apparent

(1) Op.cit..372.

when it is realised that the main bulk of British steel production in the past decade or two has been "open-hearth basic" steel, which requires a high proportion of scrap. Therefore, a location remote from a steelworks would involve the transport of a greater bulk of material in the case of a consuming industry which was using a large amount of steel, both in collecting its supplies of steel and in returning its scrap to the steelworks. In fact, the prices charged in this country were not particularly low for low-cost districts; but under the " basing point system" which was adopted in the U.S.A. a reduction of delivery costs was almost certain because this system encouraged the concentration of steel consumption. The American steel consuming firm paid for its steel ex the nearest important producing centre - or basing point, plus the transport costs. Thus there would be a natural tendency for firms to locate themselves in reasonable proximity to the basing points; and to act similarly if new centres of steel production were opened up. "it is a valid conclusion" writes S.R. Dennison in this connection "⁽¹⁾ that the (British) system shifts the emphasis from nearness to materials to proximity to markets as the chief locational factor", but he also quotes elsewhere ⁽²⁾ the figure of 16% as the average costs of transport of scrap metal to a port f.o.b. as a percentage of the value f.o.b. This is a significantly large percentage, and even allowing for a slight decrease when considering the home trade, it must be accepted that the delivered price system would be likely to be inimical to cost reduction in the newer centres of steel production such as Lincolnshire and Northamptonshire. Moreover, the very establishment of a uniform regional price is by implication, a bulwark against drastic re-organisation or re-location, in that the high-cost producing firms would tend to shelter and embed themselves behind it.

When 1921 came, the post-war boom had departed, and with its departure came ten difficult years for the iron and steel industry, conspicuous only by the smallness of the practical endeavours to

(1) Op.cit. p.53. (2) Ibid. p.66.

improve the lot of the industry. Two schools of thought prevailed: there were those who regarded recession as inevitable in view of the decline in the natural advantages, which had been enjoyed by the industry in the past, principally through the deterioration of raw material supplies. Those who supported this view were in favour of concentrating on such special products, as the high-grade steels of Sheffield which were unrivalled in quality elsewhere, or the acid steel of West Cumberland, a steel of the highest possible reliability, but in demand only when quality and not price was held to be the criterion. A more optimistic standpoint was taken by those who advocated radical reconstruction: they felt that, if the industry would only look to its faulty organisation and pay more attention to technical improvements, it could fight its way back into the front ranks of world steel producers. In retrospect, a situation in which "⁽¹⁾ British firms normally put little aside for depreciation, could rarely pay their fixed interest dividends, and the ordinary shareholders in heavy steel companies got nothing." seemed to hold out little promise of progress in the direction urged by those who supported this second viewpoint.

An empirical study of the fresh developments in the industry up to the onset of the "Great Depression" in the 30's bears out the previous remarks. From D.L.Burn, we have the disquietening information that "⁽²⁾ the elimination of plants was as uncommon in the decade as radical transformation, so that the structure pattern of the industry remained from the aspect of low cost locations very much as it was in 1900, though the average size of plants had grown." Of the structure pattern in general, however, there is evidence of a tendency towards that rationalisation which is anticipated in an earlier quotation from the P.E.P. Report through a growth in the size of the average unit of production. "... in the steel-melting division of the industry there were in 1924 665 open-hearth steel furnaces in the United Kingdom and the output of steel ingots and castings amounted to 8.2 million tons, whereas

(1) Burn. P.430. (2) Ibid p.432.

in 1929 the number of furnaces had been reduced to 595 and the output increased to 9.6 million tons".⁽¹⁾ It must not be overlooked, however, that advances in fuel economy must account, to an uncertain degree, for the increased output, so that it is not legitimate to say that what we are observing is purely the outcome of larger plants squeezing out smaller ones in favour of more advantageous locations.

The one example of the development of a low cost location is that of Lysaght's works at Normanby Park, Scunthorpe, which were subjected to a drastic reconstruction in the late 20's and became the first works in Great Britain to operate with no external fuel or power other than that provided by the coal which was used in the coke ovens: the fuel economies effected were compatible with continental results which were well in advance of the average achieved in this country at the time. No new common-grade steelmaking plants were laid down during these years up to 1931, and of the two remaining large reconstructions of note the formation of the Lancashire Steel Corporation is interesting as an example of the regional specialisation as a means of reducing the costs of marketing and distributing the finished products, upon which we remarked earlier. Here, at Irlam "a number of older plants have been closed down, and work is now in progress for the construction of the most modern type of coke oven, steel rolling and billets and steel bars plant, with ultimately a rounding off of the complete process by the erection of blast furnaces."⁽²⁾ The ore has to be transported from some distance, mainly from Lincs. and Northants. and it might have been more economical to have used "semis" from lower cost districts, but there is a big local market, especially for wire rods: a large proportion of the British manufacture of which is conducted by the Lancashire Steel Corporation. It may be added that the "financial factor" as an

(1) E. D. McCallum. "Britain in Depression" page 269.

(2) Industrial Survey of the Lancashire Area 1932. Section on Steel Melting, Iron puddling, furnaces, rolling mills etc.

influence on location comes on to the scene in Lancashire. The Bank of England sponsored the Irlam developments after reviewing its private survey of the iron and steel industry in the country; and it seems at least probable from the industrial survey of the area that without this financial backing the industry would gradually have shifted from Lancashire as "the record between 1923 and 1930 suggests that it is tending to disappear altogether for unemployment has been rising, whilst the insured population and the numbers employed have fallen"⁽¹⁾.

The third and last reconstruction of any consequence in the decade before the world slump of 1930 took place at Consett - one of the older centres of production which no longer retained its earlier advantages of ore and coal situated on the site of production. Nevertheless good coking coal was available within a short haul, and transportation charges for conveying the imported ores from the coast to Consett, and the finished products in the reverse direction could not, have been significant enough to induce a move towards the Tyne - a suggestion which had been rejected, although Newcastle would have been a profitable market for the company's coke oven gas. The steel-works and rolling mills were entirely rebuilt then, on the old site: it may be that such an old established firm did not desire to create the social upheaval which a locational shift might have occasioned to the life of the area; nor to lose the skilled workers which time and tradition had concentrated in the area, and it could afford to be more sentimental than most steelmakers in this respect for it possessed "vast liquid resources" - an uncommon phenomenon in the industry at this period. There were indications of the attractions of the Tyne to Consett a few years before the 1939-45 war, however, when the Company financed a new project consisting of electric ore furnaces and rolling mills at Jarrow; and erected its most modern coke ovens on the Tyne.

In 1930, a 'Civil Research Committee of the Cabinet' presided over by Lord Sankey, produced a report on the iron and steel

(1) Industrial Survey of the Lancashire Area 1932. Section on Steel Melting, Iron puddling, furnaces, rolling mills etc.

industry which, whilst ostensibly secret, became well known in this country through the publication of a pamphlet by the Kölnische Zeitung of Germany. From this account, which seems to be fairly reliable, the main conclusion of the Committee was that the re-organisation should be pressed forward in the first instance without a protective tariff for the industry - an issue which had been smouldering over the past decade, and was urged with more force, of course, as the world slump took a sharper downward turn. If the re-organisation by itself did not enable the industry to hold its place against foreign competition, then the Committee were prepared to see the introduction of protection for a period adequate for the recovery of the industry. Because of its extremely important implications for locational change towards a better ⁽¹⁾ siting and grouping of the industry, a brief consideration of what protection might entail, must be given here.

"Whilst there is a certain presumption that an industry which is struggling to come into existence will, if it is given a chance, adopt the most suitable methods of organisation, there is considerable danger that the protection of an industry which has fallen into difficulties largely through its conservatism and lack of initiative will simply result in the perpetuation of the old faults"⁽²⁾ Professor Whale seems to have had the iron and steel industry particularly in mind when he wrote this section of his book, and there is a crystallisation in a later passage of the fear which must surely have been in the background of the Civil Research Committee's advocacy of re-organisation rather than tariffs. "The case (for a "reconstruction" tariff) would be stronger if the problems could be made effectively conditional on progress being made in re-organisation. It is extremely

(1) The word 'better' must be understood only in a relative sense: "during recent times, the relative importance of various localising factors has been changing much more rapidly than in the past" so that causes which quite recently exerted a decisive influence are now often of quite small significance. Nevertheless, there were very many obvious examples of mal-location of the iron & steel industry at this stage. [P.E.P. Report. p. 58]

(2) P. Barrett Whale "International Trade".

difficult to contrive this. Protection promised only for a short period would usually be of no use at all; and if its continuance is to be assured so long as the industry in question makes reasonable headway in solving its problems, some outside authority or tribunal must be assigned the almost impossible task of determining whether this condition is fulfilled" (1). Instead of a radical re-organisation, the high cost producers would merely tend to perpetuate themselves behind the tariff barrier, and prices would remain as high as ever. It may well be that the method of reorganisation proposed by the Civil Research Committee - that of regional amalgamations and specialisations - would only have fostered progressive mal-locations of the industry, as Mr. Burn argues; (2) but in any case, the Bank of England would have been required to sponsor the financing of the scheme and that body was by now preoccupied with its own problems arising out of the depression. The situation then was favourable to those who wanted the tariff, and they won their case early in 1932, when a protective duty of $33\frac{1}{3}\%$ was imposed for three months, subsequently extended for a further three months; then for two years from October 1932, and finally in May 1934 the time limit was removed entirely - a chronological history illustrative of the fact that tariffs are comparatively easy to impose, but extremely difficult to remove. The remainder of Professor Whale's statement appears to have been equally prophetic, as we shall see.

".... the Government, the Import Duties Advisory Committee and the Iron and Steel Federation all adopted a policy which led, I agree "writes G.D.H.Cole (3)" to some increase in average technical efficiency as well as to higher profits, but did so in such a way as to limit expansion" From this stage on, we shall be concerned to discover whether there was any justification for this and other remarks to the effect that having got their tariff, the firms were in no hurry to build new plants and modernise the industry,

(1) P. Barrett Whale "International Trade". (2) Op. cit. p. 442.

(3) Op. cit. p. 28.

for there is a prima facie assumption (1) that this last decade of the period under review should witness the first large scale attempts towards affecting "the supply to the using industries of the right products at the right prices," and as a sine qua non to this from an industry situated (in so far as this can ever be determinant) in the right places.

For the first two or three years after the imposition of a tariff, there was only one stimulating project for a combined works that was actually put into construction. This was the new works of Stuart & Lloyds Ltd. at Corby in Northamptonshire - "perhaps the most interesting and important development in the depression period" (2). This had been planned in 1929, and the decision to go ahead with the work was made in November 1932; it therefore seems fairly safe to assume that the tariff had a favourable influence in this instance; although it certainly was not the prime mover. This scheme was the first large scale development of the Northamptonshire Ore Fields, and marked also a revival of the Bessemer basic process of steelmaking. Thus, apart from the transport costs of the coal, all other raw materials could be assembled on the site and full advantage taken of the fuel economies yielded from a large integrated plant. Moreover, Bessemer basic steel is the cheapest kind of steel to produce. Taking this factor into account, and also an earlier observation that transport costs tend to diminish as a product becomes more "manufactured", it will be realised that transport costs to markets of the finished product - in this case, tubes for assembling industries in the Birmingham area and for export - would not alter to any appreciable degree the advantages of the location. Finally, it may be noted that the Bankers Industrial Development Company arranged ^{the} £ 3 million financing of the Corby scheme - undoubtedly a happier choice than that made in Lancashire by the Bank of England.

(1) The renewal of the import duties was upon the recommendation of the I.D.A.C. made conditional upon the re-organisation of the industry.

(2) E.D. McCallum op.cit. p.276.

One example of "a strong tendency to concentrate manufacture near the sea⁽¹⁾" in South Wales is provided by the activities of Guest Keen & Baldwins, the only other firm in the immediate post-tariff years to erect a new integrated plant. More strictly this was an example of consolidation rather than of locational change, for the old site at Cardiff was chosen for the new works, but at the same time they closed down the old works at the hill site of Dowlais, thus emphasising the significance of a coastal location. In South Wales there is an ample supply of coal at hand, but ore has to be imported into the district from the Midlands or from overseas. In addition, quantities of pig iron are drawn from Lincolnshire. As the sheet steel and tinplate sections of the industry, which form the bulk of the South Wales product, were in a very backward condition, disintegrated and old-fashioned - and indeed, still are to a large extent - the Cardiff project can be considered as being at least one small step in the right direction. Elsewhere, there was a certain amount of reconstruction, adaptation and installation of new equipment, but nothing to occasion interest in a study of the location of the industry. A contemporary writer, observing the work that was being carried out under individual initiative at the time comments that "there are signs that the industry finds it difficult to carry through voluntarily the large scale re-adjustments which are expected of it in the interests of efficiency by the general public, The Government and the iron and steel consuming industries"⁽²⁾ He cites the National Committee of Iron & Steel Manufacturers which, under the auspices of the I.D.A.C., was set up to make proposals for the re-organisation of the industry. After two years of discussion, reports - and what in retrospect frankly looks like "tariff haggling" - the result emergent was not a scheme for the re-organisation of iron and steel but for re-organisation of the central body, henceforth to be known as the British Iron & Steel

(1) Industrial Survey of South Wales 1932.

(2) E.D. McCallum op. cit. p. 277.

Federation, stronger in character than the National Federation and (one year later) with an Independent Chairman. Collective action came first in the dealings of the Federation, as newly constituted, with the Continental Steel Cartel. Despite a 33¹/₃% tariff, continental steel makers were still able to compete with British firms in the home market: an eloquent revelation of the high costs which continued to prevail throughout the British industry, with all too few exceptions. So the tariff was raised to 50% and a quota fixed for continental imports at a preferential rate, whilst the British Iron & Steel Corporation was established to deal with these imports as a subsidiary of the Federation. It was felt by the Import Duties Advisory Committee that with this additional support the industry was in a position which "would encourage the continuance of the work of re-equipment and re-organisation to maximum efficiency, which were now being delayed by the uncertain future, but had otherwise been proceeding satisfactorily (1)" but very soon after this in July 1935 there came a development which brought to the forefront an issue which had been in the uneasy background since the Government had first come to the aid of the industry in 1932: the state as an influence upon location.

In 1933, Richard Thomas & Co. re-opened their Redbourne Steel Works at Scunthorpe, Lincs. for the manufacture of billets destined for rolling mills in Newport, (Mon.) In July 1935 they decided to erect a strip mill at Redbourne, presumably impressed by the economies which could be gained from the use of the Lincolnshire ~~areas~~^{ores} in conjunction with an integrated process of manufacture. The Chairman, Sir Wm. Firth, took the line that "it would be absurd and against the national interest to build modern works in South Wales. Northamptonshire and Lincolnshire were undoubtedly the natural centres for the economic production of British steel .." (2) But at this time, the Commissioner for Depressed Areas was striving to restart the Ebbw Vale Company in South Wales and the Prime Minister, Lord Baldwin, persuaded Richard Thomas to take over this

(1) D.L. Burn. p.457 referring to Cmd.4851(1935) & Cmd.5201(1936).

(2) "The Times" May 27th, 1936.

concern, and to build a new integrated sheet rolling works there - a plant which was soon to produce 30% of the British output of tinsplate. No doubt, Richard Thomas were acting commendably in creating fresh employment in a depressed area: but as the Ebbw Vale plant was to roll and tin steel sheets, this could not but aggravate the situation in their previous locations at Swansea and Llanelly - both coastal sites, it is to be noted. As Sir Wm. Firth so vehemently complained Ebbw Vale was a high cost location, and indeed a reversal of that "shifting of location from the hills to the sea" which has been noticed previously, inspired in part by the prospects of adequate scrap supplies. Richard Thomas owned sites in Lincolnshire and Northamptonshire, and D.L.Burn has estimated that the difference in cost of making pig iron in the latter area and in the Ebbw Vale were probably about 5/- per ton in 1936, sufficient in itself to prejudice the advisability of the Ebbw Vale project even on the original estimate of 150,000 tons of sheets and tinsplates a year; more so for the much larger output which was eventually attained. The firm was given a concession by the local rating authorities, but it seems unlikely that this would be a substantial factor, certainly not in fact nor for such a reason that high rates create the presumption that the services provided and the local administration generally will be of a poor quality. (1) In 1937 Richard Thomas found the costs of expansion at Ebbw Vale unexpectedly high, and the Bank of England had to step in with assistance "since the slightest possibility of failure after the public had subscribed £ 9 million was too serious to be contemplated." (2) Thus, despite the comparatively high costs of production because of the transport charges involved both for raw materials and marketing "it seems inevitable that steel sheet production will tend to become concentrated at Ebbw Vale and Shotton(Cheshire) to the detriment for instance of Stockton and Glasgow"(3).

(1)As suggested by the South Wales Development Council in evidence before Royal Commission on Distribution of Industrial Population.

(2) P.E.P.Report p.23. (3) Ibid.

Immediately after the Ebbw Vale project had been started there arose a further controversy which was to lead to a much closer supervision of the planning for further expansion of the industry by both the Federation and the Government. The proposed integrated plant at Palmer's Shipyard, Jarrow, became one of the main planks of support for those critics who accused the iron and steel industry of a negative dilatory policy behind the tariff barrier. The plan was to make steel by the Thomas process, which as we have seen was the cheapest kind of steel to produce, with suitable ores, and required less labour than the open-hearth process. ^{EW}Stuarts & Lloyds were willing to sell ores from their Northamptonshire sites for the purpose. The semis and small sections which it was intended to produce could therefore have been sold at low prices, with a market on the doorstep moreover; but the syndicate who were interested in the project could not acquire either the financial backing they needed or the promise of markets, through the Federation. Whilst this stage of the proceedings was being slowly enacted, Dorman Longs and Cargo Fleet, also situated in the North East, constructed new rolling mills of a type similar to what was intended for Jarrow. Good trade favoured these patchwork additions to existing plants, but they effectively ruled out the Jarrow scheme, despite a good deal of political agitation; and it seems fairly certain that opposition from other steelmakers was the predominant element in the discontinuation of the project." Unanimity might have been reached"⁽¹⁾ declared the Iron & Steel Federation in a revealing sentence "upon the principle of a co-operative and integrated plant if located upon the Tees." Jarrow was not forgotten, however, and later in 1936 another scheme was finally approved, with Consett providing the capital. An electric steel melting plant was to be erected with rolling mills to handle its products and to re-roll semis from Consett.

In its report on the present position and future development of the iron and steel industry ⁽²⁾, the Import Duties Advisory

(1)"Times" July 7th, 1936. (2) Cmd.5507 1937.

Committee defined its supervisory scope as covering "location in relation to sources of raw materials, and markets, balance between home and imported materials, centralised versus scattered plants." The Federation had, meanwhile, assembled a committee to examine all schemes of expansion in the industry, before submitting them to the Government agency; and even to recommend expansions where they seemed to be desirable. The first fruits of this closer co-operation which one gathers had been thrust upon the two bodies are to be seen in four projects which had been approved. Jarrow has already been discussed. A second was for the erection of blast furnaces, coke ovens and steel furnaces at Frodingham, Lincs. by the United Steel Company. This proposition could be regarded as a hopeful omen, so far as it went; but unfortunately, the finishing stages were to be carried out at United Steels' Rotherham Works for onward transmission to consumers in the Birmingham area. The radical change needed would have been to concentrate the rolling mills at Frodingham as well, it having been already stressed that Sheffield was an inappropriate location for mass production steel making except where a strong local demand was to be met. Furthermore this arrangement entailed additional transport costs with all the concomitant possibilities of disrupting the even flow of production which might be expected if the processes of manufacturing had been combined. The economies of integration must not be over emphasised, but here was a situation known to be favourable to combined works, with every expectation of long, economical "runs". United Steels' own Chairman, Sir.W. Benton Jones, intimated that "the steel industry in the future is likely to find fuller employment than in the past" as early as October 1934; so that reluctance to abandon a comparatively new works despite its apparent anachronism must be the conclusion reached for the retention of the Rotherham works.

In 1932, a responsible industrial inquiry made the gloomy statement that "(1) unless there is some drastic re-organisation ... the prospects (of the pig iron section of the industry) are dreary in the extreme." Scotland was faced with its own peculiar

(1) Industrial Survey , South West Scotland.

problems: the rapid exhaustion of the Lanarkshire Splint coal and local ores left all the blast furnaces many miles from the ^acost, just as the industry was beginning to rely more and more upon imported ores. Thus, the high costs of Scottish pig iron coupled with the necessity of importing iron ore or pig iron from the continent or other parts of Britain put the Scottish steel-makers at a relative disadvantage " although the steelworks themselves are on the whole as efficient as any in this country⁽¹⁾". In 1929 there were discussions among the Scottish Steelmakers concerning the establishment of a new combined plant on the Clyde, near shipyards so that foreign ores could be unloaded direct from ships to the works and with the intention of supplying coke oven gas to Glasgow. The scheme was not carried through, however, possibly because of the high capital costs involved. In addition to pig iron the Scottish industry uses a very high proportion of scrap, however, and is favoured by a good local supply of this; and for markets, the bulk of the industry need look no further than the nearby shipbuilding yards and heavy engineering works. Technical improvement and concentration and a regular supply of raw material, therefore, were - and still are - in the main interest of the Scottish Steel Industry. In the light of the foregoing, the third project approved by the Import Duties Advisory Committee reveals yet another example of reluctance to abandon old equipment and to make the radical change necessary for lowest possible cost production. The Colvilles group which brought together approximately 4/5 ths of the Scottish steel capacity in 1936, added blast furnaces and coke ovens to their steelworks at Clydebridge to supply the bulk of Scottish pig iron requirements; but not much concentration was effected, and in fact " in steel-making and steel rolling there remains a large programme of regrouping, scrapping and rebuilding."⁽²⁾. Whatever the

pretext - and this was the decade when the social costs of locational changes were coming into prominence and possibly being used to justify policies that lacked an economic sanction - the problem was not squarely faced and the question remains " whether the new plant should be mainly grouped at the more favourable of the sites already occupied by steelworks, or built at an entirely new riverside site lower down the Clyde." (1)

Lastly, John Summers of Shotton, near Chester, were recommended to go ahead with the building of a continuous strip mill for the manufacture of steel sheets, a project principally intended to replace old equipment. This firm had moved to Chester at the turn of the century when its business was almost wholly in export markets, so that proximity to a great Port like Liverpool was undoubtedly an asset. At the time, the industry as a whole was dubious about the low grade ores of the East Midlands, but the technological discoveries of the intervening years accentuated the relatively higher costs which were certain to obtain in Chester, when the raw materials had to be transported from Lincs. or Northants. with a loss of the economies of an integrated plant. Here also, the Import Duties Advisory Committee noted with satisfaction that the balance of employment was not being disturbed; and indeed there seemed little likelihood of disturbing John Summers from their location for many years ahead, for the scheme was supported by a large sum of new capital put up by the United Steel and the Bankers Industrial Development Coy. Second thoughts on Shotton are illuminating: "it is recognised that the Shotton plant is not situated in so favourable a position for the assembly of the raw materials, coking coal and ore, as some of the other coastal plants, and it is visualised that this plant will operate on a rather higher proportion of scrap than for the country as a whole." (2)

(1) Industry and Employment in Scotland Cmd. 7125 1947 p.28. The second alternative is adopted as the long term end in view Cmd. 6811 1946.

(2) Report by the British Iron & Steel Federation 1946 Cmd. 6811.

Offsetting against this the technical desirability of using higher grade imported ores for modern steel making, it still appears to remain an open question whether this plant could be said to be operating in the best possible location. A familiar attitude of unwillingness to abandon a 'going concern' is observable although perhaps more justified in this instance than in others which have been described.

This brings us to the end of the major schemes which were put into effect during the period. Sir Wm. Larke, the Director of the Iron & Steel Federation gave a figure of £ 10 millions a year spent on 'modernisation' between 1934 - 39, but the recent White Paper⁽¹⁾ quotes £6,250,000 a year on "constructional work", the disparity between the two figures being due of course to the fact that the former included ordinary replacement of obsolescent plant. Despite the great increase in efficiency obtained through this comparatively small expenditure "most was achieved by improving details and parts of plants, relatively little by concentration and translation"⁽²⁾, however, the old problem of a fundamental lack of balance between one stage of the industry and the next remained. By 1938 about one third of all the ore used in pig iron was imported; scrap formed 57½% of the steel furnace charge, and nearly 800,000 tons of that was imported ~~imported~~. Coke supplies were inadequate due to a lack of coke ovens, both in numbers and in efficiency. Then the inadequacy of the blast furnaces made pig iron supplies insufficient to meet the needs of the steel furnaces. Our semi-finished steel output could not fully supply the capacity of the finishing sections and quantities had to be imported. Only in the finishing stages was the capacity adequate, and here there was a chronic surplus capacity except at the height of a boom. Table 5 demonstrates plainly enough how the distribution of steel production remained almost the same in 1937 as it was in 1929.

(1) Cmd. 6811 p.35.

(2) Burn p.483.

TABLE 5.

REGIONAL DISTRIBUTION OF STEEL PRODUCTION (PERCENTAGES).

	1913	1929	1935	1937
North East Coast	28	23	21	22
S.Wales & Monmouth	23	24	19	20
Scotland	19	16	13	15
Sheffield	11	13	14	13
Lincs.	3	8	11	10
Lancs.Ches.	7	8	9	8
Black country	5	6	7	5
North West Coast	5	2	3	3
Northants	0	0	2	3

Reticence on the part of the industry to develop the Lincolnshire and Northamptonshire ore fields may be advanced as one reason for the undue reliance upon imported ores; but it would be impossible and quite impracticable to centre all production in these areas. If we were sitting down to plan a steel industry from scratch, we would probably locate its main production centres very differently from their present positions. But things being as they are, even from the narrow technical point of view, any savings in the actual costs of production must be countered partially by the increased cost of transport to the market and this applies particularly to the export market when the main home ore fields are situated inland. "A limit is set on the extent to which additional production should be developed on a home ore site by the extra carriage incurred if a disproportionate amount of steel is produced in one location." (1) Moreover as D.L.Burn points out (2) "to promote long period stability there must be some relatively high-cost production using foreign ores." The social implications of the widespread upheaval of an important basic industry are too great to be lightly ignored, despite the fact that increasing mechanisation has loosened the bond which a skilled labour force maintained in the past, and laid more stress upon general intelligence and adaptability. Burn stresses material

(1) Cmd.6811 p.12. (2) Op.cit p. 505.

assembling costs as the chief consideration, to be borne in mind when determining location. This brings us back to the transport factor under another name. For all practical purposes markets must be taken as immobile, contrary to his assertion, but we can certainly agree that where the choice of a location is balanced between the transport costs of the raw materials to the centre of production and the delivery costs from the centre to the market, in all other than very exceptional cases, the former would take precedence.

The argument thus leads us to accept the validity of each region as far as possible getting its raw materials from the most suitable place and selling for its most localised market. Thus the North East, Scotland, South Wales, Lancs. and the North West coast should aim at supplying either their own industrial hinterland or the export market, for which they are comparatively well-placed. Lincs. and Northants should concentrate on the Midlands and home market. Obvious exceptions occur to the mind; it would for example be stupid to suggest that Sheffield should be barred from the export market with her high grade special steels.

The broad trends at work in the re-location of the iron and steel industry are discernible, although they were not explicitly recognised by either the Federation or the I.D.A.C. before the war: on the one hand, there is the concentration upon the home ores, suitable for making low and medium grades of steel, on the other, the growing importance of coastal sites where foreign ores can be easily handled and higher grade qualities of steel produced. In both cases there is a move towards increasing integration of plants; certainly this integration could be carried too far, but this consideration is not one of the industry's immediate problems. Integration implies in general an increase in the average size of plant; and though this was happening during the inter-war years, there was no growth comparable to that of foreign rivals. There seems little doubt that the development of quota schemes behind a protective tariff, coupled with the great cost of providing new

capital equipment for an industry notoriously susceptible to booms and slumps, militated against a progressive locational policy. While it was possible to produce guaranteed if limited quantities of steel within the cartel framework of the Iron and Steel Federation, aided by the imperfections of competition, there was no incentive for producers to scrap and modernise on the scale which "the national interest" might have been held to demand and which the Sankey Committee would like to have seen. "Predominantly the policy of patching" prevailed from 1919-1939. A drastic move in such an industry entails a hundred and one vital decisions: one of the most important capital assets of a firm - though it does not appear anywhere in its balance sheet - is the fact that it forms part of an established community. The houses where its workers live are nearby, roads and railways are arranged to handle its goods, the local authority provides all the thousands of incidental services for the company itself and for the community of which it forms a part. These intangible assets do not lend themselves to precise formulation: they must be calculated again for each and every case. And yet can they be legitimately disregarded from the cost of producing iron and steel?

In the last analysis, the economist gives his approval to a new location on the basis of the combination of factors which will yield the lowest cost of the finished product to the consumer over the long period. In his absorption with the number of transport miles from raw material sources to plant, and from plant to markets, with optimum size and technical efficiency, with production and a steady flow of factors, he may tend to overlook that society "must regard economic interests as one element in life, not as the whole of life. It must so organise its industry that the instrumental character of economic activity is emphasised by its subordination to the social purpose for which it is carried on."⁽¹⁾ But with problems of location, we are not yet dealing with an element for which precise rules can be laid down and elevated to 'laws'; and if we accept Tawney's dictum as

(1) R. H. Tawney. "The Acquisitive Society". p. 241.

a criterion, we still have to master the vast problem of embodying technical progress into acceptable institutional forms. The greater the emphasis upon social organisation, the greater the onus which is placed upon the exponent of locational problems: no industry has such a need of wider vision in this respect than iron and steel.

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A P P E N D I X I.

MAIN STAGES OF IRON & STEEL PRODUCTION

from G. D. H. Cole (slightly amended). "Why Nationalise Steel?"
New Statesman & Nation Pamphlet.

