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SPECIAL MEMORANDUM No. 39

**THE IRON AND STEEL INDUSTRY
OF GERMANY, FRANCE, BELGIUM,
LUXEMBOURG AND THE SAAR**

BY
FREDERIC BENHAM

OCTOBER 1934

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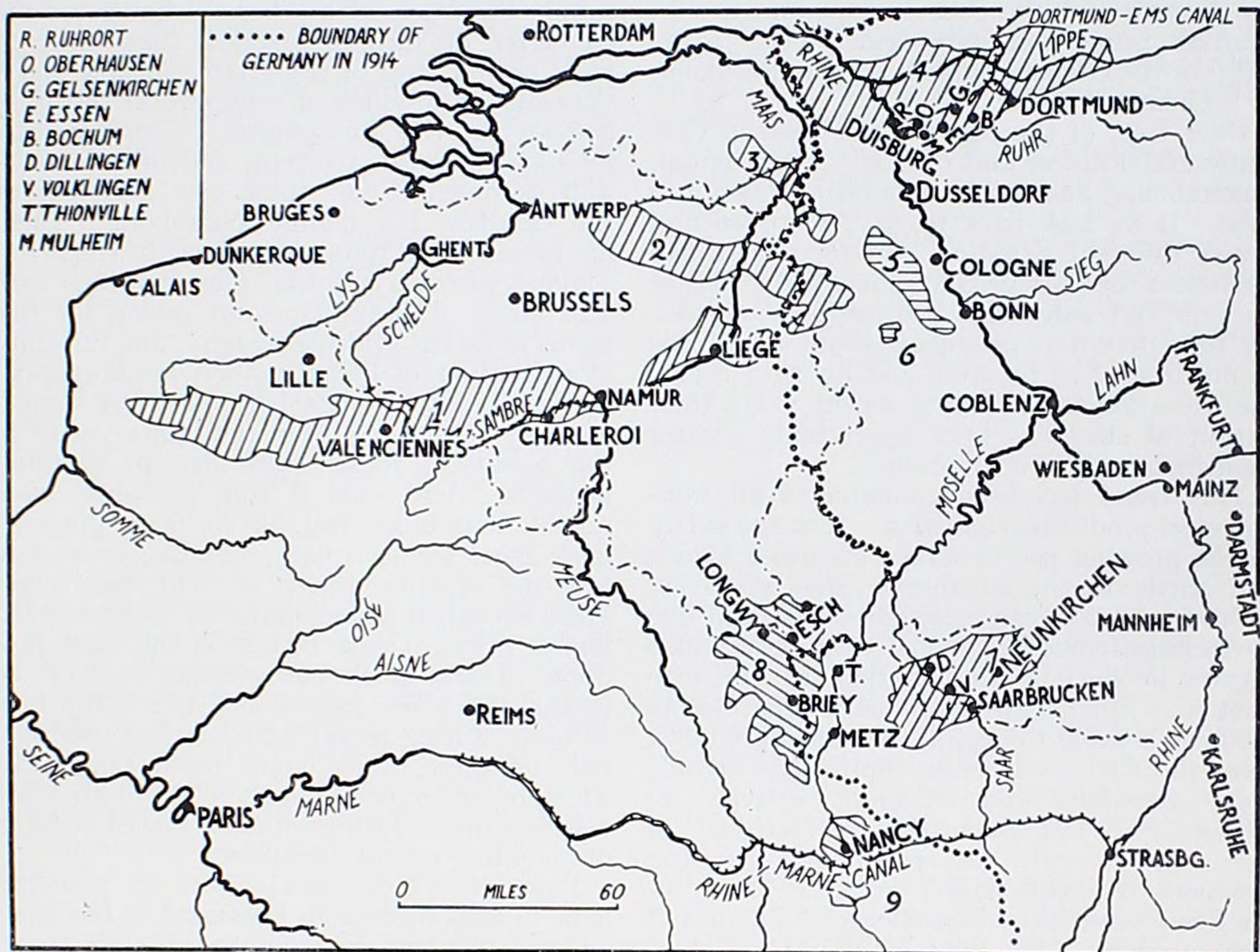
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THE IRON AND STEEL INDUSTRY OF GERMANY, FRANCE, BELGIUM, LUXEMBOURG AND THE SAAR



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4. Westphalian Coalfield.
5. } Cologne Lignite Field.
6. }
7. Saar Coalfield.
8. } Lorraine Iron Ore Field.
9. }

INTRODUCTION.

THIS Memorandum is mainly a collection of facts about the iron and steel industry in Germany, France, Belgium, Luxembourg, and the Saar. Most of the figures given have been rounded*; those who desire greater detail should consult the sources named in the Bibliography. Many of the statistics for 1933,

* Hence the totals in the Tables are not always identical with the sum of the items.

and some for 1932, are only provisional. The ton used throughout, unless otherwise stated, is the metric ton of 1,000 kilogrammes or 2,204 (English) pounds weight, and not the ton of 1,016 kilogrammes or 2,240 (English) pounds weight.

This introduction makes some general comments upon the facts and figures which follow it.

I.—NATURE OF OUTPUT.

Most of the steel produced in the world is produced by the open-hearth or Siemens-Martin process. In both the United States and Great Britain, during recent years, 90% or more of the steel produced has been open-hearth. But nearly all of the Belgian and the Luxembourg output, some three-quarters of the French and the Saar output, and a substantial proportion (averaging 43% 1925-1933) of the German output, is basic Bessemer, or "Thomas," steel.

Over 80% of the pig-iron produced in Germany and France, and over 90% in Belgium, Luxembourg, and the Saar, is transformed into steel. If we look back to, say, 1870, we find a very different situation. In 1870 these five territories together produced over 3 Mn. tons of pig-iron and only some 200,000 tons of steel. By 1900 they were producing about two-thirds as much steel as pig-iron, and by 1913 nearly the same amount; during recent years their output of steel has been appreciably greater than their output of pig-iron.

This trend has been common to all iron- and steel-producing countries. It is due partly to the growing use of scrap, discussed below, and partly to the advance of steel relatively to iron. This advance, in turn, has been due to technical progress, which has been much greater in steel production than in iron production. Further, iron products require more labour relatively to capital than steel products. Over the last few decades capital has become more abundant and cheaper relatively to labour; this has favoured steel relatively to iron. In general, the production of iron products requires skilled labour. The production of most basic Bessemer (or "Thomas") steel products does not: only a handful of supervisors need be skilled. Thus in the Lorraine area (including Luxembourg), where workers are recruited mainly from the local agricultural population and from abroad, very little iron is produced.

We may next notice that nearly all the steel produced in these five territories is basic, and not acid, steel. Nearly all the iron ore consumed in France, Belgium, Luxembourg, and the Saar comes from the "minette" deposits of the Lorraine field. This field extends between Nancy and Luxembourg for 120 kilometres with an average breadth of 20 kilometres. It covers 120,000 hectares, divided between Meurthe-et-Moselle (73,000 hectares), Moselle (43,000 hectares), Luxembourg (3,600 hectares), and Belgium (400 hectares). The

term "minette" is a derogatory diminutive of "minerai." The ore was at first considered of little value. Not only has it a low iron content; it also contains phosphorus, which made the iron produced from it of poor quality, and too liable to break. Gilchrist and Thomas, in the late seventies, changed all that. Their simple invention of a "basic" lining for the converter or furnace enabled these ores to yield both a steel of respectable quality and a valuable by-product of agricultural fertiliser, embodying the phosphorus. Germany uses Swedish, Spanish, German, and other ores as well as minette, but these ores also (except the German) are mainly phosphoric. There has been a world trend, ever since the Gilchrist-Thomas discovery, towards basic rather than acid steel. The fundamental reason for this seems to be the growing scarcity, and difficulty of extraction, of hematite (or non-phosphoric) ores relatively to phosphoric ores. A supplementary reason has been the improvement in the quality of basic steel, due to technical progress. Acid steel is still, probably, more reliable than basic steel, but for many purposes basic steel seems equally suitable, or at any rate the superior quality of acid steel is not great enough to compensate for its 10 to 15% higher price. Great Britain is the main producer of acid steel, but whereas in 1913 she produced 4.9 Mn. tons of acid to 2.8 Mn. tons of basic, during recent years she has produced two or three times more basic than acid. This preponderance of basic steel will probably continue unless further suitably-placed deposits of hematite ore are discovered.

Finally, we may consider why the predominant process (except in Germany) is Bessemer and not open-hearth. (Other processes are of quite minor importance, although electric furnaces—producing a high quality, expensive steel—have been contributing a growing percentage of the total output.) In this connection, two differences between these processes are significant. First, the Bessemer process, lasting only twenty to thirty minutes, consumes considerably less fuel than the open-hearth process, which lasts for a number of hours. Second, the latter, unlike the former, permits the use of a high proportion of scrap. An open-hearth furnace could be run entirely on scrap, although none are, since the resulting product would be of poorer quality; but in the North and Centre of France the proportion of scrap used is as high as 75 to 80%.

The main reason why the steel output of

France, Belgium, Luxembourg, and the Saar is predominantly Bessemer is the relatively high price of coal in these areas. Luxembourg imports all its coal (mainly in the form of coke). Lorraine also imports most of its coal from other districts, for the Lorraine coal plays quite a minor part. Thus these two districts have to pay transport charges on their coal or coke. It is easy to understand why Luxembourg, paying about a hundred Belgian francs a ton for the transport of Ruhr coke, uses almost entirely the fuel-economising Bessemer process, and why about three-quarters of the output of Lorraine is Bessemer steel. The output of open-hearth steel in Lorraine—about a quarter of its total output—is explained partly by the quantities of “new” scrap available from the rolling mills, partly by the supply of gas available from the coke ovens (Luxembourg has no coke ovens) which provides heat for the open-hearth furnaces, and partly by the French internal demand for open-hearth steel. But even in the North and Centre of France, Belgium, and the Saar, where iron and steel production is based on the presence of coal, the coal is nevertheless

expensive when compared with the pithead price in England or the Ruhr, for in the former districts coal is relatively difficult to win, and both France and Belgium are net importers of coal. Moreover, the quality of Belgian coking coal is comparatively poor and that of Saar coking coal still poorer. The fact that about half the steel output of the North of France and three-quarters of the steel output of the Centre of France is open-hearth is explained by the internal French demand for open-hearth steel, and by the distance of these districts from ore deposits, and their comparative nearness to scrap supplies.

Rhineland–Westphalia, on the other hand, has cheap supplies of good coking coal and of scrap, and has to import most of its ore: hence Germany produces more open-hearth than Bessemer steel. It is perhaps significant that during the last three years the production of “Thomas” steel in Germany has been reduced considerably more than that of open-hearth steel. The latter process may be expected to gain ground relatively to the former in Germany as existing Bessemer equipment wears out.

II.—MARKETS.

The comparative magnitude of the different uses to which iron and steel are put varies between different countries. The United States is exceptional in the high proportion—recently as much as 20%—absorbed by the automobile industry. Out of the five territories here considered, estimates are available only for Germany (see page 26). The Institut für Konjunkturforschung estimates that over a third of the German iron and steel production is absorbed by “iron and steel wares”: a very wide category which includes, for example, the demands (other than for machinery and buildings) of gas and water companies, and for which there is no equivalent term in English. But there can be no doubt that the bulk of the demand for iron and steel products comes from the constructional and engineering industries, which use iron and steel as a raw material. Thus it is not surprising to find that the home demand of the small territories of Belgium, Luxembourg, and the Saar is quite small compared with that of Germany and France. Belgium exports normally 75 to 80% of its production, the Saar over 90%, and Luxembourg almost the whole. Germany and France, on the other hand, each exports a proportion which has varied during recent years (1926–33) around 30%. In terms of absolute tonnage, however, before the depression,

the exports of Germany were greater than, and those of the French–Saar Customs Union nearly as great as, those of Belgium and Luxembourg combined. Moreover, nearly a third of the “exports” of the Saar have been sold to the French internal market, and over a third to the German internal market, while the latter has also taken a small percentage of the Luxembourg output.

The iron and steel exports of all these territories are fairly widely distributed among different countries, but the largest single market for them all (except the Saar) is on the whole the United Kingdom. Thus in 1930, the United Kingdom took 727,000 tons out of a total German export of 4,540,000 tons; 626,000 tons out of a total export from France and the Saar of 4,075,000 tons; and 1,030,000 out of a total export from Belgium and Luxembourg of 3,918,000 tons. The relative importance of the British market, however, is much greater for Belgium and Luxembourg than for the others. And it is these countries, together with Lorraine (most of the French exports to Belgium and Luxembourg—507,000 tons in 1930—are re-exported), who have suffered most from the British import duty of 33 $\frac{1}{3}$ % on iron and steel, and who will be hardest hit if this duty is raised or if a quota is imposed to protect British home production of iron and

steel still further. The relevant British Board of Trade indices are as follows :

RETAINED BRITISH IMPORTS OF IRON AND STEEL AND MANUFACTURES THEREOF.
(Average of 1930 = 100.)

	Index Numbers of	
	Volume.	Average Values.
1924	76.9	124.3
1930	100.0	100.0
1931	94.8	89.1
1932	49.5	75.3
1933	34.9	75.7

There was an increase in the first half of 1934. Even so, the volume of imports in the first half of 1934 was only about half that of the first half of 1930 and the prices received were considerably lower. (The index number of volume was 50.5 for the first quarter and 48.9 for the second quarter; that of average values was 81.0 and 82.7.*)

Of course, much of the fall in British imports has been due to the depression and to the reduced exchange-value of sterling, but a considerable part of it has certainly been due to the import duties. It should be noted that, despite these duties, Belgium and Luxembourg have maintained their production and exports during the depression better than the other territories considered here.

It is perhaps worth while pointing out that iron and steel products have a low value per ton relatively to most industrial products, so that the transport costs from works to market form a considerable percentage of the "delivered" or "c.i.f." price. This gives an advantage to any centre in selling to those markets to which it can transport goods more cheaply than other centres. Thus Belgium has such an advantage in selling to Great Britain and to many overseas countries, and the Saar has such an advantage in selling to South Germany.

Relative cheapness of transport, of course, does not depend solely upon relative distance. In the first place, sea transport is much cheaper than land transport. This fact, however, has little direct relevance to the competitive position of the main producing centres considered here relatively to one another. For the bulk of the overseas exports goes via Antwerp, although the French railways charge the same rates from the Moselle district to Dunkerque as those payable from that district to Antwerp, despite the considerably greater distance, and although some export from the

Ruhr takes place down the Rhine to Rotterdam. But the comparative dearness of land transport as against sea transport emphasises the advantages of the Belgian works in being situated so much nearer the seaboard than the other leading centres. In the second place, inland water transport is usually cheaper than rail transport, although this is not always apparent if rail and water rates between two points are compared, for railways have a habit of lowering their rates to meet the competition of an alternative water route. This fact, again, is of only minor importance for most of the centres considered here. The great bulk of their iron and steel products are despatched by rail. The only exceptions worth noting are exports from the Ruhr district, which on the whole go mainly by water (to Antwerp and Rotterdam), and some movement from the Metz-Thionville district by the canalised Moselle and the Rhine-Marne canal to the Paris region. The works of the Metz-Thionville (or Moselle) district invested considerable sums in order to get the Moselle canalised between Metz and Thionville. The canal was opened in August 1932. It affords unbroken water communication (via Strasbourg) with the Ruhr, from which coking coal is imported and to which ore is sent, as well as with the Paris region. But it is not yet certain that the investment will prove profitable. In two or three years time another important canal, now under construction, may be completed: that between Antwerp and Liège.

In the third place, railway rates per ton-kilometre are not uniform. The dense industrial population of Belgium, coupled perhaps with the relatively low wages there, enables the Belgian railways to charge considerably lower rates than most railways, thus affording an "external economy" to the Belgian iron and steel industry. Again, as the railway rates table for steel bars on page 49 shows, much lower rates are charged for export traffic than for inland traffic. But since this practice is followed by all the railways, the competitive position of the centres considered here, relatively to one another, is not much affected thereby. Finally, railway rate policy within a country may be partly designed (as the Report to the French National Economic Council declares it should be designed) to counteract the disadvantages of centres in less favourable locations. Throughout the area we are considering, railway rates are considerably lower per ton-kilometre for longer distances (and this is only partly due to lower costs per ton-kilometre for longer hauls); and some additional concessions are made to

* Board of Trade Journal, May 3 and July 26, 1934.

certain less favourably placed works, such as those of the Centre of France.

Nevertheless, the main point remains valid and significant. The iron and steel industry, owing to the weight of its product, is especially subject to local monopoly. Each producing centre has a distinct advantage in selling to neighbouring markets. This advantage is strengthened, in all the territories considered here, by the adoption of the basing-point system. The consumer pays the price fixed by the national cartel, plus the freight from the town chosen as the basing-point (for example, Oberhausen or Thionville), no matter from which works the goods are actually delivered.

This advantage may be partly counteracted by a direct or indirect subsidy to exports given by a competing country. All the territories considered here are on the gold standard, although the adherence of Germany is somewhat nominal. If one of them were to depreciate its currency externally, without a corresponding rise in internal costs, its ex-

porting industries would receive a temporary competitive advantage. Germany has already done something in this direction, by assisting exports with the aid of scrip marks.

Again, a national market, to which a foreign centre would otherwise sell at a profit, may be partly or wholly closed by import duties to protect its home industry. Both Germany and France have fairly high duties on most iron and steel products, although both admit Saar products duty free, and the former undertakes to buy limited quantities of pig-iron and other products from France and Luxembourg (see pages 47-48).

Finally, this discussion gives only a part of the picture. The complete picture includes costs of production, as well as the transport costs of delivering the products. The latter have been considered first, since they bring out the "local monopoly" aspect, and explain the continued existence of certain centres with relatively high costs of production. We now turn to the former.

III.—COSTS OF PRODUCTION.

This is a very complicated subject. We may begin by pointing out that interest on the capital already invested in an undertaking is not a price-determining cost. The blast furnaces, rolling-mill trains, and so on, are there. Their form cannot be altered; bygones are bygones. If the plant is worth working, then, subject to limitation of output by cartels, it will be worked; if not, it will be scrapped. The magnitude of the capital originally invested has no relevance to this issue. If current costs (including those for running repairs, new linings, etc.) can be more than covered, the plant will be worked. Only when it is worn out will the question arise of whether new free capital (possibly available from the sums set aside for depreciation) will be more profitably invested in replacing it than in some other direction.

Several writers on the iron and steel industry include fixed interest charges on borrowed money, but not dividends, in costs, since the former have to be paid out before any profits can be declared. But if mal-investment has taken place, its extent depends only on the amount so invested, and not on whether it was supplied by the share-holders or borrowed at fixed interest in the hope that it would earn rather more than it cost the share-holders in interest-charges. If current expenses, including fixed interest-charges, cannot be met, then—unless the share-holders are sufficiently optimistic about future conditions to pay the

difference out of their own pockets—there will be some reorganisation (with or without formal bankruptcy) involving a scaling-down of the fixed charges, for the creditors will prefer to get something rather than nothing.

Current interest on working capital, on the other hand, is a price-determining cost, since the capital is constantly becoming liquid, and need not be re-invested. Throughout the last ten years or so, interest rates have been considerably higher in Germany than in the other territories considered here. In this respect, costs of production in Germany have tended, and still tend, to be higher than elsewhere.

We may next mention taxation. A tax levied on the turnover, besides offering an inducement to integration, tends directly to raise both costs and prices. A tax levied on the assessed value of the property (which has to be paid irrespective of what profits, if any, are earned) does not directly affect prices, but it does definitely enter into costs. Both types of tax have been and still are quite considerable both in Germany and France.

We may next consider wages. The British Delegation which visited these territories (see page 51) gave the average inclusive normal weekly earnings of all classes of workers, in English currency, at the beginning of 1930 as

France	37s.
Belgium	35s. 5d.
Luxembourg	36s. 7d.
Germany	50s. 11d.

In the Saar, which the Delegation did not visit, average hourly earnings per worker (according to "Saarwirtschaftstatistik") were 5.15 francs—nearly £2 per week. (The corresponding figure for Great Britain is about 60s.)

Without doubt, wages have been considerably higher in Germany than in the other territories. Of course, it is labour costs (including compulsory social contributions paid by employers) per unit of product, and not weekly earnings, which are relevant in this connection. Satisfactory data on this are almost impossible to get. A very rough comparison of the production per worker (including only workers employed in blast furnaces, steel works, and rolling mills) in 1932 in Germany, France and Belgium is as follows:

OUTPUT.
(000 tons.)

Country.	Number Engaged.	Foundry and Forge Pig-Iron.	Semi-Finished Steel Products.	Finished Steel Products.	Total.	Output per Worker (tons).
Germany	63,000	442	319	4,234	4,995	79
France	60,500	1,027	1,002	4,081	6,110	101
Belgium	30,800	133	584	2,048	2,765	90

The defects of such a comparison are obvious. In particular, differences in the time worked are ignored; and pig-iron, "semis," and all kinds of finished products, are lumped together by weight. (The latter defect would not be avoided by taking values, owing to the differences between the three countries in inland prices for similar products.) Both these defects render the comparison unduly unfavourable to Germany. But the comparison, with all its faults, does suggest that differences in output per worker (after allowing for the two points mentioned) are not marked between these three countries. The higher wages in Germany are not compensated by a correspondingly greater physical output per worker.

The proportion of labour costs to total costs depends largely upon the method of reckoning. A works which does nothing but re-roll "semis" will count the price it pays for the "semis" entirely as costs of materials. An integrated works, with blast furnaces, steel works, and rolling-mills, will take its total wages bill (thereby including the labour cost of producing its pig-iron, ingot steel, and "semis") as its labour costs. A firm which owns iron and coal mines, as well as one or more integrated works, will include the wages paid to its miners as part of its labour costs.

If we include the labour costs incurred in producing pig-iron and transforming it through the various stages into finished products, but

count the cost of ore, coke, and other materials as being the cost of materials, labour costs in the countries considered here appear to form between 20 and 30% of total costs. The data available are not sufficiently complete to be more precise. The country for which the fullest information of this kind is available is Luxembourg. In 1932, the value of production and the wages bill in different stages, in millions of Belgian francs, was as follows:

	Pig-Iron.	Steel.	Rolling-mill Products.	Foundry Products.
Value of Production	498	606	751	21
Wages Bill	41	22	82	7

The net total value of output was a little over 772 Mn. (751 + 21) francs, and the total wages bill was about 152 Mn. francs, or around 20%. Available statistics suggest that in Germany during the last few years this percentage has been around 25%, and that in the Saar it has been in the neighbourhood of 30%. But the statistics are not sufficiently comparable for much weight to be placed upon them. What is certain is that direct labour costs form less than 10% of the cost of producing pig-iron in a blast furnace equipped with labour-saving devices for automatic charging, etc., and that the proportion of labour costs to added value is greatest in rolling-mills and foundries.

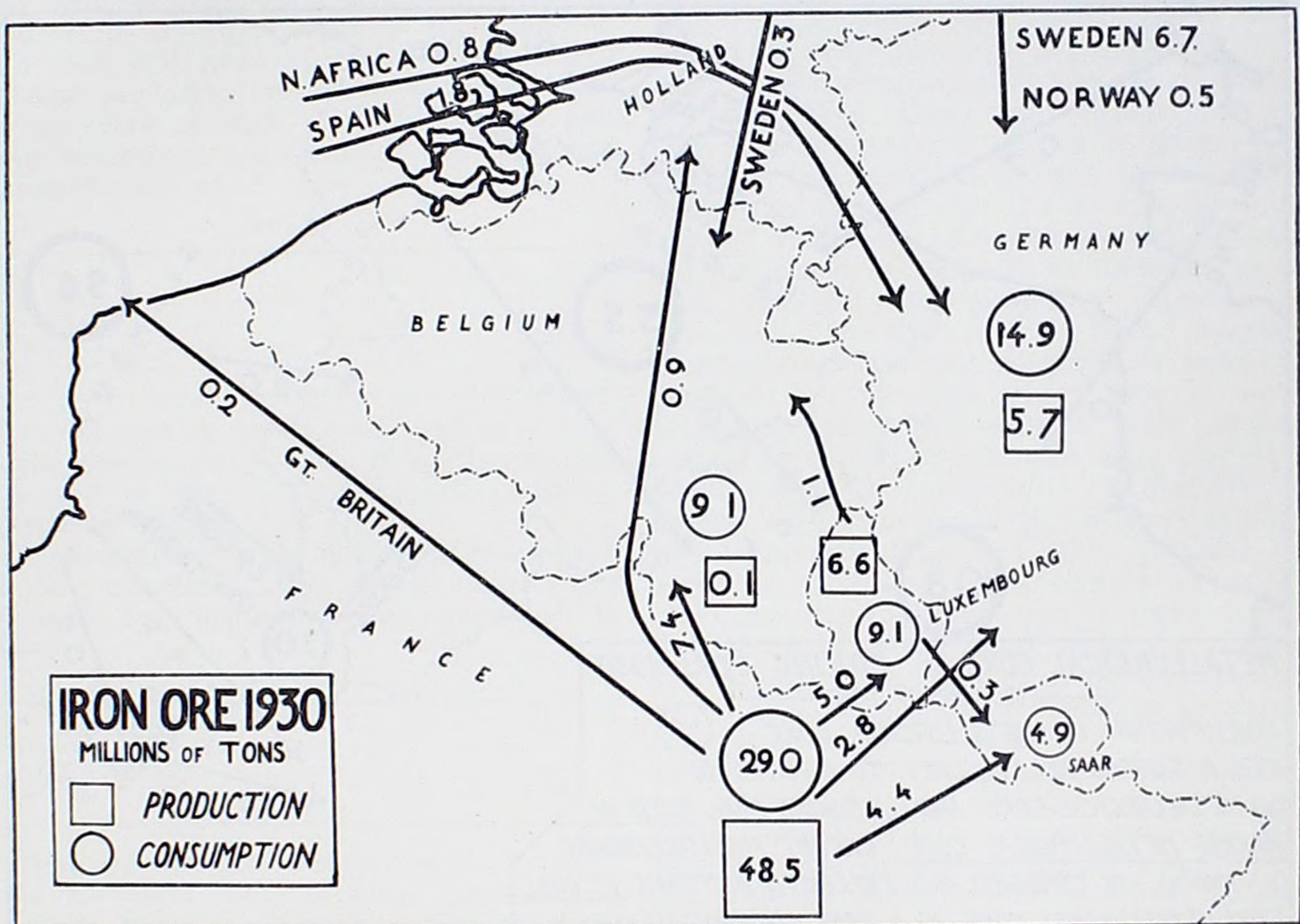
Finally, we turn to the cost of raw materials. Let us consider first the making of pig-iron. The materials which are of importance (for air and water are available almost anywhere, while limestone is fairly widespread) are iron ore and coal, in the form of coke. France, Belgium, Luxembourg, and the Saar all use almost entirely the minette ore of the Lorraine field. (The following diagram shows movements between countries in 1930. It does not show internal movements such as 2.3 Mn. tons from French Lorraine to the North of France.) Hence the cost of extracting this ore is a cost element common to them all, although firms owning iron mines may treat it as a direct labour cost, while to others it appears only indirectly in the price of the ore they purchase. The cost of extraction is fairly low, despite the large quantities of water which must be pumped out of many of the mines. Germany also imports some minette ore, although most of her ore is imported from Sweden, Spain, and other overseas countries or obtained from the ore deposits within Germany. Recently, special efforts have been made to increase the amount of

home ore used. This ore is relatively costly to produce, and its sales are maintained only with the help of a bounty and of pressure by the Government upon the iron and steel industry. Germany is fortunate, however, in being able to import high-grade ore by sea and up the Rhine.

Broadly speaking, the higher the iron content of the ore the less coke is required to smelt it. The price of coke is much higher than that of ore. Thus ore containing less than about 28% iron is usually not worth smelting; and it pays Luxembourg works to import

of metallurgical coke and of coking coal used in making metallurgical coke between the five territories considered here (but not between different producing centres) are shown for 1930 in the diagram on page 10. They are shown in terms of coking coal (except for Luxembourg, which imports all its coke as coke) as the bulk of the movement takes place in that form. The figures shown for Belgian imports are only approximate, owing to lack of complete information.

We may next consider the cost of transport of materials to the blast-furnaces. If materials



Briey ore of, say, 37% iron content instead of using Luxembourg ore of, say, 30% iron content, although the latter costs less than half the delivered price of Briey ore.

The cost of producing coking coal is considerably lower in Germany than in France, Belgium, or the Saar. (Luxembourg has no coal.) Although wage-rates are higher in Germany, the output of coal per man is considerably higher (see page 33) and the coal is of better coking quality. Thus the producing centres in France, Belgium, and the Saar which are based on the presence of coal are nevertheless at a disadvantage in this respect as compared with Germany. The movements

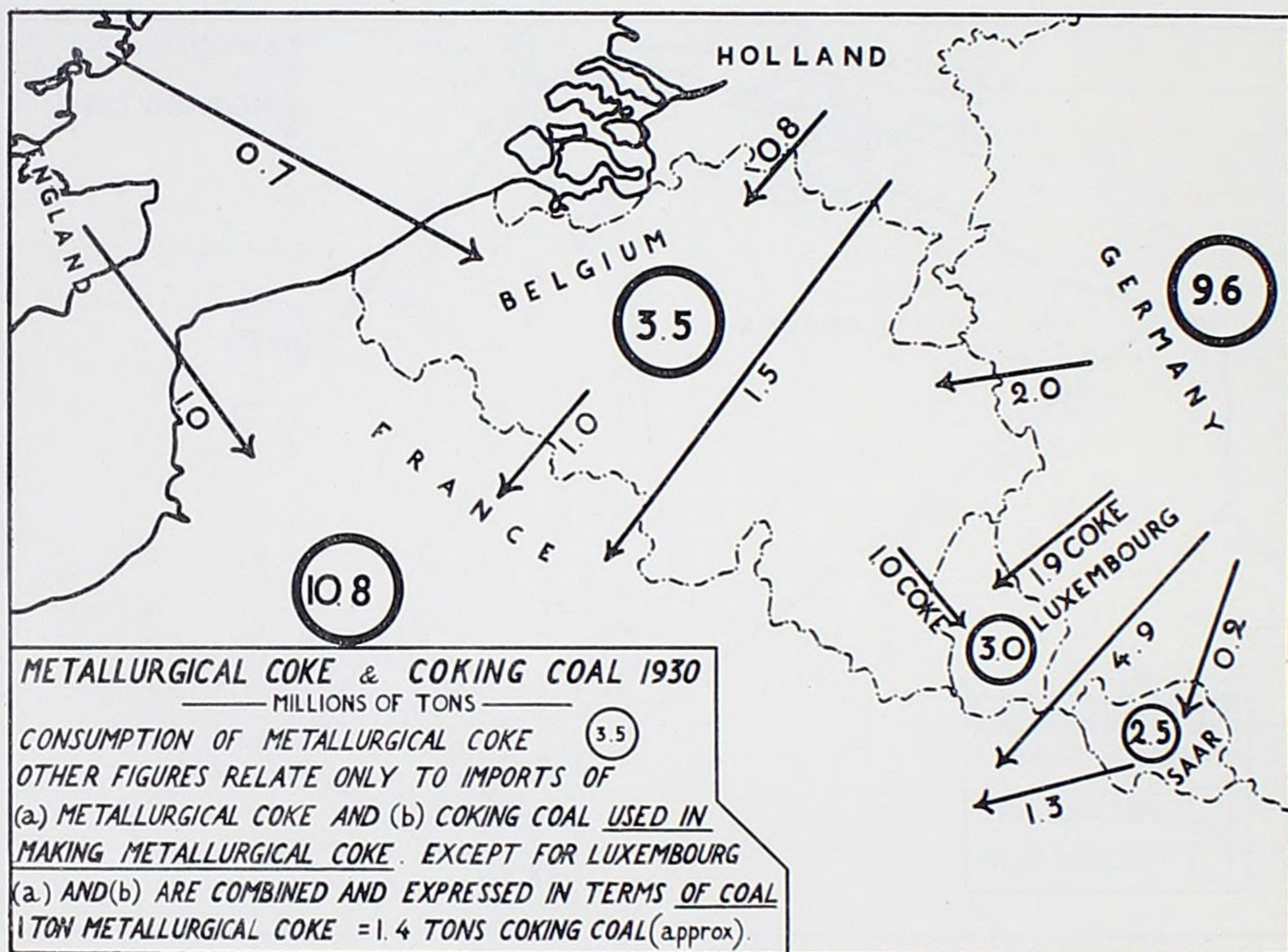
lose weight in the process of manufacture, clearly transport costs are saved by manufacturing near the materials, and not near the markets. This largely explains the attraction of coal areas for manufacturing industries which use considerable quantities of coal. Most of the iron and steel centres of the world are based on coal. When suitable iron ore and coking coal are found close together, as in parts of England, no problem of location arises. But what if iron ore is in one district and coking coal in a different district, as in the territories considered here?

Suppose that $1\frac{1}{2}$ tons of coal (yielding 1.1

tons of coke) and 3 tons of iron ore are needed to make a ton of pig-iron. Clearly the number of ton-kilometres of transport of raw materials is doubled if the blast furnaces are on the coal deposits; if the coal is coked near the pit-head, the number is almost trebled. Even if the market is nearer to the coal deposits than to the ore deposits by the whole distance between them, transport is saved if the blast furnaces are near the ore. For in that case only 1.1 tons of coke and 1 ton of pig-iron need be transported for the distance between the two deposits, as against 3 tons of ore.

content of available ore has diminished. Both these tendencies favour locations near ore as against locations near coal.

So far we have considered only the production of pig-iron. Let us now turn to the transformation of pig-iron into ingot steel and of the steel into more or less finished rolling mill products. In the course of this transformation, the pig-iron loses little weight, and additional quantities of fuel are required. Thus it appears that the transport of raw materials would be minimised if the Lorraine ore were made into pig-iron on the spot, and



This, however, is counteracted by railway rates which (see page 49) are higher for pig-iron than for coke or coal, and higher for coal or coke than for iron ore.

Thus the growth of pig-iron production on the Lorraine minette field is easy to understand, although a location based on ore is not the general rule. Even in other parts of the world, there has been some tendency during recent years for ore locations to expand relatively to coal locations. During the last few decades technical progress has considerably diminished the amount of coal required to smelt a ton of pig-iron, while the average iron

the pig-iron were sent for transformation to works on the coal deposits.

This was in fact done, to a considerable extent, before the war. Thus Luxembourg in 1909 produced 1,553,000 tons of pig-iron and only 535,000 tons of steel, and in 1913, 2,548,000 tons of pig-iron and only 1,182,000 tons of steel. Moreover, most of the steel consisted of ingots and "semis." The pig-iron, ingots, and "semis" were sent mainly to the Ruhr to be transformed there. Similarly with the present French department of Moselle, then part of Germany (Lorraine annexée). In 1913 this district produced 3,864,000 tons

of pig-iron and only 2,286,000 tons of steel. Over a third of its pig-iron was "exported" in the form of pig-iron, over 600,000 tons going to the Saar. Similarly with Meurthe-et-Moselle, which in 1913 produced 3,560,000 tons of pig-iron and only 2,514,000 tons of steel, sending pig-iron to be worked up in the North of France and elsewhere. Moreover, before the war nearly a third of the steel output of these two districts was sold in the form of semi-finished products.

But since the war the picture has changed. Even during the years before the war there was some evidence of a tendency for these districts to transform more of their pig-iron into steel and more of their "semis" into finished products. After the war this trend became very marked. New rolling-mill and other equipment was installed, and by 1925 the production was :

(000 tons.)

	Pig-Iron.	Steel.
Luxembourg	2,363	2,080
Moselle	3,287	2,629
Meurthe-et-Moselle	3,528	2,760

Moreover, during recent years well over 80% of the steel output of these three districts has consisted of more or less finished products, as against "semis."

A counterpart to the change in the nature of the production of the Moselle district can be clearly seen in the following figures for the Saar :

(000 tons.)

	Pig-Iron.	Steel.
1913	1,371	2,080
1929	2,105	2,209

Why did the three districts in the Lorraine field transform more of their pig-iron and "semis" into finished products after the war?

One possible explanation is the economy of "Wärmewirtschaft": the saving of fuel in passing the metal through its various stages without allowing it to become cold. This implies that, in the absence of counteracting factors, an integrated (or "composite") works, including blast furnaces, steel works, and rolling mills, is the most economical; and, in fact, the great bulk of the steel products of the territories considered here are now produced in works of this kind. Figures illustrating this are given in the body of this memorandum for every territory except France; and a search through the *Annuaire* of the Comité des Forges de France shows that the number

of isolated blast-furnaces or rolling-mills in France is almost negligible.

Many large works in Moselle and Meurthe-et-Moselle (but not in Luxembourg) have also installed coke-ovens. They therefore import coal and not coke, which means, as far as the blast furnaces are concerned, "importing" a greater weight of about 40%, for it takes around 1.4 tons of coal to produce a ton of coke. But the coke-oven gas is used, together with the purified blast-furnace gas, in the form of either gas or electricity, to provide heat and power for subsequent stages of production, so that little or no further fuel need be imported. The power thus produced is used also in the mines to work the pumps, etc.

But "Wärmewirtschaft" was known before the war. Why, then, the post-war change? One possible answer is that more progress in this direction might have been advantageous before the war, but that the German concerns owning works in Luxembourg and Moselle did not choose to make it, as they had more than sufficient steel-producing capacity in existence in the Ruhr and the Saar. Another possible answer is that considerable technical progress in Wärmewirtschaft did, in fact, take place after the war. A third possible answer is that over-optimism after the war, coupled with the availability of Reparations money, led to the installation of more rolling-mill equipment than was really justified by economic conditions and prospects. Possibly all three explanations contain some truth, but the main reason seems to be the change in markets. The changes in boundaries and ownership, and the reduced demand of Germany for pig-iron and "semis" (as for almost everything) before the stabilisation of the mark, hit Luxembourg and Moselle; while France found herself with a greatly increased pig-iron- and steel-producing capacity and (despite the large reconstruction activities of the immediate post-war years) without an equivalent increase in her home requirements: she was therefore compelled to develop iron and steel exports. Under these new conditions, more-finished products found a readier sale than pig-iron and "semis."

The above discussion on materials, and on the relative cost of transporting materials to different locations, has taken no account of scrap. "New" scrap consists of the pieces "left over" in the processing of iron and steel in rolling-mills and in engineering and similar works. Old scrap, of course, consists of discarded railway material, motorcars, ships, and so on.

Scrap is an important material for the iron

and steel industry. After the war, its use was somewhat stimulated by the abundant supplies from discarded war equipment and materials and its consequent relative cheapness. In 1929, the German iron and steel industry used in all over 8½ Mn. tons of scrap and the French used over 5 Mn.. Scrap is likely to become of still greater importance relatively to ore in the future; for whereas iron ore, once extracted from the ground, cannot be replaced, iron and steel products retain most of their original iron content and weight when they are discarded or worn out.*

Scrap has various uses. It can be charged into blast furnaces—indeed, one or two blast-furnaces have been run entirely on scrap †—but comparatively little is so used in the centres considered here. Many electric furnaces also are run very largely on scrap, but the proportion of electric steel to the total output of steel is still very small, although growing.

IV.—CARTELS.

There are several factors which make for the organisation of the iron and steel industry of a country upon monopolistic lines. In the first place, as we have already mentioned, the weight of its products tends to give each works a local monopoly, and this is strengthened by the basing-point system. But in the territories under discussion most of the works are grouped together in producing centres, based on the presence of either coal or ore. Thus there would appear to be plenty of scope for competition between the different works in any one centre. But, in the second place, the technical optimum size for a works appears to be large. Apart from foundries and open-hearth furnaces attached to engineering works (as in the North and Centre of France) and a number of independent rolling mills (as in Belgium) and tube works (as in the Saar), nearly all the works considered here represent large investments of capital and number their workers in thousands. When the great bulk of the output of a country is produced by a small number of works, it is easier for the owners of these works to agree upon a combined output or/and price policy. In the third place, the number of firms controlling the bulk of the output is smaller than the number of works. A large company, such as the Vereinigte Stahlwerke or Arbed or Pont-à-Mousson, owns, or holds shares in, quite a number of works,

* See "Iron and Steel," by Baron Gerard de Geer in *Index*, Nos. 88 and 89, April and May 1933.

† With a coke consumption of only 8-10 cwts. per ton of pig-iron. See J. B. Fortune, "Scrap in the Blast Furnace," *The Fuel Economist*, February 1929.

Again, scrap is used in foundries. But its main use is in the production of open-hearth steel, discussed above. Thus Germany and France use more scrap, relatively to pig-iron as well as absolutely, than the other territories considered here. The amounts of pig-iron and scrap used in producing steel in 1932 were as follows :

(000 tons.)

	Pig-Iron.	Scrap.
Germany	3,400	2,800
France	4,496	1,672
Belgium	2,731	376
Luxembourg	1,988	181

Scrap is somewhat cheaper than pig-iron. Thus steelworks near scrap supplies but at a distance from iron-ore deposits can substitute scrap for pig-iron and thereby reduce their costs.

not to mention coal and iron mines. Moreover, "communities of interests" have been established between large companies by the mutual exchange of shares, so that it is often difficult to discover where the real control resides.‡ Finally, a Government is usually more ready to protect the iron and steel industry than most other industries. Thus the stage is set for national cartels, protected by import duties from foreign competition.

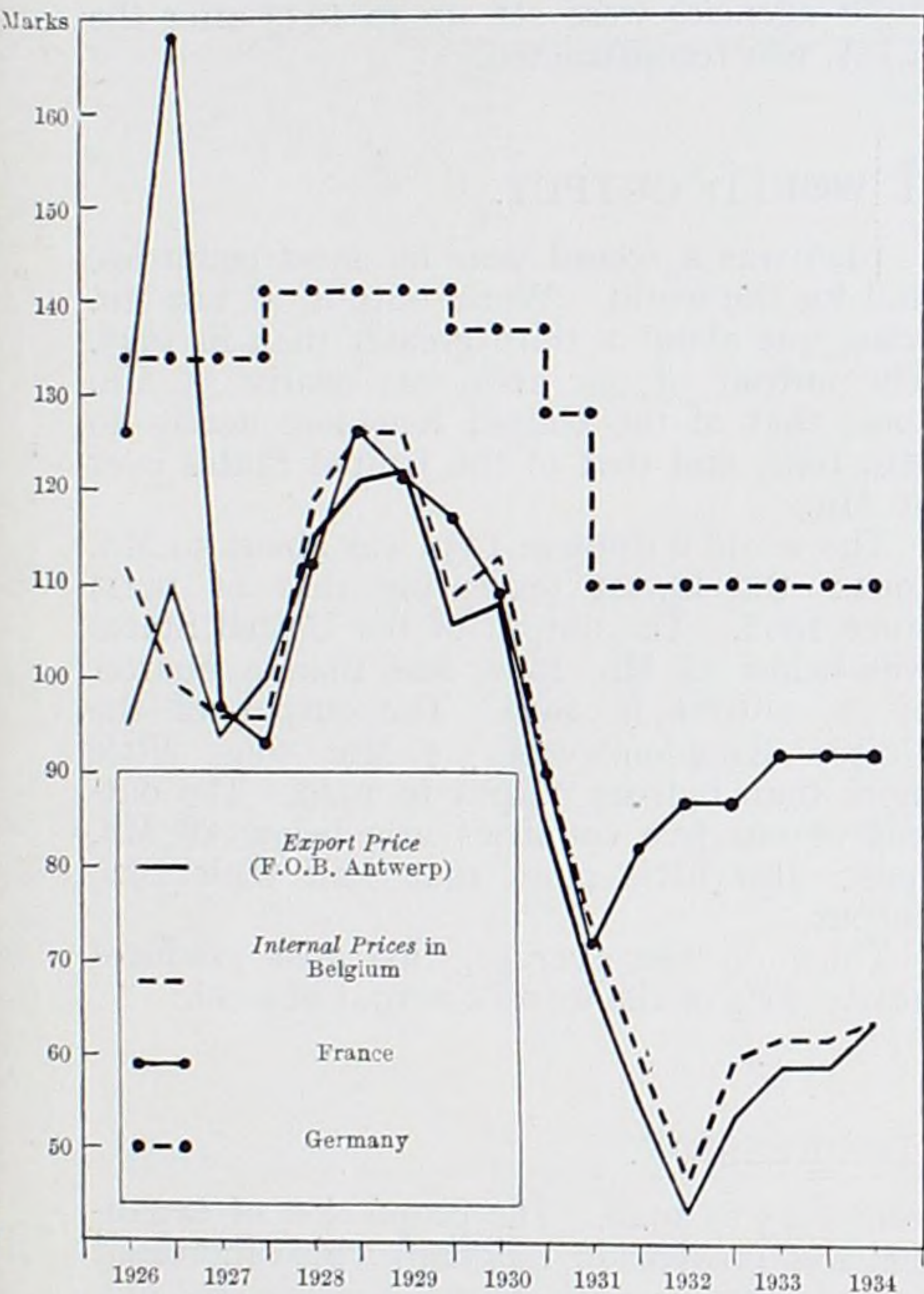
The possibility of thus controlling the national market is of much more importance in Germany and France, where it is large, than in Belgium, Luxembourg, and the Saar, where the great bulk of the production is for export. Both the former countries have long had national cartels for nearly all iron and steel products and, with the aid of fairly high import duties, have maintained inland prices considerably above inland prices in, for example, Belgium, and still more above export prices. The graph shows the prices of steel bars; the French inland price of steel bars was uncontrolled (as one might deduce!) throughout 1928, 1929, and 1930.

But a national cartel does not permanently provide its members with profits greater than those obtainable upon capital invested elsewhere. First, the large capital necessary to set up an integrated works does not altogether

‡ See, for example, the diagram on the interpenetration of groups in Lorraine at the end of Raoul Du Fou, *Le mouvement de concentration dans la sidérurgie Lorraine*, or the diagram of the economic structure of the Arbed-Terres Rouges group in M. E. Faber, *La métallurgie du Luxembourg*, p. 155. Arbed itself is said to be controlled (like the Czechoslovakian Skoda) by Schneider!

keep out new entrants. The capital, of course, can be obtained from the public or from banking and industrial groups, if the prospects are sufficiently favourable. But the promoters must consider carefully. Existing works may be doing well, but will the entry of a new one spoil the market? Present prospects of profits may be good (especially if the new works can take advantage of the cartel prices without being subjected to the cartel restrictions of output), but most of the capital must be

PRICE OF STEEL BARS.
1926-1934.
(Natural Scale.)



invested in specific forms, such as blast-furnaces, which will last a long time: the outlook for five or ten years hence must be considered. Nevertheless, in times of prosperity new entrants do come in, and the history of cartels is one of frequent reorganisations to include established outsiders. In the second place, in the past established works have expanded somewhat too optimistically during good times, and have subsequently found themselves with unused capacity. Some of them are then tempted to sell below the cartel price by giving secret rebates, etc. Iron and

steel merchants, knowing that a firm has unused capacity and is in need of liquid funds, may offer some buyer a large order at well under current prices, and, if he accepts, may make the firm an offer (tempting in the circumstances) to supply the order at cut prices. Experience of such action by merchants led the German iron and steel industry recently to name merchants through whom alone they would deal; and in the hope of suppressing "weak selling," the usual rule in all these territories is that all orders must pass through the central selling-office of the cartel—direct sales by works are not allowed. Nevertheless, it is difficult in bad times to prevent firms from breaking away from the cartel and its quotas and prices from becoming ineffective. Thus on the whole a cartel has a fairly short life before it is revived on a different basis. This leads to competition for orders within the cartel, with an eye to an increased quota in the next reorganisation, despite the central selling agency. This explains why at present leading firms have their own selling agencies. Although all orders pass through the central sales-office of the cartel, and although no works can sell more than its agreed quota, the orders received by each firm are recorded, and buyers' preferences for the ("differentiated") products of a particular works are noted. Thus competition in this form does take place between the different firms within the framework of the cartel.

But cartels to regulate the home market do nothing to restrain competition among different countries in common export markets. International cartels, or rather agreements, for that purpose exist for a very limited number of products. Of these, the agreement for rails (I.R.M.A.), formed in 1904, is the best known. But before 1926 there was no agreement (covering most of their output) among the territories considered here, which export similar products to common markets. Largely through the efforts of M. Mayrisch, the President of Arbed, the Entente Internationale de l'Acier (E.I.A.) was formed in September 1926. In England, it is usually known as the International Steel Cartel. The main facts about it are given under this heading towards the close of this memorandum.

The remarks made above about the difficulties of national cartels apply with greater force to international cartels. The agreement, to be effective, must offer some advantage over unrestricted competition to every participating country. Every large exporting works within these countries must be induced to come into the agreement. Account must

be taken of actual and potential competition from countries outside the agreement.

The 1926 agreement was one for national limitation of output. During the depression, Belgium pursued a policy of maintaining production and exports as fully as possible by cutting prices. Thus in 1932 the inland price of bars, in marks, was around 110 in Germany and nearly 90 in France, but the export prices were around 50. The formal existence of the cartel was maintained, but the output quotas allotted were so high as to be ineffective.

When the E.I.A. was reorganised in April 1933, considerable concessions had to be made to induce Belgium and Luxembourg to join.

The present agreement appears to provide a greater measure of control than the former one. There are export quotas for each country, export prices are fixed by agreement, and (although not definitely provided for in the international agreement) national cartels limit the output of each firm. Nevertheless, there is still competition between the different firms, of the kind mentioned above, with an eye to the next reorganisation. It is significant that although all the sales of a product must be made through the sales-office of the cartel for that product, each big firm has its own selling agency to get orders; a number of these agencies were set up in 1933 after the E.I.A. was reconstructed.

V.—COMPARISON WITH WORLD OUTPUT.

It is interesting to compare the output of the geographical area considered in this memorandum (Germany, France, Belgium, Luxembourg, and the Saar) with that of the world as a whole. The best single index for this purpose is the output of steel. (The growing use of scrap makes pig-iron an unsatisfactory index. During recent years the world output of steel has been 20 to 25% greater than the world output of pig-iron.)

In round figures this area (present boundaries) produced in 1913 about 25 Mn. tons of steel out of a world output of 76 Mn. tons. The United States produced over 31 Mn. tons and the United Kingdom nearly 8 Mn.

In 1925 the output of this area was slightly more, and that of the United Kingdom slightly less, than in 1913, but the output of the United States was over 45 Mn. tons, raising the world total to some 89 Mn.

1929 was a record year for most countries, and for the world. World output, at 119 Mn. tons, was about a third greater than in 1925. The output of our area was nearly 35 Mn. tons, that of the United Kingdom nearly 10 Mn. tons, and that of the United States over 56 Mn.

The world output in 1932 was about 50 Mn. tons: the lowest (excepting that of 1921) since 1908. The output of the United States was below 14 Mn. tons, less than a quarter of its output in 1929. The output of the United Kingdom was 5.3 Mn. tons, little more than half its output in 1929. The output of our five countries was below 18 Mn. tons; also little more than half their 1929 output.

Thus, on the average, this area produces nearly 30% of the world's output of steel.

VI.—BOOM AND DEPRESSION.

It is well known that the output of iron and steel (the leading example of producers' goods) expands more during a boom and contracts more during a depression than that of most commodities. This was so during the boom which culminated in 1929 and during the subsequent depression. The steel output of each of our five territories 1925-1933 is shown in the following table and chart.

The absolute expansion of output was greatest in Germany. In 1927 she produced over 4 Mn. tons more steel than in 1925. The following year her output was appreciably less, but in 1929 it again increased, nearly to the 1927 level. In the other territories the increase of output was practically continuous

from 1925 to 1929. The proportion of expansion was greatest in Belgium, which increased

ANNUAL STEEL OUTPUT.
1925-1933.
(000 tons.)

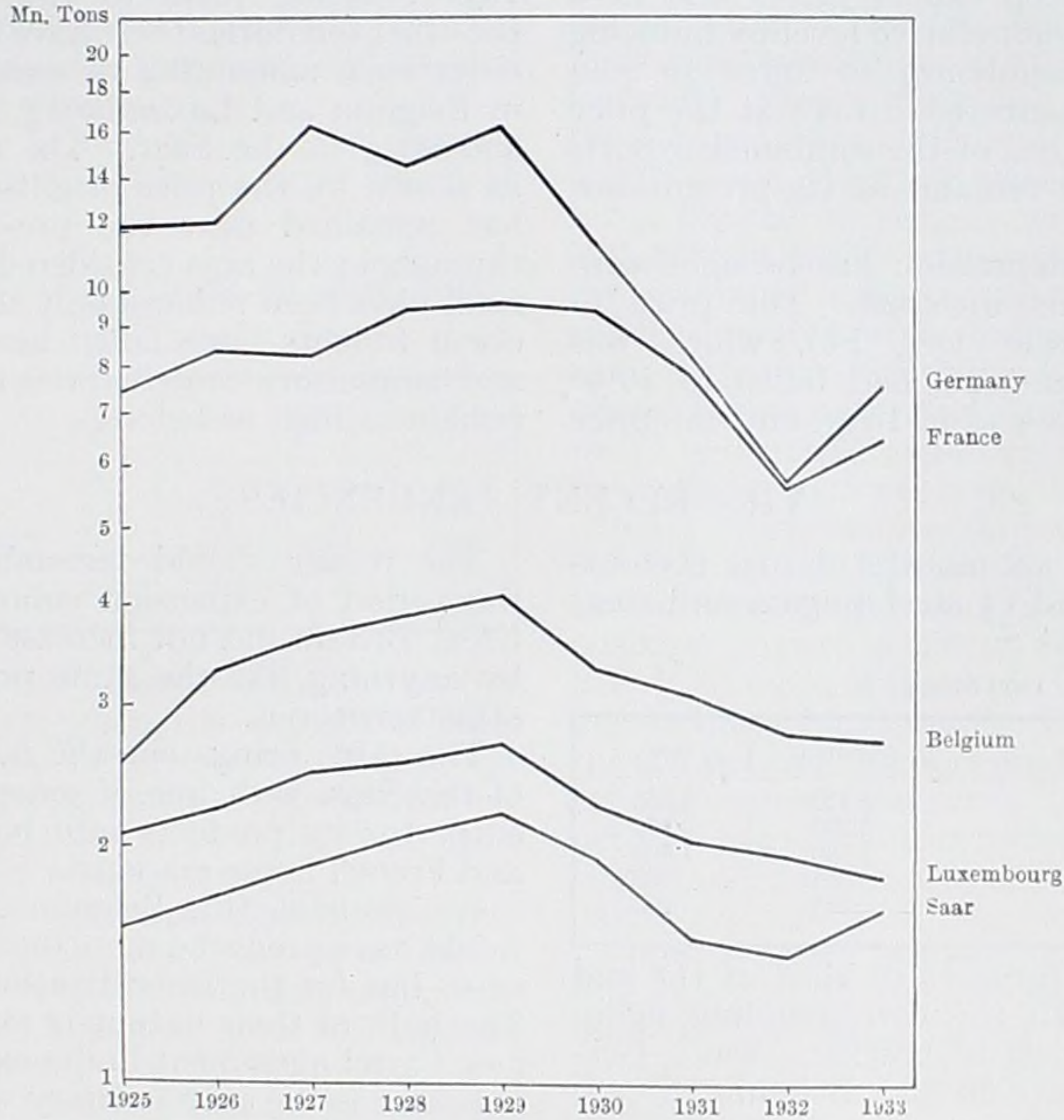
	France.	Germany.	Belgium.	Luxembourg.	Saar.
1925	7,446	12,195	2,549	2,086	1,579
1926	8,430	12,342	3,339	2,244	1,737
1927	8,306	16,311	3,680	2,471	1,895
1928	9,500	14,517	3,905	2,567	2,073
1929	9,699	16,246	4,110	2,702	2,209
1930	9,447	11,539	3,354	2,270	1,935
1931	7,822	8,292	3,105	2,035	1,538
1932	5,640	5,771	2,790	1,957	1,463
1933	6,526	7,586	2,742	1,845	1,676

her output by over 60% during this period.

This expansion was accompanied by considerable investment in the iron and steel industry in all these territories. The new capital came from various sources: from increase of share capital, from the issue of bonds, and from undistributed profits. In the case of Germany, a substantial proportion came from abroad. The over-investment in the German iron and steel industry was becoming apparent in 1928: metallurgical shares stood at about their 1924-26 level, while the

since an output greater than that of 1929 seems unlikely for some years, much of this represents destruction of capital just as much as the blast furnaces and steel works which were actually scrapped (although in good working order) as part of the Stahlverein reorganisation. This is reflected in the price of metallurgical shares. In the spring of 1934 the index of metallurgical share prices in both France and Belgium was less than a quarter of its 1929 level. (The smaller fall in the

ANNUAL STEEL OUTPUT.
1925-1933.
(Logarithmic Scale.)



general index of ordinary shares was nearly 50% above that level.* The capacity of the German steelworks was estimated in 1930 at nearly 20 Mn. tons per annum. Although such estimates are usually somewhat too large, the total German capacity is certainly well over double the actual output during the last three years.

But it is plain, in the light of after-events, that over-investment in this industry took place in all these territories during this period. It was merely greater and more striking in Germany than in the other four. The depression revealed a great "excess capacity," and

* See the table of Indices of Security Prices, p. 50.

German index was due largely to heavy reductions in nominal capital. The nominal capital of the Stahlverein is now, after the reconstruction, only RM. 560 millions, as against RM. 774 millions in 1931.)

It will be noted that cartels, limiting output, do not prevent over-investment. Indeed, their existence seems to make it greater. In so far as they succeed in maintaining prices, they make prospects more tempting for new entrants. In so far as output quotas tend to be divided among firms, when a cartel is renewed, on the basis of existing capacity, each firm is tempted to increase its own capacity in order to maintain or increase its quota when the

cartel is renewed. In 1932, the steel output of Germany was only 36% of that of 1929. The corresponding percentage was 58 for France, 66 for the Saar, 68 for Belgium, and 72 for Luxembourg. Belgium and Luxembourg, as we have already remarked, maintained their output (and exports) better than France and Germany, but only by heavy reductions in prices. Germany and France, while of course compelled by competition from Belgium and other countries to make large reductions in their export prices, did not reduce their inland prices by more than about 20% below the boom levels. They have endeavoured to keep export prices also at a somewhat more remunerative level by inducing Belgium and Luxembourg to agree to join them in the reconstituted E.I.A., at the price of granting them 50% of the combined exports so long as output remains at its present low level.

Of course, the depression has brought with it some reductions in costs. The price of iron ore (Thionville 32% Fe), which was 28 francs a ton in 1929, had fallen to 16.50 francs a ton by the end of 1933, and the price

of Swedish ore (delivered Ruhr) fell during the same period from 21 marks a ton to about 13 marks a ton. The price of coke during this period fell from 140 francs to 87 francs in France, and from 200 to 100 (Belgian) francs in Belgium, although only from 16.87 to 14.21 marks (inland price) in Germany. It will be shown later that the cost of coke in Lorraine has at times formed over half the selling-price of pig-iron. The price of scrap nearly halved, although this did not help works using their own scrap. In Germany, wage-rates have apparently been more or less maintained since the general decree of December 1931 reducing them to the 1927 level. In the other territories there have been appreciable reductions, amounting to something like 20% in Belgium and Luxembourg, 15% in France, and 20% in the Saar. The rate of interest, as shown by the price of gilt-edged securities, has remained near the pre-depression level throughout the area considered here. Railway rates have been reduced only slightly, although ocean freights have fallen heavily. Taxation and compulsory contributions to social services remain as high as before.

VII.—RECENT TENDENCIES

During the first six months of 1934 the output of pig-iron and of steel (ingots and castings) was as follows:

(000 tons.)

	Pig-Iron.	Steel.
Germany	3,770	5,365
France	2,970	2,975
Belgium	1,380	1,400
Luxembourg	915	905
Saar	865	920

The number of furnaces in blast at the end of June 1934, with the corresponding figure for June 1933 shown in brackets, was: Germany 66 (44), France 86 (92), Belgium 36 (35), and the Saar 20 (18).

The rate of steel output in the first half of 1934 is compared, for each territory, with the rate in 1929 (the peak year) and in 1933, in the following table. Corresponding figures for the U.S.A. and Great Britain are given for comparison.

AVERAGE MONTHLY STEEL OUTPUT AS A PERCENTAGE OF AVERAGE MONTHLY STEEL OUTPUT OF SAME TERRITORY IN 1929.

	1933.	1934 (6 mths.).
Germany	47	62
France	67	61
Belgium	67	68
Luxembourg	68	67
Saar	76	83
U.S.A.	41	57
Great Britain.....	73	93

The reader should remember that during the period of expansion culminating in 1929 Great Britain did not increase its steel output by anything like the same proportion as the other territories.

The table brings out the favoured position of the Saar, with free, if somewhat restricted, entry for its products into both the German and French home markets.

It is probable that Belgium and Luxembourg would have produced more during the last year or so but for the reconstitution of the Cartel. The bulk of their output is exported and the new Cartel agreement limits exports.

France is the only territory whose (monthly) output in the first half of 1934 was appreciably below that of 1933. This reflects the difficulties of France, which is maintaining the gold standard in spite of the increasing exchange depreciation of several other currencies. France, owing largely to the comparatively high cost of living due to agrarian protection, has not reduced internal costs as much as, for example, Belgium.

Germany shows a considerable recovery since 1933, but even so is producing only about the same percentage of its 1929 output as France. The recovery has been due largely to government action. Inflation through public works expenditure has involved increased orders from the railways and from the con-

structional industries. The government has exempted newly-purchased motor-cars from the horse-power tax and this, combined with official propaganda, has greatly stimulated the output of motor vehicles. The government has also exempted from taxation income spent on the replacement of capital equipment, and this has stimulated output in the constructional and—to a less extent—in the machinery industries. The method by which a considerable proportion of German exports has been subsidised is discussed on page 27. Recent events suggest that the foreign trade of Germany will diminish still further in the near future. Thus a continuance of the recent rate of recovery in iron and steel output will depend largely on whether inflation is continued or increased, and internal demand thereby stimulated.

The following table* shows that exports are still far below the level of 1929, the peak year.

AVERAGE MONTHLY EXPORTS OF IRON AND STEEL
(000 gross tons.)

	1929.	1932.	1933.	1934 (1st. qr.).
Germany	457	180	160	191
France (and Saar) ...	351	198	221	225
Belgium-Luxembourg	377	275	261	258
Great Britain	365	157	160	159
United States	207	31	47	85

Only Belgium and Luxembourg are exporting less than in 1932, when the exports of most countries were at their lowest. This is the result of the Cartel agreement. It will be noted that their exports are nearer the 1929 level than those of any other country.

The tables show strikingly that the recovery in output during the last year or so is due mainly to a revival in home demand in the various countries and only to a small extent to increased exports.

We may next turn to prices. The tables on pages 48 and 50 show the prices of various products at the close of 1933. Since then, German internal prices have remained unchanged. Some French internal prices have been slightly raised; for example, billets and sheet bars were raised in price about 5% in February 1934 and the price of pig-iron (No. 3 Foundry, Longwy), which had fallen to 185 francs per ton in May 1934, rose to 220 by the end of June owing to the agreement of the French pig-iron producers to reconstitute the pig-iron *comptoir* as from July 1st. Belgian internal prices since June 1933 have been the

same as the export prices (f.o.b. Antwerp) of the Cartel. These prices are on the average slightly higher than at the close of 1933: for example, merchant bars are now £3 3s. 9d. ("gold") as against £3 2s. 6d., and plates £4 2s. 6d. as against £4 1s.

This raises the question of the influence upon the market of the so-called International Steel Cartel. The reconstitution of the Cartel in June 1933 was without doubt an event of considerable importance to the industry. Nevertheless its significance can be easily exaggerated.

In the first place, its title of "International"—and even the alternative "Continental"—is misleading. The only members are the five territories considered in this Memorandum—Germany, France, Belgium, Luxembourg, and the Saar. Thus Poland, Czechoslovakia, Austria, and Hungary remain outside (except for a limited agreement with Czechoslovakia and Austria, which includes plates). Although the combined capacity of these territories is small compared with that of the Cartel, their competition is a limiting influence. They have agreed (not unnaturally!) to respect the Cartel's prices in common export markets, but they are not willing to accept the limitation of their exports which membership of the Cartel would involve. Great Britain and the United States are not important competitors of the Cartel in common export markets. Their exports are mainly of more finished products. But in selling to these countries the Cartel has to meet the competition of home producers (of "semis," etc.), protected by a tariff. To meet this competition the Cartel is constrained to charge less than its official prices to these countries. Thus only 50% instead of over 60% (with the £ at its present level) is added to the "gold" sterling price to obtain the actual sterling price quoted,† and some recent increases in prices have not applied to the United States and Great Britain.

In the second place, the Cartel covers only a limited number of products, although these do form the greater part of the output and exports of the member territories. For other products, such as rails, tubes, and tinplates, there are separate Cartels (or agreements) with a wider membership, for Great Britain and the United States supply a significant proportion of the world's exports of more-finished products. The attitude of Great Britain, in protecting her home market against continental imports of "semis," etc., and at the same time enjoying

† In this respect the sterling prices quoted in the excellent article in *The Board of Trade Journal*, August 30th, 1934, p. 343, are somewhat misleading.

* Compiled from the monthly *Statistical Bulletins* of the British Iron and Steel Federation.

high quotas in international cartels for more-finished products, causes some resentment on the Continent. The tendency on the Continent to produce a greater proportion than formerly of more-finished products (such as special steels in France and tinplates in Germany) is partly due to the British tariff.

In the third place, the general rule that less can be sold at a higher price seems to apply. The Cartel has raised its prices, but exports have increased much less than output. There is little doubt that exports would be greater if export prices were lower.

Yet the fact remains that the reconstitution of the Cartel was accompanied by a very considerable rise in export prices. The Cartel began to operate on June 1st, 1933, but the agreement was signed in April 1933, and was anticipated by the market. From December 1932 to June 1933 the prices of Cartel products rose by 20 to 30%. For example, merchant bars rose from £2 7s. 9d. (gold) to £3, billets from £1 19s. 6d. to £2 7s., and plates from £2 16s. 3d. to £3 18s. 6d.; and at present (June 1934) all Cartel prices are somewhat higher than a year ago. Doubtless some rise from the low level of 1932 would have occurred in any case (or, alternatively, exports would have been greater than they have been) owing to the partial recovery in economic conditions. There was, in fact, some rise in the prices of these products between June and December 1932. But probably the greater part of the rise since 1932 can be attributed to the Cartel.

In conclusion, one or two general comments may be made. We have already mentioned that the large size of plants and the weight of the products in this industry tend to make it monopolistic, and that the struggle to get higher quotas (based on past performance and present capacity), at each reorganisation of a

Cartel, strengthens the constant tendency towards "excess capacity." The iron and steel plant of the world could produce nearly double its present output. Yet "capacity" continues to increase—in some cases because technical progress makes a new type of plant worth while, but in others only because national tariff barriers or the existence of Cartels makes it profitable. "Thus, in the United States the annual capacity increased by 1,450,000 tons in 1932; Great Britain has a new basic Bessemer plant of 300,000 tons; South Africa, a works capable of producing 150,000 tons of finished products; Australia, rolling-mills for plates and a tube factory capable of supplying the whole home demand; Manchuria a steelworks of 500,000 tons. China and Japan continue to increase their equipment." *

A consequence of monopoly and excess capacity is dumping. Despite the recent rise in export prices, goods are still exported from France and Germany at considerably lower prices than those paid by home consumers.

The effect of the increased restrictions on foreign trade and investment which accompanied the depression is shown by comparing the movements of production and exports. In the first half of 1934 the steel output of our five territories, the United States, and Great Britain, combined, was nearly two-thirds that of 1929, but their combined exports were little more than half those of 1929. A further recovery in the iron and steel industry depends mainly upon a general world revival in economic activity and upon a reduction of present obstacles to international trade and investment. The outlook is not very promising at the moment, although it is somewhat brighter than a year or two ago.

* Henry Laufenberger in *Revue d'Economie Politique*, Mai-Juin 1934, p. 734.

GERMANY.

PRODUCTION.

In 1913 Germany produced 16,764,000 tons of pig-iron and 17,598,000 tons of steel (ingots and castings). In addition, Luxembourg, then part of the German Customs Union, produced 2,548,000 tons of pig-iron and 1,336,000 tons of steel. The effect of the changes in frontiers due to the war is best shown by dividing the 1913 output into that produced within the present frontiers of Germany and that produced in territory no longer part of Germany. This division was :

OUTPUT OF GERMANY IN 1913.
(000 tons.)

	Pig-Iron.	Steel.
Germany (present frontiers) ...	10,904	12,182
Polish Upper Silesia	625	1,050
Lorraine	3,864	2,286
Saar	1,371	2,080
Total Pre-War Germany	16,764	17,598

The following figures bring out the importance of the Rhineland-Westphalia (the "Ruhr") district. It will be noted that since the war

its relative importance has increased; it is there that most of the post-war investment has taken place. These two provinces now produce over 80% of both the pig-iron and the steel produced in Germany.

PRODUCTION OF PIG-IRON AND STEEL BY DISTRICTS.
(000 tons.)

	Rhineland-Westphalia.	Siegerland-Lahn-Dill-Hesse.	Silesia.	North-East and Central Germany.	South Germany. ^o	Total (present frontiers).
1913						
Pig-Iron	8,209	995	370	1,001	320	10,895
Steel	10,112	388	350	741	584	12,175
1929						
Pig-Iron	10,985	658	180	1,264	314	13,401
Steel	13,172	382	536	1,292	866	16,246
1933						
Pig-Iron	4,416	194	449		208	5,267
Steel	6,061	249	830		446	7,586

* Some three-fifths of the steel shown above as produced in "South Germany" was produced in Saxony.

The amount of pig-iron used in foundries in 1913 (present frontiers) was 2.6, in 1929 2.2, in 1930 1.5, and in 1931 0.9 Mn. tons. A small part of this pig-iron is imported from Luxembourg and Lorraine (109,000 tons in 1929, 40,000 tons in 1931); the rest is produced in Germany.

In 1929, 2.7 Mn. tons of iron castings were produced in foundries; the main items were machine castings (1.2 Mn. tons) and tubes (0.4 Mn. tons).

In 1931, the total of iron castings was 1.3 Mn. tons (machine castings 0.6, tubes 0.2).

Over 96% of all the steel produced in Germany is produced either by the basic Bessemer ("Thomas") or by the basic open-hearth (Siemens-Martin) process. In 1913, within the present frontiers, the total production of steel was 12.2 Mn. tons, of which 5.2 Mn. was basic Bessemer and 6.2 Mn. basic open-hearth. The figures for recent years are:

	Basic Bessemer.	Basic Open-hearth.	Total.		Basic Bessemer.	Basic Open-hearth.	Total.
1925	5.1	6.6	12.2	1930	5.1	5.9	11.5
1926	5.5	6.6	12.3	1931	3.2	4.7	8.3
1927	6.9	8.9	16.3	1932	1.8	3.6	5.8
1928	6.5	7.5	14.5	1933	2.6	4.6	7.6
1929	7.4	8.2	16.2				

These figures include both ingots and castings, but castings (mainly basic Bessemer) form only 2% to 3% of the total. Practically no acid Bessemer has been produced since 1925; the minor processes are mainly acid open-hearth and electric.

In the rolling-mills in 1929, out of a total of 16.0 Mn. tons of steel ingots, 1.2 Mn. tons

were converted into semi-finished goods for sale and 11.3 Mn. tons were converted into more finished goods. The latter are classified in the following table, which gives also the comparable figures for 1933.

OUTPUT OF ROLLING-MILL PRODUCTS.
(Mn. tons.)

	1929.	1933.
Railway permanent way material ...	1.4	0.4
Girders	1.0	0.2
Bars	3.0	1.1
Hoops	0.5	0.3
Rolled wire	1.2	0.6
Thick plates *	1.3	0.3
Thin plates	1.1	0.5
Tin plates	0.1	0.1
Tubes	0.9	0.3
Rolling stock	0.2	0.1
Forged pieces	0.3	0.1
Other products	0.2	0.1
	11.3	4.2

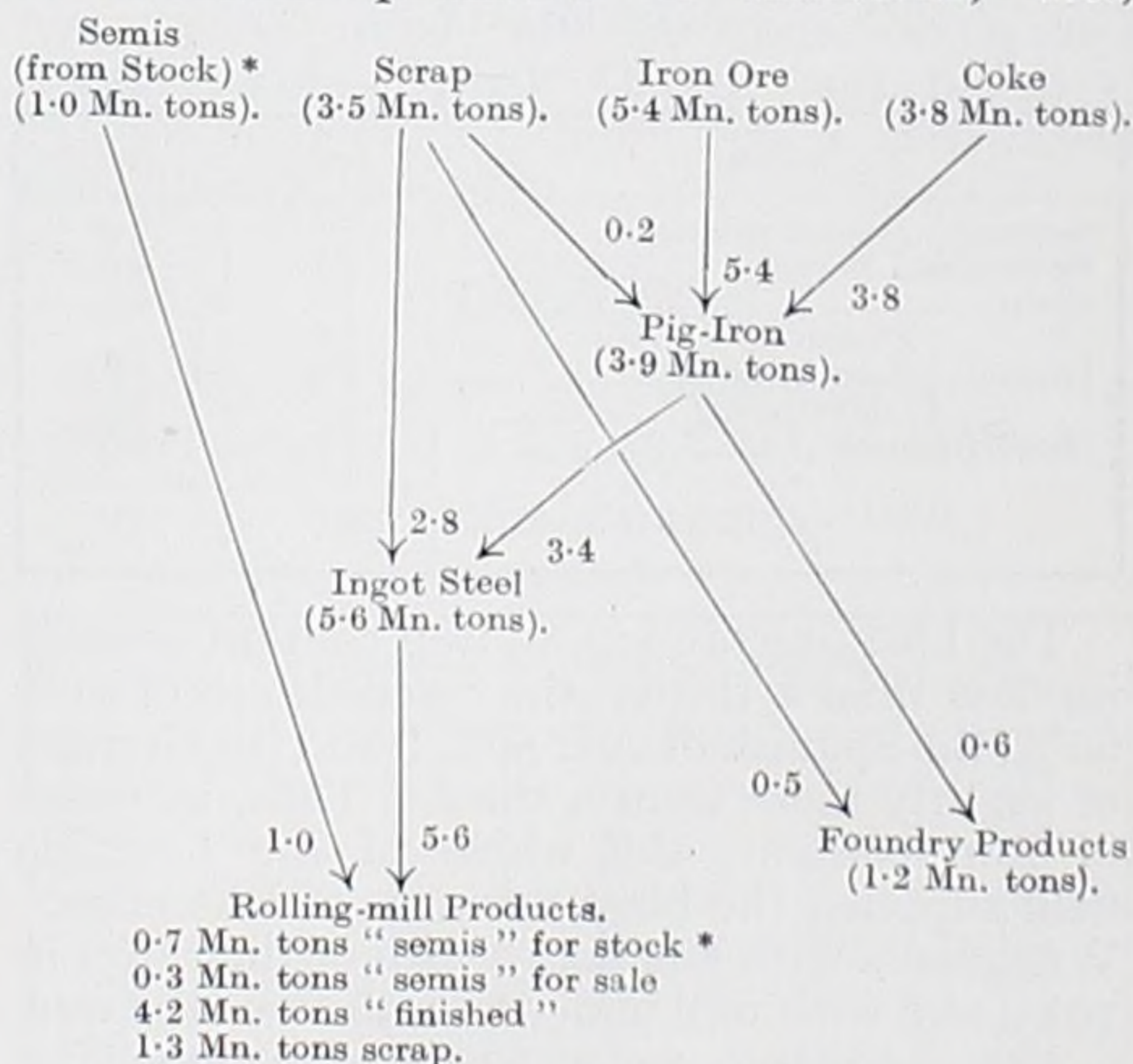
* Over 4.75 mm.

RAW MATERIALS.

The quantities of iron ore, coke, and scrap used by the German iron and steel industry were as follows, in Mn. tons:

	Iron Ore.	Coke.	Scrap.
1913 (new frontiers) ...	27.1	12.1	5.6
1926	20.6	9.7	6.8
1927	21.5	13.3	8.8
1928	20.3	12.2	8.1
1929	21.3	13.4	8.5
1930	14.9	9.6	6.2
1931	8.5	5.8	4.6
1932	5.4	3.8	3.5

Other raw materials are of minor importance. Considerable quantities of limestone, etc.,



* During any period, some "semis" made in a previous period are worked up and some new "semis" are produced, to be worked up later.

were used (4.5 Mn. tons in 1929; 1.3 Mn. tons in 1932) and around 200,000 tons of high-grade manganese ore and around 100,000 tons of pig-iron were imported each year, but these other materials formed less than 10% of the total value of the iron ore, coke, and scrap used.

The diagram on page 19 gives a broad view of how these materials were used in 1932.

(a) *Iron Ore.*

In 1913, Germany produced 28.6 Mn. tons of iron ore. (Luxembourg, within the German Customs Union, produced a further 7.3 Mn. tons.) Of this, only 7.3 Mn. tons were produced within the present frontiers of Germany. The total amount of ore sent from the whole of the Lorraine field into Germany (excluding the Saar and Moselle) was only 4.6 Mn. tons (2.9 from Metz-Thionville, 1.0 from Briey, 0.2 from Nancy, and 0.5 from Luxembourg). Practically all this 4.6 Mn. tons went to Rhineland-Westphalia. (3.9 Mn. tons went by rail, the rest going by rail to Strasbourg, and then by water up the Rhine. The bulk was sent by rail because the double handling involved in a water haul made rail transport cheaper for such a relatively short distance.) In 1913, the total imports of iron ore into Germany were 14 Mn. tons, including 4.6 Mn. tons from Sweden, and 3.6 Mn. tons from Spain. If, in order to avoid the statistical difficulties caused by the changes of frontiers, we consider only the Rhineland-Westphalia region, the consumption of iron ore in blast furnaces by this region was as follows :

CONSUMPTION OF ORE BY RHINELAND-WESTPHALIA.

(Mn. tons.)

Source.	1913.	1929.
Germany (present frontiers)	1.6	2.0
Sweden and Norway	3.5	6.6
Spain	3.4	2.2
Lorraine { French Lorraine	1.0	} 2.4
{ German Lorraine	3.2	
{ Luxembourg	0.5	
Other Imports	1.8	3.5
Total	15.0	17.0

The Lorraine ore has an iron content averaging less than a third; the Swedish ore of over 60%, the Spanish of over 50%; and the German of slightly more than a third. Thus, in terms of iron content, the whole of the Lorraine field supplied the blast-furnaces of Rhineland-Westphalia with less than a fifth of their iron in 1913, and with well under a tenth since the war.

For Germany as a whole, the following table shows the main sources of iron ore during recent years.

IMPORTS OF IRON ORE INTO GERMANY.

(Mn. tons.)

	1929.	1933.
Sweden and Norway	8.0	2.5
Spain	3.0	0.4
France	3.3	1.0
Algeria and Tunis	1.1	0.2
Other Countries	1.6	0.5
Total imports	17.0	4.6
Home production	6.4	2.2

Of the iron ore mined in Germany, about a third comes from the Siegerland district, a quarter from the districts of Lahn, Dill, and Upper-Hesse, and a quarter from the Peine-Salzgitter district. The rest is scattered over western Germany. Most of the ore has an iron content of about a third, and contains very little phosphorus. The Siegerland ore is the nearest to Rhineland-Westphalia, and contains 4.5-7.0% manganese; but it is difficult to mine and contains a relatively high percentage of sulphur. The production of Siegerland ore has been encouraged by a bounty (of 2 marks a ton), paid half by the Reich and half by the Prussian Government, and by specially reduced freight rates on the German (State) railways. In May 1933 the Reichswirtschaftsministerium induced the big steelworks of Rhineland-Westphalia to agree to use more German ore (135 kilogrammes of "Rohspat" for every ton of steel produced). The works also agreed to take yearly 250,000 tons from the Lahn, Dill, and Upper-Hesse region. Partly owing to these agreements, the ore production of Siegerland, which had fallen from 2,067,000 tons in 1929 to 511,000 tons in 1932, recovered to 790,000 tons in 1933, and that of the Lahn-Dill-Upper-Hesse region, which had fallen from 890,000 tons in 1929 to 175,000 tons in 1932, recovered to 339,000 tons in 1933. The Government is planning to bring about a still greater consumption of home ore, in order to keep down imports.

(b) *Coke.*

The coking coal of Rhineland-Westphalia yields an excellent metallurgical coke, and practically all the blast-furnaces of this region form part of "mixed" concerns, owning their own coal-mines and coke-ovens. (Some 80% of the Rhineland-Westphalia coal is owned by metallurgical concerns. Before April 1925 the Rhenish-Westphalian Coal Syndicate permitted a separate consumption quota, in addition to a sales quota, only to mines with coke-ovens at the pit-head, but in April 1925 this was also permitted to concerns owning

coke-ovens not at the pit-head. This encouraged the construction of batteries of coke-ovens near blast-furnaces.) The deposits of coking coal have been a dominant influence in the location of the blast-furnaces, and most of the great metallurgical centres (Hamborn, Duisburg-Ruhrort, Essen, Gelsenkirchen, Herne, Bochum, Dortmund) lie between the Ruhr and the Emscher, where coking coal is most easily accessible.

The amount of coke required to smelt a ton of pig-iron depends partly upon the iron content of the ore. For example, only 0.9 ton or less of coke is required to smelt Swedish ore containing 55 to 60% iron, whereas 1.1 tons or over are needed to smelt Lorraine ore containing 35% iron. But the amount of coke required depends partly also upon the construction of the blast-furnace and upon the technique of preparing and mixing the materials used therein.

The consumption of coke per ton of pig-iron produced in Germany diminished from both these reasons from 1,115 tons in 1913 to less than 1,000 tons in recent years. A smaller consumption of coke per ton of pig-iron, however, is not necessarily an economy; relative prices may make the use of lower-grade ore, and therefore of more coke per ton of pig-iron, more profitable.

(c) Scrap.

In 1913 the consumption of scrap, within the present frontiers, was 5.6 Mn. tons. After the war it increased, reaching a peak of 8.6 Mn. tons in 1929. Before the war, well over 80% of the scrap used was "new" scrap, coming mainly from foundries and rolling-mills. During recent years, nearly half has been "old" scrap. These changes are associated with the relative growth of open-hearth steel production as against Bessemer, with the loss of Lorraine and Luxembourg as sources of "new" scrap, and with the increased supplies of "old" scrap after the war, first from old war equipment and then from various causes: greater scrapping of machinery and railway equipment and ships, the obsolescence of motor-cars, and so on. Most of the "new" scrap is consumed in the works which produce it.

About three-quarters of the scrap is consumed in open-hearth furnaces, the rest being consumed mainly in foundries and, to a less extent, in blast-furnaces. The relative amounts of scrap and pig-iron used in open-hearth furnaces varies, within limits, with relative prices; during recent years the proportions have been about 60% scrap, 30% pig-iron, and 10%

other materials. The Bessemer process, on the other hand, permits the use of very little scrap iron. There is also a considerable range of substitution between iron ore and scrap in blast-furnaces. The amount of scrap used in blast-furnaces for every hundred tons of pig-iron produced was 1 ton in 1913, 15 tons in 1920, and 5 tons in 1929.

German imports and exports of scrap have been small relatively to total consumption. In 1929 358,000 tons were imported and 238,000 tons exported; since then, there has been an export surplus: of 96,000 tons in 1930, 221,000 in 1931, 197,000 in 1932 and 161,000 in 1933. The main countries to which scrap is exported from Germany have varied from year to year; during the last few years they have been, on the whole, Belgium, Sweden, Czechoslovakia, and Italy. Export is permitted only under licence from the Government.

(d) Other Materials.

Other materials are of minor importance. Before the depression, the consumption of limestone (mainly in blast-furnaces) in Rhineland-Westphalia was about 2 Mn. tons a year. Most of it was quarried locally, but about 100,000 tons came from the Middle Rhine and the Lahn, and a similar but variable quantity from Belgium.

A small and decreasing amount of low-grade manganese ore is mined in Germany (182,000 tons in 1929; 21,000 tons in 1932). Practically all the high-grade manganese ore (containing more than 30% manganese) is imported. The quantity imported in 1929 was 390,000 tons (179,000 from Russia and 131,000 from British India), and in 1933, 132,000 tons (86,000 from Russia and 30,000 from British India).

LABOUR.

The 1925 Census of Production gives the number employed in the iron and steel industry

NUMBERS EMPLOYED.

(000's.)

Year.	Blast-furnaces.	Steel-melting Shops.	Rolling Mills.	Total.
1913 *	27	33	93	153
1924	24	33	91	148
1925	23	36	94	153
1926	21	25	78	124
1927	22	29	92	143
1928	20	28	90	138
1929	22	30	92	144
1930	17	24	71	112
1931	11	18	52	81
1932	8	15	40	63

* Present frontiers.

in 1925 as 320,000. This figure includes over 100,000 in independent foundries. A fifth of the workers covered by the sample enquiries of the Federal Statistical Office, mentioned below, were in repair shops. Continuous figures, however, are available only for blast-furnaces, melting shops, and rolling-mills. They are given on page 21.

The fullest information about earnings and hours is that provided by two special enquiries of the Federal Statistical Office, relating to October 1928 and October 1931, covering 41,000 workers and 44 works. This is reproduced below.

EARNINGS AND HOURS.

Department.	Average Total Earnings (including additional rates for overtime and Family Allowances), Rm. per week.		Average Hours Worked per Week.	
	Oct. 1928.	Oct. 1931.	Oct. 1928.	Oct. 1931.
<i>Blast-furnaces</i>				
Furnace men—				
1st hands.....	64.02	51.63	54.00	48.42
2nd „.....	56.75	47.72	53.25	49.15
3rd „.....	55.31	44.59	53.25	48.04
Other Men—				
Time.....	51.78	34.49	57.75	43.84
Piece or Bonus...	58.92	41.38	56.25	44.75
<i>Melting-shops</i>				
Furnace men—				
1st hands.....	73.39	57.54	51.25	44.25
2nd „.....	58.25	45.99	49.75	42.27
3rd „.....	54.10	40.79	49.50	39.53
Other Men—				
Time.....	45.92	39.58	51.75	44.04
Piece or Bonus...	54.19	40.32	50.50	39.97
<i>Rolling-mills</i>				
Rollers—				
1st hands.....	77.45	48.42	49.75	37.06
2nd „.....	67.31	37.88	48.50	33.86
3rd „.....	56.98	34.59	48.25	34.95
Other Men—				
Time.....	45.18	33.06	53.00	41.68
Piece or Bonus...	55.77	36.47	50.75	37.98
<i>Foundries</i>				
Skilled—				
Time.....	52.82	43.40	55.50	45.40
Piece or Bonus...	58.92	43.40	52.75	42.67
Semi-Skilled—				
Time.....	45.66	36.73	52.75	44.89
Piece or Bonus...	54.39	38.66	52.75	41.58
Unskilled—				
Time.....	39.30	32.71	51.50	44.67
Piece or Bonus...	51.42	35.65	52.25	43.03
<i>Repair Shops</i>				
Skilled—				
Time.....	51.39	39.88	55.25	43.67
Piece or Bonus...	56.49	38.52	55.75	40.36
Semi-skilled—				
Time.....	44.87	33.69	55.50	42.32
Piece or Bonus...	50.48	37.42	54.75	41.84
Unskilled—				
Time.....	39.15	30.41	54.50	41.25
Piece or Bonus...	50.13	45.84	53.25	48.68

This table covers only workmen of 21 years of age and over. Family Allowances account for over 2% of the total earnings shown in the table. Out of these earnings workers had to pay income tax (averaging around 3% of their

earnings) and contributions to social insurance (averaging around 8% of their earnings).

Hourly rates (as distinct from earnings) were rising throughout the period 1925-29. In 1929 they were 25% higher than 1925. They were not decreased until 1931. But hourly rates are no indication of actual weekly earnings. In October 1931 hourly rates were about the same as in October 1928, but weekly earnings per employee were 30% lower (owing to the reduction in hours worked per week and in overtime and bonuses earned).

By the decree of December 8th, 1931, wage-rates in all German industries were reduced to the level of January 1927 (subject to certain qualifications); for the iron and steel industry this meant a reduction of some 10%. The German Iron and Steel Federation gives the following index-numbers (for Rhineland-Westphalia):

(January 1930 = 100.)

	Hourly Earnings.	Monthly Earnings.	Total Wages Paid.
First quarter 1932	78	57	30
December 1933	81	74	49

In the first quarter of 1932 the indices were at their lowest.

EQUIPMENT: RATIONALISATION.

There have been three periods since the war during which the construction and installation of new plant and equipment took place more rapidly than usual in the German iron and steel industry. The first was just after the war; the second was about 1922, during the inflation and the flight into "Sachwerte"; the third was 1925-29. This last period is by far the most important; it was during these years that most of the existing "modern" plant and equipment was set up; and therefore it is only this period which will be considered here.

The amount of rationalisation which took place is partly indicated by the extent to which the indebtedness of iron and steel firms increased between 1925 and 1928. This increase certainly exceeded 600 Mn. marks for the eight largest firms alone. And this is by no means the whole story, for a great deal of profits was invested in modernising and extending the plant and equipment of the firms making the profits. The most important example of this was the Vereinigte Stahlwerke, which reinvested 400 Mn. marks of its profits in this way between 1926 and 1929. Subsequent events have shown that much money was mal-invested during this period.

The average market value of the total share capital of the Vereinigte Stahlwerke in 1926 was 1,160 Mn. marks. Between its formation at the beginning of 1926 and September 1929 it borrowed 407 Mn. marks, mainly in foreign loans, chiefly from the United States. Yet in 1929 the average market value of its total share capital had fallen to 840 Mn. marks and in 1934 it was only 315 Mn. marks.

Other leading firms do not show nearly such heavy losses. The total market value of their share capital increased considerably from 1925 to a peak in 1929, falling to its lowest point in the middle of 1932, and subsequently recovering somewhat.

Nevertheless, the leading firms show considerable losses (as measured by this method) and most of them have paid nothing in dividends since 1930.

The reasons for the great increase of investment during 1925-29 are various. First, there was a desire to build new plant or modernise existing plant in order to take advantage of increased technical knowledge. This knowledge related mainly to the lay-out of a works (to save internal transport costs), to the preparation of materials and recovery of by-products, and above all to arrangements for passing the metal through various stages with as little reheating as possible and for using all the heat produced, either in the works or for sale outside, as gas or electricity. Considerable importance was attached to these arrangements; a new science, of "Wärmewirtschaft," arose concerning them. The application of "Wärmewirtschaft" made for integration, in the sense of carrying out a number of processes in one works.

Secondly, it was constantly claimed by directors of iron and steel companies that the policy of the German Trade Unions in demanding increased wages compelled the companies to invest in labour-saving plant and equipment. Certainly wage-rates in this industry increased, as we have seen, by 25% during this period, while the average percentage of unemployment among German Trade Unionists (all industries) was 11.5 for the six years 1924-29, and the number engaged in the iron and steel industry slightly decreased.

Third, the turnover tax on all money sales gave some inducement to firms engaged in different stages of production to combine in order to avoid the tax, and any consequent amalgamation of firms would usually be accompanied by a reorganisation of plant. This tax was 2% in 1924. It was reduced by steps to $\frac{3}{4}$ % (1926-30) and raised again to 2% (where it remains) in 1932.

Fourth, although there was a considerable

shortage of capital and high interest rates in Germany, foreign capital (especially American) could readily be borrowed by large firms.

Finally, perhaps the main explanation is that the whole movement was largely without a rational basis; many of the arguments for it put forward at the time will not bear analysis.

During this period there was much scrapping of plant in order to concentrate production in the more modern units. Thus since its formation in 1926 the Stahlverein has reduced its iron and steel plants from 145 to 66, its blast-furnace systems from 23 to 9, and its rolling-mills from 17 to 10.

Undoubtedly the installation of new equipment and the scrapping of old considerably increased the output per man-hour, but it is difficult to measure this. A smaller number of workers in 1929 produced 33% more steel than in 1925, but we do not know to what extent plant was used to capacity, or how much overtime was worked, in either year. There was certainly a large increase in the output of by-products. The average weekly output of a blast-furnace was 1,127 tons in 1913, 1,655 tons in 1924, and 2,567 tons in 1929. (The largest blast-furnaces are in Rhineland-Westphalia, where the average weekly output is over 3,200 tons.) The average capacity of a converter is some 40 tons, as against 20-25 tons before the war, and open-hearth furnaces of 100-120 tons are not uncommon, as against 20-30 tons before the war. The yearly output of rolling-mill products per plant in 1913 was 86,000 tons, and in 1927 101,000 tons.

COSTS OF PRODUCTION.

It is possible to make a rough estimate of the raw material and labour costs incurred in the production of rolling-mill products by a concern, using ingot steel produced from its own pig-iron, and buying its scrap. The latest year for which statistics are available is 1931. In that year 6,061,000 tons of pig-iron were produced. The total cost of the raw materials used in blast furnaces was 321 Mn. marks (including 150 Mn. marks for iron ore and 115 Mn. marks for scrap) and the total amount paid in wages and salaries was 30 Mn. marks, giving an average of 57.9 marks per ton. The amount of pig-iron used in steel works was 5.3 Mn. tons. Counting this at 57.9 marks per ton and adding the value of the other materials used (132 Mn. marks, of which 113 Mn. marks was for scrap) and of the wages paid (48 Mn. marks), we get a total of 480 Mn. marks incurred for an output of 8.2 Mn. tons, giving an average of 59 marks per ton. Adding 136 Mn. marks for wages paid in rolling-

mills, we get a total of 616 Mn. marks. The output of rolling-mill products in 1931 was 6.6 Mn. tons, giving an average cost for materials and labour of 93 marks per ton.

A similar calculation gives 99 (marks per ton) for 1927, 106 for 1928, 128 for 1929, and 116 for 1930.

The following figures give some indication of the movement of raw material- and wages-costs in recent years.

COST OF MATERIALS AND LABOUR

	Scrap. Marks per ton.	Iron Ore.		Blast- furnace Coke. Marks per ton.	Hourly Rate of Wages.	
		Swedish, delivered Ruhr. Marks per ton.	German Rohspat. Marks per ton.		Skilled. Rpf.	Un- skilled. Rpf.
1929	61.77	21.00	20.00	18.10	84.0	66.0
1930	47.67	21.00	20.00	17.97	84.0	67.0
1931	33.70	21.00	19.50	16.50	80.3	64.7
1932	25.09	16.27	18.50	15.22	70.0	55.0
1933	32.40	13.00(?)	16.83	15.22	70.0	55.0

The Enquête-Ausschuss concluded, on the basis of a "very complete enquiry," that in 1927 the average "prime cost" of producing one ton of iron bars was 111 marks. This agrees fairly well with our figure of 99 marks, since the Enquête probably valued the pig-iron used at its market price. Any single figure must be misleading. On the one hand, costs are currently incurred for repairs and maintenance, contributions to social insurance, interest on working capital, and taxes (especially local taxes on the property), which do not enter into the above calculation. On the other hand, by-products are produced and sold as well as steel.

Some further light is thrown on costs by a special estimate of the semi-official Institut für Konjunkturforschung, which unfortunately relates only to two years: 1927-28 and 1930-31. The estimate is as follows:

COSTS AS A PERCENTAGE OF "ADDED VALUE" PRODUCED.*

	1927-28.	1930-31.
Wages and Salaries	41.1	39.8
Taxes	12.3	15.9
Social Contributions	11.2	14.6
Fixed Interest Charges	11.2	20.6
Depreciation	14.5	15.9
Profits	9.7	0.07
	100.0	106.87
Losses		6.87

* Vierteljahrshefte zur Konjunkturforschung, 1932, Heft 2, Teil B, page 87.

No explanation is given of this rather odd method of presenting the statistics, but it is

clear that in 1930-31 the total value added to materials and fuel, etc.—that is, the total sum available for distribution—was not sufficient to cover all the above items. Since all of them except depreciation were, in fact, paid out, it would appear that the sums shown as required to cover depreciation (15.9% of the added value) were not, in fact, set aside for that purpose, only some 57% of them being in fact set aside.

In the above estimate, money paid in wages and then paid by the wage-earners in social contributions, almost certainly has been included in "Social Contributions" and not in "Wages." It will be observed that 15.9% of the added value in 1930-31 was paid out in taxes, although the amount of profits made (by the few firms who made any) was negligible. This arises mainly from taxes which do not vary with profits. The two most important of these are the Gewerbesteuer and the Hauszinssteuer. The former is based partly on the assessed value of the property, partly on the total wages bill, and partly on the gross receipts. The latter is based on the rental value of the property. Further, the Umsatzsteuer, based on turnover, cannot be completely evaded even by "integrated" concerns.

CONCENTRATION.

The bulk of the capacity of the German Iron and Steel Industry is in the hands of a small number of firms. Thus in 1929, three firms (out of twenty-eight) produced 68.8% of the pig-iron, four firms (out of forty-nine) produced 68.3% of the crude steel, and three firms (out of fifty-nine) produced 55.8% of the rolling-mill products. By far the largest single firm is the Vereinigte Stahlwerke (often called the Stahlverein), employing over 100,000 workers and with a steel-producing capacity of over 7,000,000 tons per annum.

In 1932 the Federal Government purchased from Herr Flick a large *bloc* of shares which, together with some others, gave it a majority holding in the Vereinigte Stahlwerke. Under the recent new financial reorganisation, the Federal Government has a holding of just over 25%. Such a holding is called a *Sperr-Minorität*, as it can successfully oppose measures proposed by the majority.* The other big holders are Thyssen (13-15%), Rheinische Stahlwerke (controlled by I. G. Farben.) (11-12%), Otto Wolff (9%), and the Haniel group (6%).

* See "The German Steel Trust" in *The Economist*, Sept. 1, 1934, p. 392.

	Blast-furnaces.		Converters.				Open-hearth Furnaces.				Electric Furnaces.		Capacity of Steel Works (000 tons).
			Acid.		Basic.		Acid.		Basic.				
	Number.	Capacity 000 cu.m.	Number.	Cap. (tons).	Number.	Cap. (tons).	Number.	Cap. (tons).	Number.	Cap. (tons).	Number.	Cap. (tons).	
Stahlverein.....	79	40.5	—	—	28	652	—	—	183	8,473	23	179	9,579
Krupp.....	19	9.9	1	2	6	160	11	275	46	1,485	9	84	2,876
Klöckner.....	9	5.1	—	—	4	80	14	1,145	20	995	—	—	1,075
Mannesmann ...	2	1.3	—	—	4	128	—	—	30	755	2	11	894
Hoesch	7	4.6	—	—	4	63	—	—	15	678	2	10	751
Haniel	8	3.6	1	2	6	150	—	—	15	595	1	3	750
Otto Wolff	10	3.6	—	—	8	105	—	—	13	488	2	16	609
Stumm	10	4.9	—	—	8	157	—	—	11	414	1	4	575
Arbed	10	3.7	—	—	5	120	3	75	5	117	—	—	312
Röchling.....	7	3.7	—	—	5	100	—	—	7	150	7	42	292
Borsig	2	0.8	—	—	—	—	1	10	7	220	—	—	230
Lothringen.....	3	0.7	—	—	—	—	—	—	3	120	2	19	139
Total.....	166	82.4	2	4	78	1,715	29	1,505	355	14,490	49	368	18,082
As % of total for Germany	78.7	88.0	14.3	9.3	92.9	91.9	65.9	85.9	89.1	92.1	80.3	88.0	91.3

* From Kupczyk, "Die Konzentrationsbewegung in der deutschen Grosseisenindustrie nach dem Kriege," *Wirtschaftsdienst*, 1930, Heft 41, p. 1750.

CARTELS AND SELLING PRICES.

In Germany there are cartels for every leading type of iron and steel product, including pig-iron.

In 1930 the existing cartel agreements expired and were renewed. The "outsiders" existing at the time were nearly all bought up by the Stahlverein and other big concerns, in order to get their plants inside the new cartels. It has been estimated that 60 to 70 Mn. marks were expended in buying them up; in every case much more than the market value (as shown by Stock Exchange quotations) was paid. The production quotas, based on estimated "capacity" (probably higher than could be attained) before 1930, were:

	Pig-Iron (Mn. tons).	Other Products (in terms of crude steel (Mn. tons)).
Total	1.70	16.37
Of which:		
Stahlverein.....	0.74	7.93
Krupp.....	0.11	1.79
Gutehoffnungshütte ...	0.06	1.08
Hoesch	0.03	1.04
Mannesmann	Nil	0.41

The purchase of the "outsiders" added 0.23 Mn. tons to the pig-iron quotas (of which about 0.10 went to the Stahlverein) and 1.41 Mn. tons to the quotas for other products (of which about 1.00 went to the Stahlverein).

The cartels are the sole selling organisations, both for inland and export sales. They must receive all orders, which they allocate between the firms in accordance with their quotas.

For inland sales, the "basing-point" system is used: that is to say, the customer pays the cartel price plus the freight from the basing-point, no matter from where the goods are in fact supplied. For all products the basing-point is in the Ruhr (the most common being Oberhausen); for some products (notably iron bars) Neunkirchen forms a second basing-point, for the Southern part of Germany. The iron- and steel-consuming industries towards the East of Germany have strongly demanded, but without success, that a new basing-point—such as Magdeburg—should be established.

The cartels for so-called "A" products—semi-finished goods, girders, rails, etc.—and some cartels for the more finished "B" products (e.g. those for thick plates, and for hoops and strips) are united in an association called the Stahlwerksverband. The Stahlwerksverband, together with the other "B" product cartels, selected iron and steel merchants with whom alone they would deal, and these have formed themselves into an Association (Bund Deutscher Eisenhändler), with four regional divisions and three kinds of merchants: merchant firms owned by steel-works, independent firms, and importing firms. Nearly all dealing is confined to the restricted membership of this Association; it is very difficult for "outsiders" to deal.

The following official price-indices suggest that the cartels prevented iron and steel prices from rising as much in the boom and from falling as much in the depression as they would otherwise have done:

INDEX NUMBERS OF PRICES.

(1913 = 100.)

	Iron and Steel Goods (incl. iron ore).	Manufactured Goods: all kinds.	All Wholesale Prices.
1924	123	156	137
1925	129	157	142
1926	124	150	134
1927	125	147	138
1928	128	159	140
1929	130	157	137
1930	126	150	125
1931	115	136	111
1932	103	118	97
1933	101	113	93

Iron and steel prices in Germany have been maintained considerably above the prices in the "world market" (if one can speak of a world market in this connection). For example, the price of steel bars in Germany was 141 marks (peak) in 1929 and 110 marks in 1933; the price of steel bars f.o.b. Antwerp was 116 marks in 1929 and 57 marks (Reichsmark) in 1933. These differences have considerably increased during the depression.

These price differences are made possible by a high tariff on iron and steel goods, ranging from 15 marks a ton on "semis," 25 marks a ton on railway material, and 45 marks a ton on plates of 1 millimetre or less thickness, to 200 marks a ton on certain kinds of tubes.

The total iron and steel "consumption" of Germany, including foundry products and imported foundry and rolling-mill products, is estimated yearly by the German Iron and Steel Federation. Thus in 1928 it was estimated at 14.8 Mn. tons and in 1932 at 5.2 Mn. tons. The distribution of this among different uses was approximately as follows*:

	1928.		1932.	
	Amount (000 tons).	%.	Amount (000 tons).	%.
Machinery	3,013	20.3	1,151	22.0
Iron and Steel Wares (ironmongery, hollow-ware, forgings, wire, gas and water, etc.) ...	5,062	34.1	2,024	38.6
Motor Vehicles	417	2.8	108	2.1
Building and Construction	1,989	13.4	689	13.0
Railways:				
Permanent Way	1,114	7.5	523	10.0
Rolling Stock	70	0.5	15	0.3
Unknown	3,177	21.4	734	14.0
	14,843	100	5,244	100

German steel-using industries clearly would be handicapped on the export markets by the

* Based on estimates in Vierteljahrshefte zur Konjunkturforschung, 1933, Heft 1, Teil B, p. 15.

higher inland price of iron and steel goods. They are united in an association known as A.V.I. (Arbeitsgemeinschaft Verarbeitender Industrien). The iron and steel cartels pay them a kind of private "drawback" to compensate them for the difference between the prices they pay for iron and steel used by them in manufacturing exported products and the world prices of such iron and steel. The full difference used to be paid, but owing to the increased divergence between inland and world prices only the absolute differences existing in May 1931 are now paid.

FOREIGN TRADE.

The total quantity and value of German exports and imports of iron and steel goods (excluding materials such as iron ore and scrap and more finished products such as machinery) were as follows:

	Imports.		Exports.	
	000 tons.	Mn. Rm.	000 tons.	Mn. Rm.
1929	1,460	322	5,575	1,894
1930	1,140	253	4,540	1,646
1931	843	170	4,014	1,365
1932	691	105	2,190	774
1933	939	133	1,953	658

The exports were as follows:

EXPORTS.

(000 tons.)

	1913.*	1929.	1930.	1931.	1932.	1933.
Pig-Iron and Ferro Alloys	857	433	228	187	76	115
Ingots and Billets	701	468	393	409	74	124
Sections, Bars, Hoops	1,173	1,149	977	878	574	396
Girders and Structural Iron and Steel	557	309	337	240	104	75
Plates and Sheets	610	636	460	371	316	162
Tinned and other Coated Plates, etc.	54	81	87	104	91	137
Rails	501	245	207	214	36	61
Sleepers and Fishplates	134	146	94	51	11	30
Wire, Rolled or Drawn	463	457	307	313	181	176
Pipes and Fittings, wrought	307	369	275	236	142	152
Other Items	944	1,282	1,175	1,011	585	524
Total.....	6,301	5,575	4,540	4,014	2,190	1,952

* German Customs Union (incl. Luxembourg).

The chief products exported, and the leading countries of destination, in 1929 and 1933 were as follows:

EXPORTS BY COUNTRIES AND PRODUCTS.

(000 tons.)

	Holland.		United Kingdom.		Japan.		Belgium.		Argentine.		Sweden.	
	1929.	1933.	1929.	1933.	1929.	1933.	1929.	1933.	1929.	1933.	1929.	1933.
Pig-Iron	4,876	2,016	2,865	—	815	324	189,389	23,842	1,960	283	49,520	21,544
Semi-finished Goods * ...	2,335	917	354,386	37,159	46,611	48,841	8,950	1,535	776	41	—	—
Rails, Sleepers, Fishplates	34,867	10,951	7,633	986	20,944	640	466	37	16,254	—	7,330	2,799
Steel Bars, Sections, etc.	323,967	97,299	90,373	5,237	44,389	23,334	13,587	4,586	64,857	18,149	27,099	8,138
Hoops and Strips	16,599	10,831	43,001	4,056	11,055	4,649	2,211	1,194	4,229	2,531	4,174	809
Thick Plates	176,219	14,653	51,638	—	19,281	13,532	1,623	272	3,019	1,648	31,842	6,471
Wire	35,887	22,668	102,452	16,892	92,485	10,866	7,528	5,903	41,042	18,877	9,991	3,168
Tubes	34,798	11,114	32,063	1,033	29,558	1,618	6,440	2,918	38,732	6,971	9,643	3,401
Railway Material	17,771	2,641	1,208	174	1,089	—	1,764	171	1,612	436	1,288	157

	Denmark.		Switzerland.		France.		United States.		Russia.		China.	
	1929.	1933.	1929.	1933.	1929.	1933.	1929.	1933.	1929.	1933.	1929.	1933.
Pig-Iron	13,583	10,337	38,941	13,329	1,293	891	360	229	—	—	—	—
Semi-finished Goods * ...	—	—	3,189	1,767	111	598	—	—	1,561	2,614	—	—
Rails, etc.	5,924	1,099	3,408	1,866	5,554	4	2,100	402	218	154	10,900	8,566
Steel Bars, etc.	53,397	12,984	10,400	5,909	37,095	7,396	50,813	4,936	16,294	43,662	12,291	13,569
Hoops and Strips	5,111	2,521	6,626	2,484	2,957	2,707	16,077	3,939	7,367	6,518	1,244	1,735
Thick Plates	50,436	9,788	2,020	827	5,700	302	1,968	—	19,101	6,448	6,297	2,642
Wire	1,659	1,757	4,023	2,306	1,348	1,176	2,034	1,820	3,053	9,840	14,163	15,925
Tubes	8,346	6,881	9,670	7,025	5,409	1,106	23,319	2,999	2,041	78,208	2,842	979
Railway Material	2,402	784	3,368	1,665	259	9	537	291	—	2,359	1,666	956

* Ingots, Billets, Blooms, and Slabs.

The chief products imported, and the leading countries of consignment, in 1929 and 1932 were as follows :

IMPORTS.

(000 tons.)

Products.	Country of Consignment.											
	Saar.		Luxembourg.		France.		Belgium.		U.K.		Total.	
	1929.	1932.	1929.	1932.	1929.	1932.	1929.	1932.	1929.	1932.	1929.	1932.
Pig-Iron and Ferro Alloys	23.7	6.9	6.9	4.3	79.6	21.5	0.2	4.2	24.4	8.8	177.2	63.7
Ingots, Billets, Blooms and Bars ...	47.0	47.1	32.3	6.6	32.6	20.9	0.1	—	—	—	135.2	75.6
Girders and Structural Iron and Steel	120.7	24.7	53.0	16.5	75.0	19.6	13.7	12.1	—	0.2	263.0	74.1
Sections, Bars and Hoops	229.8	81.5	63.6	36.3	76.0	53.4	20.2	31.8	1.3	0.9	415.4	212.3
Rails, Sleepers and Fishplates	102.7	41.7	3.3	1.5	1.5	0.3	0.9	—	—	—	109.5	43.6
Wire, Rolled or Drawn, and other Wire Goods	65.5	57.6	0.3	—	16.3	16.1	7.1	0.5	0.9	1.5	103.0	84.5
Total (all products).....	747.3	337.3	159.8	65.1	285.6	142.1	49.2	71.0	50.7	19.6	1,460.0	690.7

The above tables call for little comment. It will be noted that about half the imports came from the Saar, while the exports were widely distributed among different countries. 1929 was the peak post-war year for exports. In 1933 the quantity exported was 10-15% lower than in 1932, but during recent months there has been a considerable recovery, and also a rise in export prices.

During 1931 and 1932 Russia was important as an export market, taking about 20% in 1931 and 30% in 1932 of the total quantity, and about 19% in 1931 and 24% in 1932 of the total value, of iron and steel exports, as against quite small percentages in previous years. Exports to Russia, against very long-term

Bills, were facilitated by guarantees from the Federal Government and by the formation of a special Bank to discount the Russian Bills. In 1933, however, Russian purchases from Germany greatly diminished, owing to the political quarrel between the two countries.

Since the middle of 1933, German exports (including iron and steel exports) have been encouraged by the use of scrip marks. These scrip marks have three sources. A foreigner with a "blocked account" in Germany may be permitted to exchange part or all of his deposit for scrip marks. Interest payments on external debt (excepting the Dawes and Young Loans) are made partly in scrip marks. The purchase by Germans of German bonds on foreign Stock

Exchanges, where their price is lower than in Germany, is in principle prohibited by the exchange control regulations, but it is sometimes permitted provided that the buyer exchanges his profits for scrip marks which are used to assist exports. Scrip marks are at a heavy discount as against Reichsmark, so

that the sale of scrip marks in exchange for blocked accounts, etc., on the basis of 1 scrip mark = 1 Rm. yields a profit to the Konversionskasse (Conversion Office), which makes the sale. These profits are in effect transferred to exporters who can show that they have exported "at a loss."

FRANCE.

PRODUCTION BY DISTRICTS.

In 1913 France produced 5,207,000 tons of pig-iron and 4,687,000 tons of steel (ingots and castings). Lorraine désannexée, then part of Germany, and now the French département of Moselle, produced 3,864,000 tons of pig-iron and 2,286,000 tons of steel. The production by districts in 1929, the peak year, and in 1933, was as follows:

PRODUCTION.
(000 tons.)

	Meurthe-et-Moselle, Haute-Marne, Ardennes.	Moselle.	North.	Centre.	South-West.	South-East.	West.	Total.
1929								
Pig-Iron	4,313	3,806	1,215	189	175	139	527	10,364
Steel	3,674	2,985	1,698	566	56	125	595	9,699
1933								
Pig-Iron	2,742	2,195	822	88	91	84	305	6,327
Steel	2,464	2,086	1,118	359	36	66	397	6,526

Thus the East—that is, Meurthe-et-Moselle, Haute-Marne, Ardennes, together with Moselle—is by far the most important region, producing some four-fifths of the pig-iron and some two-thirds of the steel. It is based on the iron ore of the Lorraine field; nearly all its fuel has to be transported from elsewhere. The works of Meurthe-et-Moselle sell most of their products, as before the war, to the internal French market, which takes some nine-tenths of their merchant steel and plates, some three-quarters of their wire, some two-thirds of their girders, and some half of their rails and railway material. The works of Moselle before the war sold over half their production, mainly in the form of pig-iron (over 1 Mn. tons) and semi-finished products, to the German market (especially to the Saar). They now provide the greater part of France's exports of iron and steel, especially of railway material, girders, and semi-finished products, although their sales within France are also considerable. Before the war, 29% of the steel output of the East was sold in the form of semi-finished products (ingots, blooms, billets, etc.); by 1931 it had fallen to 17%.

The North, on the other hand, uses mainly local fuel. Three-quarters of its coke comes from cokeries attached to the mines of the Nord and the Pas-de-Calais, and the other quarter from cokeries attached to the metallurgical works, in which some three-quarters of the coking coal used is French. Most of its iron ore—over 80%—comes from the Lorraine field; less than 10% is imported, and less than 5% comes from the West of France. Since, in contrast to the East, it has not to pay heavy transport charges on fuel, it produces more of the more-finished products (thus it is the chief district for tubes, plates, and tyres), and nearly half its steel is open-hearth. It is the district which consumes most scrap. It exports very little, selling mainly to the transforming industries in the district.

The Centre has been declining in importance. It produces very little pig-iron; during the last two years only two blast-furnaces have been working. Its pig-iron is mainly hematite forge pig-iron, produced from iron ore imported mainly from the Pyrenees and North Africa. In 1933 the Centre produced 88,000 tons of pig-iron as against 184,000 tons in 1913. Its steel output is more important, but this too has fallen from nearly 8% of the total (present frontiers) in 1913 to 5% in 1933. It produces two-fifths of the forged pieces and nearly half the special steels produced in France. But the local coal, which it uses, is difficult to win, and therefore expensive. The main asset of the district is its skilled labour force, but it is doubtful whether it can hold its own against the North and the East (which are turning more to special steels) without direct or indirect Governmental assistance.

The South-West produces mainly hematite forge and foundry pig-iron and ferro-manganese pig-iron. The South-East produces mainly hematite forge and ferro-silicon pig-iron and special steels. The West uses the ores of Normandy, Anjou, and Brittany plus some imported ore, mainly from Spain. The works produce their own coke from German and English coking coal. About half the steel produced is basic Bessemer and half basic open-hearth; the principal products are wire, medium plates, and tin-plates.

PRODUCTION BY KINDS OF PRODUCTS.

The production of pig-iron by kinds was as follows :

(000 tons.)

	1913.	1929.	1933.
<i>Phosphoric</i>			
Bessemer Basic ("Thomas")	6,624	7,979	4,968
Foundry		1,248	668
Forge and O. M.		10	—
<i>Semi-phosphoric</i>	1,710	164	93
<i>Hematite</i>			
Foundry		369	195
Forge and Bessemer (acid)...	656	360	200
<i>Special</i>			
Spiegel	26	111	102
Ferros	55	123	101

It will be noted that over 90% of the pig-iron is phosphoric (or semi-phosphoric). Owing to the same reason—the phosphoric content of Lorraine ore—most of the steel produced is basic steel.

The production of steel by processes, within the present frontiers, was as follows :

(000 tons.)

	1913.	1929.	1933.
Bessemer Basic ("Thomas")	4,907	6,680	4,430
Open-Hearth ("Martin")	1,762	2,753	1,865
Electric Furnace	27	151	179
Bessemer Acid	253	98	50
Crucible	24	17	2
Total	6,973	9,699	6,526

The above figures include both ingots and castings, but only a small proportion (87,000 tons in 1913; 237,000 tons in 1929; 145,000 tons in 1933) was castings. About 99% of the open-hearth steel is basic.

In 1933 some 68% of the steel was Bessemer basic and some 28% open-hearth. The percentages for previous years were similar, although there has been some tendency for the latter process to gain ground. Clearly other methods are of quite minor importance, but it may be noted that the electric furnace has increased in importance; the Bessemer acid process (using the more expensive hematite pig-iron) has declined; and the crucible method has almost vanished. Most of the electric furnaces and crucibles are in the Centre and South-East (around Le Creusot and St. Etienne and Grenoble), where hydro-electric power is available.

The bulk—5,552 thousand tons in 1929; 3,672 thousand tons in 1933—of the Bessemer basic steel is produced in the East. The open-hearth process was distributed as follows :

(000 tons.)

	East.	North.	Centre.	Other Districts.
1929	1,081	815	460	397
1933	829	574	286	176

The open-hearth process consumes more fuel than the Bessemer process, and therefore might seem unsuitable for the East; but it utilises the large quantities of "new" scrap produced in the rolling-mills.

In 1933, out of a total of 6,526,000 tons of steel ingots and castings, 1,128,000 tons were sold in the form of semi-finished products: ingots, blooms, billets, and slabs. The corresponding figure for 1913 is 1,498,000 and for 1929 1,757,000. The principal finished products produced from the remainder are shown below, with the corresponding figures for 1913 and 1929 :

(000 tons.)

	1913.	1929.	1933.
Finished Products—			
Tyres.....	92	79	30
Forgings	87	76	52
Rails	698	610	324
Fishplates and Sleepers		187	98
Girders and Joists	854	878	488
Wire and Wire Rods	347	625	403
Hoops and Strips	62(?)	258	237
Tubes and Pipes		368	223
Special Steels	1,520	207	129
Merchant Bars.....		2,279	1,501
Tinplates	39	86	113
Sheets and Plates	669	1,258	926
Total	4,368	6,911	4,524

MATERIALS.

In 1930, to produce 10 Mn. tons of pig-iron, France consumed 28 Mn. tons of iron ore and 10.8 Mn. tons of coke. These proportions have not changed appreciably during recent years. In 1930, 541,000 tons of high-grade manganese ore were used. Practically all this was imported: 285,000 tons from India, 125,000 tons from Russia, and 89,000 tons from the Gold Coast. (In 1933, the chief source of supply was Russia.) The consumption of scrap reached a peak of 3,500,000 tons in 1929 (as against 1,474,000 tons, within present frontiers, in 1913). In 1930, nearly 2,500,000 tons of coal (as distinct from coke) were used.

(a) Iron Ore.

The French production of iron ore, within the present frontiers, was as follows :

(000 tons.)

Basin.	1913.	1929.	1933.
Metz-Thionville.....	21,135	21,355	13,141
Briey	15,104	21,366	13,251
Longwy	2,958	3,782	1,633
Nancy.....	1,917	1,495	701
Normandy	813	1,866	1,300
Anjou-Brittany.....	400	534	165
Pyrénées	334	172	12
Others.....	392	141	4
Total.....	43,053	50,731	30,207

The number of workers engaged was 42,000 in 1913, 40,000 in 1929, and 23,000 in 1933. Less than a quarter of the workers in the mines of the East are French. Over a third are Poles and nearly a third are Italians. The average daily production per worker (all workers) was 4.3 tons in 1930 as against 3.3 in 1913.

The first four basins form the Lorraine field of "minette" ore (which extends into Luxembourg). The iron content of the ore is low; that of Metz-Thionville varies from 28 to 34%, that of Briey from 32 to 39%, and that of Longwy and also that of Nancy from 33 to 38%. But the deposits have valuable characteristics. They are comparatively easy to mine. They contain both calcareous ores (mainly in the two first-named basins) and siliceous ores (mainly in the two last-named basins); this makes it possible (although it may involve transporting ore from one part of the field to another) to obtain a suitable and self-fluxing mixture for blast furnaces. Finally, their fairly constant phosphorus content (of 1.5-2.0%) makes them eminently suitable for the basic process, with its valuable by-product of "Thomas" fertiliser.

It will be seen that the Lorraine ores account for some 95% of the total production.

The ores of Normandy and Anjou-Brittany are very similar to one another. Their iron content varies from 44 to 54%. They contain phosphorus, but not enough to produce Bessemer basic pig-iron without the addition of more.

The Pyrénées ore is hematite with an iron content of 45-55%.

Of the 50,731,000 tons of ore produced in France in 1929, 29,206,000 tons were consumed in France, 5,120,000 tons (practically all Lorraine ore) were consumed in the Saar, and the rest was exported as follows:

	000 tons.
Belgium and Luxembourg	12,424
Germany.....	2,688
Holland	1,126
Great Britain.....	183
Other Countries.....	4
Total	16,425

In 1933, the production was 30,207,000 tons, of which 10,986,000 were exported (9,393,000 to Belgium and Luxembourg and 1,156,000 to Germany).

About 98% of the iron ore consumed in France is produced in France. The 2% imported comes mainly from Spain and Tunis and Algeria.

It has been suggested from time to time that France should restrict her exports of iron ore. Her total reserves of exploitable iron ore have been estimated recently at 4,500 Mn. tons, of which over 4,000 Mn. are in the Lorraine field. Thus an average annual rate of extraction of 45 Mn. tons would exhaust them in 100 years, and a faster rate would exhaust them sooner. Nothing has been done, however, to limit exports. It seems fairly clear that such a course would be unwise. Even at a zero rate of interest the gain would be doubtful. The "circulation" of iron ensures almost unlimited supplies of scrap; the growth of geological and technical knowledge may well provide cheaper alternative sources of supply in the future; and future changes in conditions and technique are as likely to lower as to raise the value of French ore.

(b) Coke.

The production of pig-iron requires coke, obtained by treating coking coal in a coke-oven. It takes 1.3-1.5 tons of coking coal to produce a ton of coke in a "by-product" oven (and nearly all French coke-ovens are of this type), but the coke-oven gas can be utilised or sold, and the coal-tar, etc., can be transformed into a whole range of by-products. It is clearly a question of relative prices whether it pays either a coal-mine or a metallurgical works to instal coke-ovens.

In 1913, 4.0 Mn. tons of coke were produced in France; of this, nearly 3.0 Mn. tons came from cokerries attached to coal-mines. Between 1925 and 1929 many mines, especially in the Nord and Pas-de-Calais, considerably increased their equipment of coke-ovens: these now have a capacity of some 6 Mn. tons a year. Some metallurgical works, especially in the East, did the same. In 1930 the production of metallurgical coke in France reached a peak of 9.2 Mn. tons, distributed as follows:

Mines (using mainly their own coal, mainly Nord and Pas-de-Calais)	5.0 Mn. tons
Independent Cokerries (on the coast, using imported coal).....	0.7 "
Metallurgical Cokerries (2.2 Mn. in the East, using largely imported coal)	3.5 "
	<hr/>
	9.2 "

The consumption of metallurgical coke in 1930 was 10.8 Mn. tons. In terms of coal, this amounted to 15,570,000 tons. The origin of the coking coal (and coke) consumed, in terms of coal, was :

Country of Provenance.	Thousand Tons.	Country of Provenance.	Thousand Tons.
France	5,839	Belgium	993
Germany	4,904	Saar.....	1,271
Holland.....	1,484		
Great Britain	1,079	Total.....	15,570

Before the war, three-quarters of the coke used in the blast-furnaces of the East came, in the form of coke, from the Ruhr district. In 1927 and 1928 Germany supplied over 38% of France's imports of metallurgical coking coal and coke. By 1931, this had fallen to 28%.

The share of the Saar, on the other hand, rose from a negligible one in 1913 to 3.6% in 1927, and 6.7% in 1931. Technical progress after the war made it possible to use Saar coking coal in the coke-ovens of the East mixed with coking coal of better quality. The proportions vary : a typical mixture contains about 30% Saar coal.

During the depression, the French Government adopted a policy of import quotas for many commodities, using the average imports of 1928, 1929, and 1930 as a basis of reference. This basis would represent 767,000 tons a month, in terms of coal, for imports of coking coal and coke for the iron and steel industry. Actually, such imports have been subjected to no official restrictions and the industry has been left free to import whence it chose, but its imports in 1932 were only 50% and in 1933 only 60% of the above basis of reference, as against an average of 70% for other imports.

Coking coal and coke imported are exempted from the tax on import licences (of 4 francs a ton), but pay a customs duty of 2 francs a ton and supplementary import taxes of about 1.50 francs a ton. Imported coke, like French coke, is subject to the tax which has replaced the turnover tax, and is now 2.75% *ad valorem*. Imported coking coal does not pay this tax, which is levied upon the coke sold by the cokeries.

(c) Scrap.

Scrap is used in blast-furnaces and foundries and in the manufacture of steel by the Bessemer process (174,000 tons used in 1932) and by the electric process (137,000 tons used in 1932), but its main use is in the manufacture of steel by the open-hearth process, in which it is the most important raw material. During recent

years the open-hearth furnaces have consumed over 75% scrap. Thus in 1932 1,369,000 tons of scrap were used to produce 1,639,000 tons of open-hearth steel. The open-hearth furnaces in the East are all attached to works which utilise mainly "new" scrap from their own rolling-mills, but in the North, the Centre, and the West, large quantities of scrap are purchased on the market. Since the war, the French steel-works, especially in these districts, have pressed for restrictions on the export of scrap, in order to keep down its price in France. A decree of December 1922 prohibited the export of scrap. Nevertheless, in 1925 517,000 tons were exported, as against 184,000 tons in 1913. Most of this went to Italy, to which country export was permitted in consequence of the French-Italian commercial agreement. Certain other countries protested that this special treatment accorded to Italy was a breach of the most-favoured-nation clause. In May 1926, therefore, a new agreement was made with Italy by which a maximum annual quota was laid down for the export of scrap from France to Italy, the quota increasing with increased Italian purchases from France. Maximum quotas were subsequently arranged for the export from France to Great Britain, Spain, and Poland. In fact, the exports exceeded the quotas. In the first place, the quotas did not cover scrap from demolished ships; the export of such scrap from France in 1929 exceeded 60,000 tons. In the second place, scrap was exported from France under other names : as (second-hand) rails, axle-trees, etc. Thus for 1929 exports of scrap from France to Italy are recorded as 193,000 tons and imports of scrap into Italy from France as 450,000 tons. French decrees of November 1931 attempted to end these practices. At present, exports of scrap are still subject to maximum quotas, controlled through export licences.

It may be noted that France is not alone in restricting scrap exports. All the countries (except Great Britain and Japan) which at Geneva in 1927 signed the declaration in favour of greater freedom of trade excepted the prohibition of exports of scrap.

LABOUR.

The total number of workers employed in the iron and steel industry, as given in official statistics, fell from a peak of 265,000 in 1929 to 256,000 in 1930, 216,000 in 1931, and 197,000 in 1932. The monthly reports of the Factory Inspectors show only a small increase in numbers since then, but 49% of the workers were working

a full 48 hours or more in the spring of both 1933 and 1934, as against 29% in June 1932. (In 1930 the percentage was about 90.) The number of persons registered at the Employment Exchanges as seeking work in the metallurgical industry, and not placed, was about 66,000 in May 1934.

The 197,000 workers in 1932 were divided among districts as follows :

East	76,000	Centre	32,000	South-East	7,000
North	66,000	South-West	6,000	West	12,000

The official figures include men employed in engineering shops (46,000 in 1932); some two-thirds of these are in the North, and more are in the Centre than in the East. They also include men engaged in transport, clerical work, etc. The number employed in blast-furnaces, melting shops, and rolling-mills did not greatly exceed 60,000 in 1932. Nearly half of the workers are foreign: principally Poles, Italians, and Belgians.

There is no effective organisation of workers in the industry, partly owing to the large foreign element and partly owing to the workers' habit of returning to the land in bad times: the principal works are in agricultural areas. Thus contracts are made between the employer and the individual workmen.

No statistics of earnings are collected. The British Delegation gives the following "trustworthy estimate" of total average normal weekly earnings (including family allowances and other social allowances paid in cash) for the beginning of 1930 :

Skilled Men	320 francs	Unskilled Men ...	200 francs
Semi-skilled Men	250 "	Weighted Average	230 "

The writer was given various estimates, in the spring of 1934, of the extent to which wage-rates had fallen during the depression. These estimates varied from 10 to 20%. At that time, the prevailing rate for unskilled labour in the East was only 2.50-2.75 francs an hour. Many workers are provided with houses at low rents and some firms provide co-operative stores which sell goods cheaply.

TRANSPORT.

The importance of transport charges to the French iron and steel industry is shown by the fact that in 1930 it paid two milliard francs in freight to the French railways: 20% of their freight receipts and 14% of their total receipts.

By far the greater part of the materials and products of the industry are transported, within France, by rail, but at least a fifth of the coking coal imported for the cokeries of steel works in the East comes by water. The

Canal of the Iron Mines—the canalisation of the Moselle between Metz and Thionville, where it was not navigable, owing to sandbanks—was completed in August 1932. This canal (besides opening a waterway to Paris *via* the Marne-Rhine canal) has reduced the freight on German coking coal by some 20 francs a ton; but not all works in the East are so situated that they can profitably utilise the canal. Apart from this, freight rates have changed little during the last few years.

Despite the unification of French railway rates in 1920, some attempt is still made to preserve "a certain equilibrium" between the different iron and steel districts. Thus the Centre, for example, gets certain advantages.

The following list of freight rates on iron and steel products shows that railways diverge somewhat from their general tariff (given on page 49) for certain hauls.

	Kilometres.	Francs.
Valenciennes —Saint-Nazaire	683	198
Longwy —Lyon	531	155.85
Longwy —Marseille	869	208.10
Pompey (Nancy)—Bordeaux	875	201.15
Longwy —Saint-Nazaire	794	212.25
Le Creusot —Lyon	151	54.30
Le Creusot —Marseille	489	120.45

The main export port is Antwerp; only about a quarter of the tonnage exported goes *via* Dunkerque, although this port has made considerable progress since the war, and although the Nord railway keeps freight rates from Lorraine to Dunkerque as low as those charged to Antwerp, despite the considerably greater distance.

Iron ore exported to Belgium is carried at reduced rates. Thus iron ore going from Tucquegnieux (Briey) to the works at Mont-Saint-Martin (Longwy) by daily trains of 880 tons in owners' wagons pays 16.7 centimes per ton-kilometre, but if for export it pays only 13.2 centimes.

Most iron ore travels in special (40-ton) wagons owned by the works which own the mines. The big movements are from Lorraine towards Belgium and Luxembourg, towards the Saar, towards Germany (partly by water), and towards the North of France, but there is also considerable movement for short distances within the East itself, in order that blast-furnaces can use a mixture of ores. Thus about half the ore consumed in the Nancy region comes from round Briey, at a transport cost of 10 to 15 francs a ton.

Most of the coke going from the mines of the Nord and the Pas-de-Calais to blast-furnaces

in the East travels by complete trains. The cost of transport per ton, in complete trains and in the railway's wagons, is 41.70 francs to Thionville, 41.90 to Homécourt, 38.80 to Longwy, and 46.30 to Champigneulle (Nancy).

PLANT AND EQUIPMENT.

After the war, the iron and steel plants which had been destroyed were reconstructed and others were modernised. Thus the bulk of the plant and equipment is still fairly new. Most of the works, especially in the East, are large integrated establishments including both blast-furnaces and rolling-mills, and usually producing electricity and a whole range of by-products as well as iron and steel.

The number of blast-furnaces, within present frontiers, was :

	Working.	Not Working.		Working.	Not Working.
1913	195	39	1931	90	121
1929	154	68	1932	81	81
1930	137	78	1933	91	120

The blast-furnaces constructed or reconstructed since 1918 have, in general, a greater capacity than those existing before the war. Before the war, the daily capacity varied between 200 and 300 tons; to-day 300 tons is typical, and a number exist of 350-400 tons. The average yearly output per blast-furnace working was about 46,000 tons in 1913 and 70,000 in 1933.

Progress in the technique of purifying blast-furnace gas has enabled this to be utilised as fuel for boilers, gas engines, and furnaces, and in the production of electricity. Thus an integrated works, which also uses its coke-oven gas, need purchase no fuel except coking coal for its coke-ovens. It should be added that during recent years those concerns which purchased their coke have fared better than those which had to keep their coke-ovens going to provide themselves with sufficient gas.

Since the war, many devices have been installed, such as automatic charging for blast-furnaces and open-hearth furnaces, electric magnets, and overhead conveyers, which reduce the labour required.

In 1930 the total sales of electricity by iron and steel works was 794 Mn. kilowatt-hours, as against 250 Mn. in 1928. 300,000 tons of cement were produced from blast-furnace slag by cement works attached to iron and steel works. 1,600,000 tons of "Thomas" fertiliser were sold to agriculture. Over 1,500,000 cubic metres of coke-oven gas were sold to industrial

establishments, municipalities, etc.; and 339,000 tons of crude coal tar, 113,000 tons of sulphate of ammonia, and 68,000 tons of benzol, were produced.

COSTS OF PRODUCTION.

According to Levainville,* the raw material and labour costs of a ton of pig-iron produced in the East before the war were :

3.5 tons minette at 4.50 per ton.....	15.75 francs
1,200 kilos Ruhr coke at 20 francs per ton plus freight at 8 francs per ton	33.60 "
Manganese	2.25 "
Labour	3.50 "
	<u>55.10 "</u>

Levainville added 3.50 francs for general expenses and interest on circulating capital.

A corresponding calculation for 1934 would be :

3.5 tons minette at 20 francs per ton	70 francs
1,150 kilos French coke at 90 francs per ton plus freight at 40 francs per ton	147.50 "
100 kilos 50% manganese ore at 200 francs a ton	20 "
Labour (12 men at 2.50 francs per hour and output 300 tons per day)	24 "
	<u>261.50 "</u>

Such calculations are of little value. There is great scope for variation in the proportions of the various costs. Less coke is needed for higher-grade ore, more labour is needed for a blast-furnace not equipped with automatic charging apparatus, transport costs vary with geographical situation and are considerably less for firms owning their own wagons, and so on. Nevertheless, they do show the important share of coke in the costs of producing pig-iron in the East. The price of coke is high in France relatively to other countries. This is due to the comparative scarcity of coking coal in France and to the comparative difficulty of mining it. The average daily output of coal per person engaged in 1930 was :

	Kg.		Kg.
France	696	Poland (Upper Silesia)	1,369
Germany (Ruhr)	1,352	Holland	1,245
Great Britain	1,098	Belgium	576

The price of the metallurgical coke of the mines of the Nord and the Pas-de-Calais is calculated quarterly by a formula in which the main elements are the price of coal at these mines, the price of Durham coking coal f.o.b. Newcastle, the price of pig-iron No. 3 Foundry départ Longwy, and the export price of bars, f.o.b. Antwerp.

* *L'Industrie du Fer en France*, p. 103.

The price of metallurgical coke, so calculated, was :

	Francs per Ton on Wagon (Basing Point Douai).		Francs per Ton on Wagon (Basing Point Douai).
January 1929	140	January 1932	99.25
" 1930	139	" 1933	87
" 1931	129	" 1934	89.75

The average price of coke imported into France (after paying customs duties) at the frontier, was :

	Francs per Ton.		Francs per Ton.
1929.....	159	1932.....	107.36
1930.....	163.61	1933.....	89.34
1931.....	141.95		

The price of scrap has fallen considerably during the depression. The iron and steel firms complain mainly of the railway freight rates, which are in many cases seven to ten times their pre-war level, and of taxation. They also point to the relatively high cost of living (due largely to Protection), which makes it difficult to reduce wages further; they have already been reduced considerably more in this industry than in most.

ORGANISATION.

Most of the pig-iron and steel is produced in fairly large works. Thus in 1928-30 about a dozen of the largest works (including Hayange, Moyeuve, Knutange, Rombas, Longwy, Micheville, Joeuf, and Homécourt) each produced around 400,000 or 500,000 tons a year of both pig-iron and steel. Between them they produced well over half the total output.

Ownership is still more "concentrated." This concentration was stimulated after the war. The recovery of Moselle (Lorraine annexée) led to the partition among the leading French groups of the works of that district; and during the post-war reconstruction, when most of the leading works in both the North and Meurthe-et-Moselle were rebuilt after having been destroyed in the war, there were numerous amalgamations and poolings of financial claims or interests. There is so much "interpenetration" between the leading groups through "participations," exchanges of shares, companies owned jointly by several groups, and so on, that it is impossible to state briefly the real distribution of ownership. But it is certain that a very small number of groups (including those of de Wendel, Marine et Homécourt, Micheville, Pont-à-Mousson, and

Schneider) together own, or at least control, over 80% of the total capacity. These groups also have large interests in iron-ore mines and coal mines, and some (notably the Schneider and Homécourt groups) are engaged either directly or through affiliated concerns in the manufacture of armaments, locomotives, machinery, and similar products.

This concentration of ownership has facilitated the formation of cartels. At the present time there are cartels, known as *comptoirs*, for nearly all important iron and steel products. Each member of a *comptoir* is allotted in advance a definite proportion of the orders to be taken by the *comptoir*. Buyers may apply to the works, or to the special selling organisations of the works, or directly to the *comptoir*; but only the *comptoir* can make contracts with prospective purchasers. The members of the *comptoir* have renounced the right to accept orders on their own account; any firm which does so is subject to heavy penalties. Thus the *comptoir* receives all orders and distributes them among the various firms in accordance with their agreed quotas. The basing-point system is in force, the basing-point for most products being Thionville. The various *comptoirs* (excepting that for pig-iron) are united in a central organisation: the Comptoir Sidérurgique de France.

There have been *comptoirs* in this industry in France ever since the Longwy *comptoir* for various products, formed in 1876. Nevertheless, they have not been as strong as the German cartels. The depression, which hit the French metallurgical industry about the close of 1930, increased the difficulties of maintaining control. For example, the *comptoir* for "semis" was renewed in August 1931, only to break down two months later. The Report to the French Economic Council, written in 1931, declares* that "for many products complete control over output and price cannot be established, and there is only a limited control relating only to output."

In these circumstances, the big producers reached an agreement at the close of 1931 to accept the limitation by quota of their output on the basis of their production in 1929 and 1930. The existing system of *comptoirs* dates, in the main, from this agreement. In the spring of 1932 new *comptoirs* were formed for some products, previously uncontrolled, and old *comptoirs* were revived or renewed, nearly all for a three-year period, in contrast to the three-month period which usually prevailed before this reorganisation.

France is also a party to various international

* Page 71.

agreements. The most important is, of course, the International Steel Agreement (see page 47). Others relate to rails, wire rods, tubes, drawn wire, and hoops and strips.

Each big group has its own selling organisation to promote sales both at home and abroad. Thus the Marine et Homécourt group has formed Davum for home, and Davum Exportation for foreign sales; Longwy, Rombas, and some other concerns formed Actuma in January 1933 to promote exports; and Schneider, de Wendel, and other groups have similar selling organisations.

FOREIGN TRADE.

The foreign trade figures given below relate to France and the Saar.

Imports of iron and steel products (including scrap) are very small: In 1933, 330,000 tons valued at 18 Mn. francs, were imported. The main items were:

	000 tons.		000 tons.
Pig-Iron: Ordinary	17	Scrap	102
„ Hematite	77	Plates and Sheets ...	29
Semi-finished Products (incl. bars)	61	Tubes	10

Nearly all the imports were into France (and not into the Saar). Import duties are high: 51 francs a ton on pig-iron, 145 on blooms, billets, and bars, 150 on rails, and 172.5 on thick plates. There are import quotas on several products, including hematite pig-iron, hoops and strips, special steels, tinplates, and ordinary plates. During the last few years about half the imports have entered as "temporary admissions," free of duty, in order to be worked up and exported. Most of the hematite pig-iron imported comes under this head.

Exports (including pig-iron) were:

	Mn. tons.	Md. frcs.		Mn. tons.	Md. frcs.
1925.....	4.0	2.4	1930.....	3.8	2.4
1926.....	3.9	3.0	1931.....	3.5	1.9
1927.....	5.3	3.3	1932.....	2.3	1.1
1928.....	4.7	2.9	1933.....	2.6	1.2
1929.....	3.9	2.6			

The main export markets during recent years have been Germany, Great Britain, Belgium, Switzerland, the French colonies,

and Italy, the first three together taking well over half of the total exports. The greater part of the exports to Germany are from the Saar. Great Britain has been a more important market, mainly for blooms, billets, and bars, than the statistics show, since a considerable part of the exports consigned to Belgium are exported again to Great Britain. The effect of the British import duties is shown in the heavy fall in exports of semi-finished products to Belgium, as well as to Great Britain.

The principal exports were:

(000 tons.)

	1929.	1933.		1929.	1933.
<i>Pig-Iron.</i>					
Belgium	268	76	Great Britain...	37	2
Germany.....	99	31	Other Countries	22	17
Italy	80	16			
Switzerland ...	56	27	Total	562	169
<i>Blooms and Billets.</i>					
Belgium	218	22	Switzerland ...	62	95
Germany.....	65	60	Other Countries	8	14
Great Britain...	60	85			
Italy	40	16	Total	453	292
<i>Bars (Merchant steel girders, etc.).</i>					
Germany.....	447	288	French N. Africa	123	159
Great Britain...	296	80	Other Countries	257	280
Belgium	245	57			
Switzerland ...	117	97	Total	1,628	1,150
Scandinavia ...	83	156			
Argentina	60	33			
<i>Rails.</i>					
Germany.....	97	55	Other Countries	197	61
French Colonies	32	36			
			Total	326	152
<i>Hoops and Strips.</i>					
Germany.....	35	32	Other Countries	29	51
Great Britain...	30	31			
			Total	94	114
<i>Wire Rods.</i>					
Germany.....	54	56	Wire	48	61
Scandinavia ...	35	23	Tinned and Other		
Belgium	37	12	Coated Plates	30	38
Japan	25	2	Tubes	74	74
Other Countries	57	43			
Total	208	136			
<i>Plates.</i>					
Germany.....	61	53	Flats	12	21
Other Countries	100	90			
Total	161	143			
<i>Scrap.</i>					
Italy	193	191	Other Countries	51	48
Belgium	50	31			
Great Britain...	21	29	Total	315	299

BELGIUM.

PRODUCTION.

The Belgian output of both pig-iron and steel during 1924-29 was much above the pre-war level. The record pre-war year was 1913, when 2,485,000 tons of pig-iron and 2,467,000 tons of steel were produced. During the war nearly all the works were demolished and output sank to very low levels. After the war, the works were reconstructed, with modern equipment, and in 1924 the output of pig-iron was 2,844,000 tons and of steel 2,875,000 tons. After a slight decline in 1925, the output of both rose continuously to a peak, in 1929, of 4,041,000 tons of pig-iron and 4,110,000 tons of steel. The subsequent movement was :

(000 tons.)

	Pig-Iron.	Steel.
1930.....	3,365	3,354
1931.....	3,198	3,105
1932.....	2,749	2,790
1933.....	2,745	2,742

The number of blast-furnaces working fell from a maximum of 58 in 1929 to 44 in 1930 and 1931, to 37 in 1932, and to 32 in 1933.

It will be seen that the fall in output during the depression has been much less than in most leading iron and steel countries, and that output has not fallen below the pre-war level.

The iron and steel industry is mainly concentrated in the coal areas around Charleroi and around Liège. There is also a much smaller centre in the south of the Belgian province of Luxembourg, nearer the ore.

The production of pig-iron by kinds, was :

(000 tons.)

	1929.	1932.
Basic	3,837	2,661
Foundry :		
Phosphoric	115	60
Hematite	33	16
Forge	41	—
Spiegel, Ferro-Manganese, etc.	14	12
Total.....	4,041	2,749

The pig-iron production is overwhelmingly basic, and nearly all this is for Bessemer (or "Thomas") rather than for open-hearth (or "Martin") steel.

The production of steel by processes, was :

(000 tons.)

	1929.	1932.
<i>Ingots</i>		
Thomas Converter	3,595	2,448
Open-hearth	400	295
Electric	14	9
<i>Castings</i>		
Converter	74	
Open-hearth	25	38
Electric	1	
Total.....	4,110	2,790

The proportion of open-hearth steel is comparatively low. In 1932, only 1,080 tons of puddled iron were produced (as against an average annual output of 238,060 tons 1901-10). Only one works, employing 68 workers, was producing.

In 1933, 39,000 tons of wrought iron were produced, as against 153,000 tons in 1929. The great bulk of this is merchant iron, the rest being plates and special sections.

In 1932, 584,000 tons of semi-finished steel were produced, as against 787,000 tons in 1929.

In 1933, 2,088,000 tons of "finished" steel were produced, as against 3,122,000 tons in 1929. The division of "finished" steel by-products in 1929 and 1932 was :

(000 tons.)

	1929.	1932.
Merchant Steel	891	457
Special Sections.....	416	190
Girders and U's	201	165
Rails	163	41
Railway Material	132	42
Tyres and Axles	31	12
Wire Rods	272	130
Hoops and Strips	65	207
Rods	51	165
Flats	104	21
Plates : Thick	387	297
Average	196	90
Thin	213	201
Tubes	—	30
Other Products	1	0
Total.....	3,122	2,048

MATERIALS.

In 1929, to produce 4 Mn. tons of pig-iron, 10.3 Mn. tons of ore and 4.2 Mn. tons of coke were consumed. In 1932, to produce 2.7 Mn. tons of pig-iron, 6.6 Mn. tons of ore and 2.5 Mn. tons of coke were consumed.

(a) *Iron Ore.*

The Belgian reserves and production of iron ore are almost negligible. Nearly all the ore used is the Lorraine "minette"; most of it comes from France and the rest from Luxembourg. The figures for 1932 are:

SOURCES OF IRON ORE CONSUMED.

	000 tons.
France.....	5,738
Grand Duchy of Luxembourg.....	700
Sweden	72
Spain and North Africa	30
Belgium	102
	<hr/>
	6,642
	<hr/>

(b) *Coke.*

Most of the coke used in Belgian blast-furnaces is coked in Belgium. Thus, in 1932, 2,546,000 tons of coke were so used, and of this only 140,000 tons were imported in the form of coke. But one cannot say precisely what were the sources either of the 140,000 tons of imported coke used in blast-furnaces or of the coking coal used in producing the remaining 2,406,000 tons of coke. For the statistics do not distinguish exactly between metallurgical coke and other coke, and between coking coal used in producing metallurgical coke and other coking coal.

Before giving such facts as are available on this, it may be well to point out that Belgium imports more coal than she exports. Thus in 1932 her total imports of all coal, coke, and agglomerates, in terms of coal, were 9.4 Mn. tons (of which 5.2 from Germany, 2.1 from Holland, and 1.4 from Great Britain) and her total exports only 5.3 Mn. tons (of which 3.5 to France). Belgium subjects coal imports to a quota, with the first six months of 1931 as a period of reference. In 1933 the quota varied around 50%, and in addition a tax of 10 Belgian francs per ton was imposed on imports.

We may now return to coke and coking coal. The total imports of coke—metallurgical and other—in 1932 were 1,943,000 tons, of which 1,329,000 came from Germany and 602,000 from Holland. It is probable that most of the 140,000 tons used in blast-furnaces came from Germany.

The total production of coke—metallurgical and other—in Belgium in 1932 was 4,410,000 tons, and only 37% of the coal used in producing this was imported (as against 52% in 1930. In 1933 total coke production was 4,545,000 tons, and for this 6,385,000 tons of coal were used, of which only 1,844,000 tons or 29% was imported). 1,145,000 tons of this were produced in cokeries attached to six metallurgical works in the Charleroi district and 994,000 in cokeries attached to four

metallurgical works in the Liège district. About two-thirds of the coal used in these cokeries was Belgian. 1,498,000 tons were produced in independent cokeries in the North of Belgium, using coal 63% of which was imported (as against 77% in 1931). The remaining 773,000 tons of coke were produced in cokeries nearly all attached to coal-mines and using nearly all Belgian coal.

The total import of *coking* coal in 1932 was 2,360,000 tons. This came mainly from Germany, Great Britain, and Holland.

The Belgian Department of Mines gives the following figures of the coke and by-products obtained in producing metallurgical coke in 1932. Per ton (1,000 kilogrammes) of coking coal, there were produced:

698	kg. Metallurgical Coke.
43	kg. Small Coke.
131	cubic metres Saleable Gas.
9.6	kg. Ammonium Sulphate.
3.8	kg. Crude Benzol.
3.8	kg. Refined Benzol.
25.1	kg. Coal Tar.

The value of all the coke (metallurgical and other) and by-products produced in 1932 was:

Coke	476	Mn. Belgian francs
Small Coke.....	28	"
Cinders, etc.	8	"
Gas (not used in making coke) ...	97	"
Ammonium Sulphate	35	"
Crude Benzol	28	"
Refined Benzol	45	"
Coal Tar	67	"
	<hr/>	
	784	"
	<hr/>	

Hence it is not surprising that a ton of coking coal sells for nearly as much as a ton of coke (e.g. in 1933 a ton of coking coal cost 105 Belgian francs and a ton of coke (partly-washed) 110 Belgian francs).

(c) *Other Materials.*

Most of the high-grade manganese ore used in the manufacture of pig-iron is imported. In 1932, 101,000 tons were used, of which 47,000 came from India. In 1932, 441,000 tons of scrap and 33,000 tons of coal were also consumed in the production of pig-iron.

In 1932, 2,790,000 tons of steel ingots and castings were produced. The materials used were:

Pig-Iron	2,731,000 tons (of which 60,000 imported)
Ore	2,000 tons
Scrap	376,000 tons
Coal.....	70,000 tons (of which 22,000 imported)
Coke	38,000 tons (of which 5,000 imported)
Blast Furnace Gas	264,000 cubic metres
Coke Oven Gas	71,000 cubic metres
Electricity	80,000 kilowatt hours

Considerable quantities of imported ingots, blooms, billets, slabs, and sheet bars are trans-

formed in Belgian rolling-mills: 297,000 tons in 1929, 120,000 tons in 1931. The rolling-mills consumed 454,000 tons of coal in 1929 and 300,000 tons in 1932.

LABOUR.

The numbers engaged were:

	1929.	1932.
Blast-furnaces	7,703	4,839
Steel Works	12,287	6,657
Puddled Iron Works	185	68
Rolling-mills	26,101	19,296
	46,276	30,860

It is interesting to note that the output of crude steel per worker employed (in steel works) was 352 tons in 1931 and 404 tons in 1932. It had never previously exceeded 330 tons. This suggests that it is possible in steel production to reduce the labour force by considerably more than the output is reduced (quite apart from any technical progress); in pig-iron production this is not equally possible, since a blast-furnace, if working, must be worked (as a rule) continuously, and hence the number of men attached to a given active blast-furnace cannot easily be reduced. Thus output of pig-iron per worker has not varied greatly during recent years.

In January 1934, unemployment in the metals industry (which is mainly iron and steel) reached a maximum: out of 214,000 insured persons 46,000 were completely unemployed and 39,000 partly unemployed. In 1929, there was practically no unemployment in this industry. The average number of days unemployment per person insured was:

	1930.	1931.	1932.	1933.
Metals	12.2	47.0	78.8	70.8
All Industries	16.5	41.1	71.8	62.4

No statistics of earnings are available. The British Delegation at the beginning of 1930 estimated total average normal weekly earnings (including family allowances) as:

Skilled Men	470	Belgian francs
Semi-skilled Men	340	"
Unskilled Men	270	"
Weighted Average	310	"

From 1929 to the end of 1933, the retail price index fell by 22%. The National Bank of Belgium has been investigating the reduction in wages during the depression; it concludes that iron and steel wages have been reduced by 18%.

EQUIPMENT.

Of the 55 blast-furnaces in existence in 1932, 6 had a daily capacity of 300 tons and over, 11 of 250-299 tons, 15 of 200-249 tons, 18 of 150-199 tons, 1 of 100-149 tons, and 4 of less than 100 tons. The five last were in the province of Luxembourg. There were 33 active steel-works, possessing 18 mixers, 57 cupolas, 57 large converters, 45 small converters, 33 Martin furnaces, and 7 electric furnaces. There were 41 active rolling-mills, possessing 19 trains for blooms, 69 for special sections, 5 for wire rods, and 78 for plates and sheets.

ORGANISATION.

The figures which have been given for production, materials used, and workers employed relate to the Belgian industry as a whole. The Belgian Office of Mines publishes figures showing the division of these totals between "composite" (or integrated) works and others.

All the "Thomas" steel ingots and the great bulk of the "Thomas" products are produced by large composite works, comprising blast-furnaces, steel-works, and rolling-mills. Most of the concerns owning these works have also interests in coal and iron mines. Thus the Société d'Ougrée-Marihaye has collieries near Mons as well as at Ougrée and Seraing (both in the Liège area) and iron mines in France (Briey) and Luxembourg. The comparative size of these composite works is indicated by the percentage of the total Belgian quota allotted to each at the formation of the International Steel Entente (or Cartel) in 1926. These percentages were:

Ougrée	15.580	Clabecq	5.703
Cockerill	12.006	Boël	5.453
Sambre et Moselle	9.332	Thy-le-Château	5.445
Providence	8.984	Alliance	5.064
Athus	6.960	Châtelineau	3.594
Angleur	6.927	Gilson	1.296
U. M. du Hainaut	6.860	Fabrique de fer	1.056

The amalgamation of Athus and Angleur gave them, combined, the second place.

In 1932, in addition to the composite works there were (a) 3 independent steelworks, (b) 17 independent foundries, and (c) 23 independent rolling-mills.

(a) The 3 independent steelworks employed 288 workers and consumed 18,200 tons of pig-iron (mainly imported) and 61,500 tons of scrap to produce 71,700 tons of open-hearth ingots and 1,500 tons of castings.

(b) The 17 independent foundries employed 2,500 workers and consumed 14,070 tons of pig-iron (over half imported) and 26,670 tons of scrap to produce 27,640 tons of castings

(out of a total for Belgium of 38,190 tons). The tonnage produced may seem relatively small, but a ton of castings is worth over six times as much as a ton of ingots. Thus the total value of their output was 67 Mn. francs out of a grand total for Belgium, of all ingots and castings, of 1,102 Mn. francs.

(c) The 23 independent rolling-mills employed 6,600 workers and consumed 275,000 tons of ingots, blooms and billets, slabs and sheet bars, of which 48,000 tons (as against only 5,000 for the 18 other rolling-mills) were imported, and some 60,000 tons of scrap. They produced 242,000 tons of "finished" steel products (out of a total for Belgium of 2,049,000 tons), of which half were thin plates (or sheets), and 29,700 tons of wrought iron (out of a total for Belgium of 35,400 tons).

At the end of May 1933, the large "com-

posite" works formed a national cartel, *Comptoir de vente de la Sidérurgie Belge* (Cosibel). The purpose of this is to allot orders among the different firms both for internal sales and, in collaboration with the International Steel Cartel, for export sales. It has entered into negotiations with the independent rolling-mills to organise the sale of their products also.

At the end of July, four leading firms—Cockerill, La Providence, Angleur-Athus, and Sambre et Moselle—formed *L'Union Commerciale Belge de Métallurgie* (Ucométal) in order to study markets for Cosibel and to allot tonnage-programmes within the group in accordance, as far as possible, with the preferences of each firm. Other commercial companies are the *Socobel* of Ougrée-Marihaye, and the recently formed *Société Commerciale de Clabecq*, and *Métal Hainaut Export* (M.H.E.).

LUXEMBOURG.

Luxembourg is a small state of 300,000 inhabitants. From 1842 to 1918 it formed part of the German Customs Union. During the war its iron and steel industry was worked under the German occupation. In 1918, after the cessation of hostilities, Luxembourg withdrew from the German Customs Union. It joined Belgium in a Customs Union in May 1922.

The number of workers engaged in industry in 1929 was about 44,000, of whom 29,000 were employed in the iron and steel industry and the iron mines. By the beginning of 1933, these totals had fallen to 28,000 and 18,000. The total number of foreigners employed fell from 14,000 in 1930 to 6,000 in 1933. Most of these were employed in the iron and steel works and the mines.

Luxembourg has a common currency with Belgium, so that prices, wages, etc., are as similar as if the two countries were completely united.

PRODUCTION.

Before the war, the output of the Grand Duchy of Luxembourg was rapidly increasing. In 1909, itself a record year, only 1,553,000 tons of pig-iron and 535,000 tons of steel were produced. In 1913, this had increased to 2,548,000 tons of pig-iron and 1,326,000 tons of steel. This expansion continued from 1922 to 1929. In 1922 (after three years of greatly diminished production) the output of pig-iron was 1,679,000 tons and of steel 1,394,000 tons. The 1923 outputs were somewhat smaller, but thereafter the increase was continuous,

reaching a peak in 1929 of 2,906,000 tons of pig-iron and 2,702,000 tons of steel.

There has been a striking change in the nature of the output: since the war, there has been a great development of rolling-mill production. Before the war, the greater part of the pig-iron was sent to the Ruhr and elsewhere as pig-iron, and similarly with a fifth or more of the ingots; now practically all the pig-iron and ingots are transformed in rolling-mills in Luxembourg. This change is associated with the change of Customs Union mentioned above.

In 1913, about 6% of the net total output was consumed in Luxembourg, about 70% was "exported" to Germany, 8% to Belgium, and 16% to other countries. Germany took over 1,000,000 tons of its pig-iron, some 250,000 tons of its ingots, and over 600,000 tons (mostly "semis") of its rolling-mill products. Some of this (64,000 tons of pig-iron and 86,000 tons of "semis," etc.) went to the Saar, some (6,000 tons of pig-iron and 35,000 tons of "semis," etc.) to Lorraine, and some to South Germany, but the great bulk went to the Ruhr. The leading works in Luxembourg were controlled by two large Ruhr concerns: the Gelsenkirchen and the *Deutsche-Luxemburgische*. Luxembourg was largely engaged in producing pig-iron, ingots, and "semis," to be transformed in the Ruhr.

In December 1918, the Luxembourg Government formally withdrew from the German Customs Union. A year later the Gelsenkirchen company sold its Luxembourg (and other) possessions to a French-Belgian-Luxembourg

group, "Terres Rouges," formed for the purpose by Arbed (Aciéries Réunies Burbach-Esch-Dudelange) and the Deutsch-Luxemburgische company sold to the French-Belgian company, formed for the purpose, of Hadir (Haut Fourneaux et Aciéries de Differdange-St Ingbert-Rumelange).

Under the Treaty of Versailles, Luxembourg had the right to export certain quantities (based on the quantities exported in 1913) to Germany, duty free, until January 10th, 1925, but this was not of much practical importance. Owing to the depreciation of the mark and the unsettled conditions in Germany, demand and prices were low, and only a part of the permitted quotas were in fact exported. The smaller market offered by Germany was one factor which induced Luxembourg producers to embark upon greater rolling-mill production. Another factor was the growing tendency towards integration elsewhere. A report of Arbed of this period says:

"Our works can produce about a million tons of steel ingots a year. Only a part of our production is transformed into finished products in our works; the rest is sold to transformers. Now this clientèle tends more and more to disappear, either because the transformers equip themselves to produce the products they need or (the more usual case) become absorbed by existing great metallurgical firms. It seems that this evolution, which began before the war, will continue in the future." Therefore, it concludes, "the time has come to concern ourselves more with the transformation of products."

Thus, in 1929, 1,910,000 tons of finished rolling-mill products were produced as against 674,000 tons in 1913.

ROLLING-MILL OUTPUT.
(000 tons.)

	1913.	1929.	1932.
"Semis"	508	217	296
Permanent Way Material	103	193	71
Girders, Joints and Large Shapes	278	399	275
Bars and Small Shapes	231	988	752
Wire and Wire Rods	43	127	80
Plates and Flats	—	112	99
Hoops and Strips	20	92	77
Total.....	1,182	2,127	1,650

The pig-iron produced is nearly all "Thomas" pig-iron (98.4% in 1929; 99.7% in 1932) and the ingots and castings are nearly all "Thomas" (98.6% in 1929; 99.7% in 1932). In 1913 about a fifth of the ingots

were exported; now all are worked up, and in 1929 156,000 tons were imported. The rolling-mill output for 1913, 1929, and 1932 is shown below. It will be noted that in 1913 more "semis" were produced than in recent years.

The foundry production was 27,000 tons in 1913, 63,000 in 1929, and 24,000 in 1932.

In 1932, 401,000 tons of Thomas phosphate were produced.

MATERIALS.

(a) Iron Ore.

The Lorraine "minette" field extends into the south-west corner of Luxembourg, where it covers 3,600 hectares in the three basins of Esch, Rumelange-Dudelange, and Pétange-Differdange. The reserves are estimated at rather more than 200 Mn. tons. At an average annual rate of extraction of 7 Mn. tons (and this rate was exceeded in 1926-29) they would be completely exhausted in some thirty years. The trend of output per worker is definitely downward. Thus, in 1928, 28,045 workers extracted only 7.0 Mn. tons, whereas 19,168 workers extracted 7.3 Mn. tons in 1913. The ownership of the ore in 1927 was approximately:

Hadir	70 Mn. tons
Arbed	80 "
Terres-Rouges	35 "
Ougrée-Marihaye (Rodange)	35 "
Others.....	30 "
	250 "

Hadir, Arbed, Terres-Rouges, and Ougrée all have iron-ore concessions in French Lorraine, from which they supplement their Luxembourg supplies.

The iron content of the ore mined varies considerably. Most of it is between 28 and 33% iron, the average being about 31%. Thus some 1,250 kg. of coke are needed to produce a ton of pig-iron, as against some 1,100 kg. for the richer ores of Meurthe-et-Moselle; this partly explains the considerable import of French ore for the Luxembourg blast-furnaces. On the other hand, the ore is comparatively easy to extract, the output per worker employed being 1,200-1,300 tons a year; and the presence of both silicious and calcareous ores (1932 output: 2.1 Mn. tons silicious, 1.1 calcareous) is an advantage.

The annual output of 1900-13 varied between 4.5 and 7.5 Mn. tons (1913, 7.3). It diminished somewhat during the war, fell to just over 3 Mn. during 1918-21, and then increased again, being over 7 Mn. in each of the years 1926-29. During the last five years it has been: 1929, 7.6; 1930, 6.6; 1931, 4.8; 1932, 3.2; 1933, 3.4.

LABOUR.

The imports of ore from France (mainly Briey) rose continuously from 2.3 Mn. tons in 1923 to 5.1 Mn. tons in 1929. They were 5.0 Mn. in 1930, 3.7 Mn. in 1931, and 3.6 Mn. in 1932.

On the other hand, over 2 Mn. tons a year of Luxembourg ore were exported in each of the years 1924-29, mainly to Belgium. Thus, in 1929, 2,271,000 tons were exported: 1,607,000 to Belgium, 337,000 to the Saar, 265,000 to Germany, and 63,000 to France. Exports fell to 1.8 Mn. tons in 1930, 1.3 Mn. in 1931, and 879,000 in 1932 (671,000 to Belgium, 181,000 to the Saar, 25,000 to France, 2,000 to Germany).

Apart from unforeseen changes, it seems likely that Luxembourg will export less ore in the future than it has done in the past, and will rely still more than in the past on ore imported from Briey.

The number employed in the mines was 5,858 in 1929 and 2,568 in 1933.

(b) *Coke.*

Luxembourg has no coal. Before the war, nearly all its coke (92% in 1913) came from Germany, mainly from the Ruhr district. The Deutsch-Luxemburgische and Gelsenkirchen companies owned mines in the Ruhr, and the German railways granted reduced rates on coke from the Ruhr to Luxembourg. Since the war, about two-thirds of the coke consumed in Luxembourg has come from Germany and most of the rest from Belgium. The Saar, Holland, and England have provided the balance. Imports of coke increased continuously from 1924 to 1929, when about 3.5 Mn. tons were imported (2.4 from Germany, 1.0 from Belgium). Since then, imports have of course considerably declined. In 1932 only 2.1 Mn. tons of coke were consumed.

Since 1913, Arbed has had a community of interests with the Eschweiler Bergwerksverein, which extracts most of the coal extracted from the Aix-la-Chapelle field. Arbed has also shares in coal mines in Belgium, Holland, and Westphalia. Rodange through its parent group of Ougrée-Marihaye, and Steinfort through its parent group of Angleur-Athus, have holdings in Belgian and other coal-mines. Only Hadir has no such holdings.

The coking is done at the mines, and not in Luxembourg.

(c) *Scrap.*

The consumption of scrap is small, as so very little open-hearth steel is produced. In 1932, the steel-works consumed 181,000 tons and the foundries 12,000 tons. This was all "new" scrap: the rolling-mills in 1932 produced 243,000 tons of scrap.

The total numbers of workers employed (including miners) in 1913 was 19,168, of whom 7,707 were Luxembourgish and 11,461, about 60%, foreigners, mainly Italians and Germans. In 1929 the total was 28,938, of whom 17,390 were Luxembourgish and 11,548, about 39%, foreigners (3,624 Italian, 3,267 German, 1,662 Belgian, 869 French, 2,126 other nationalities). The total number diminished to 27,761 in 1930, 23,725 in 1931, 18,584 in 1932, and 17,546 in 1933, and a considerable number of foreigners (especially Italians) left the Duchy. The number engaged and the total wages paid in 1929 and 1932 were:

	Number.		Wages Bill.	
	1929.	1932.	1929. (000 frs.)	1932. (000 frs.)
Blast-furnaces ...	7,463	3,349	110,142	40,761
Steelworks	3,182	1,912	49,894	22,169
Rolling-mills ...	8,542	6,558	140,470	82,112
Foundries	879	643	13,180	6,797
Total	20,066	12,462	313,686	151,839

Thus average yearly earnings fell from around 15,650 (Belgian) francs per man in 1929 to some 13,000 francs per man in 1932. This was partly due to short-time; but there is little doubt that wage-rates have fallen in Luxembourg as in Belgium.

COSTS OF PRODUCTION.

During 1927-30 about 3.6 tons of ore and between 1.2 and 1.3 tons of coke were consumed in the Luxembourg blast-furnaces per ton of pig-iron produced. Thus in 1930, 2,473,000 tons of pig-iron were produced. The consumption of ore was 9,143,000 tons, about 3.7 per ton of pig-iron, and the consumption of coke was 3,042,000 tons, about 1.23 per ton of pig-iron.

In 1932, 1,960,000 tons of pig-iron were produced. The consumption of ore was 6,467,000 tons, about 3.3 per ton of pig-iron, and the consumption of coke was 2,104,000 tons, about 1.07 per ton of pig-iron.

This change was due mainly to the larger proportion of Briey ore used in 1932. Whereas in 1930, 5,175,000 tons of home ore and 3,968,000 tons of imported ore were consumed, in 1932, 2,713,000 tons of home ore and 3,754,000 tons of imported ore were consumed.

The amounts and proportions of ore and coke required per ton of pig-iron vary with the kinds of ores used. If mainly Briey ore, containing 35% or more iron, is used, less ore and less coke are required per ton of pig-iron

than if mainly Luxembourg ore (containing say 30-31% iron) is used. This explains why it was profitable to import Briey ore in 1930, although it cost 35 (Belgian) francs a ton plus 28 francs a ton for transport, as against only 23.5 francs (average) per ton for Luxembourg ore. The delivered price of Ruhr coke was about 280 francs a ton; a reduction of 10% in the amount of coke required saved 28 francs, a reduction of 15% saved 42 francs. Since 1930, relative prices have changed more in favour of Briey ore. It seems probable that in the future, as at present, the Luxembourg blast-furnaces will consume more imported than home ore.

The amount of coke required per ton of pig-iron varies also with the quality of the coke used. Less German coke is needed per ton of pig-iron than Belgian coke. This, too, is reflected in relative prices. Thus in 1930 Ruhr coke cost 180 (Belgian) francs a ton plus 90-110 francs for transport, that is, 270-290 francs a ton delivered, and Belgian coke cost only 230-240 francs a ton delivered, the transport cost from Liège and Charleroi being 46-49 francs a ton. The greater proportion of Belgian coke used since the war is partly due to the lower rates charged (after the Customs Union was formed) by Belgian railways on coke going to Luxembourg. Belgium itself is a considerable importer, on balance, of coking coal and coke, but since coke from the Ruhr and Aix-la-Chapelle passes by Liège on its way to Luxembourg, there is little additional transport involved in the export of Belgian coke to Luxembourg. Nevertheless, probably more German coal would be used were it not for the holdings of Luxembourg concerns in Belgian mines.

Until the beginning of 1931, the direct route from Liège to the Luxembourg works, running from North to South through Luxembourg, was scarcely used for coke as the railway concerned (the Guillaume-Luxembourg, under French administration) charged higher rates than the Belgian; the coke made a détour through Belgium. The Guillaume-Luxembourg lowered its rates in February 1931.

During the depression, the Belgium-Luxembourg Union has allowed free entry to metallurgical coke, although coal is subject to quota and duty.

It will be seen that the situation of Luxembourg is not favourable with regard either to coal or to ore. Wages are low compared with England, but they are no lower than in Belgium, and little lower than in French Lorraine. Its main port is Antwerp, and it is a greater distance from Antwerp than the Belgian

works. Thus in 1930 a ton of girders sent to Antwerp cost 31.30 francs for transport from Charleroi, 32.20 from Liège, and 53.10 from Luxembourg (Belval). On the other hand, the Luxembourg works are nearer than the Belgian both to ore supplies and to part of the German market. Nevertheless, one cannot resist the impression that the Luxembourg industry owes much to the excellence of Columeta and its other selling organisations, and to the preference of some buyers for its products.

MARKETS.

Nearly all the Luxembourg output is exported. Before the war the rapid development of Luxembourg took place within the framework of the German Customs Union, and was based largely on free access to the big German internal market. Belgium cannot replace Germany in this respect. 75-80% of the Belgian output is exported, and although the Belgian market takes some of the Luxembourg production, the great bulk of it must be sold outside the Union.

Thus in 1920, Arbed and Terres-Rouges set up a selling organisation, Comptoir Metallurgique Luxembourgeois (Columeta), which has branches and agencies in 41 countries; it quotes prices and allots orders among the various works. (The situation has somewhat changed since the reorganisation of the International Steel Cartel.) Hadir sells through the French Davum-Exportation set up in 1928 by the companies of Marine et Homécourt, Rombas, Dilling and Hadir. The two other Luxembourg concerns sell through their parent groups, Ougrée-Marihaye (Socobelge) and Angleur-Athus.

It is impossible to separate in detail the exports of Luxembourg from those of Belgium. The exports of the two combined are shown below. Much of the export to Germany is from Luxembourg.

FOREIGN TRADE OF BELGIUM-LUXEMBOURG.

The total imports and exports of iron and steel (including pig-iron and scrap) for Belgium and Luxembourg were:

	Imports.		Exports.	
	000 tons.	Mn. Belgian francs.	000 tons.	Mn. Belgian francs.
1929	1,137	1,446	4,900	5,844
1930	770	1,152	4,294	4,920
1931	675	748	3,894	4,011
1932	433	354	3,472	2,769
1933	388	377	3,450	2,619

The main import is pig-iron (674,000 tons in 1929; 215,000 tons in 1933), mainly from France and, to a less extent, Germany and the Netherlands. Considerable quantities of "semis" (ingots, billets, sheet bars, slabs, blooms) used to be imported, mostly from France, but this has greatly declined (1929, 161,000 tons; 1933, 19,000 tons). Scrap is imported (1929, 145,000 tons; 1933, 96,000 tons) but more is exported (1929, 310,000 tons; 1933, 274,000 tons).

The export of "semis" declined from 936,000 tons in 1927 to 481,000 tons in 1929, and 312,000 tons in 1933. Great Britain used to take most of these "semis." Thus in 1929, Great Britain took 301,000 out of 420,000 tons of billets and sheet bars exported; in 1933 she took only 125,000 out of 275,000 tons.

Exports of leading "finished" products, in thousands of tons, are shown in the next column.

The most important market for Belgium and Luxembourg is easily the United Kingdom. During the period 1925-31 the United Kingdom took about a quarter of the total tonnage of Belgian exports, including the bulk of the "semis." The British import statistics are misleading, since they show imports by country of consignment, and thus record considerable quantities of French and other iron and steel exported from France *via* Antwerp as imported from Belgium. Thus in 1929 Belgium recorded exports of 1,081,000 tons to the United Kingdom and France recorded exports of 1,320,000 tons to the United Kingdom; the United Kingdom recorded imports from Belgium and Luxembourg of 1,576,000 (long) tons and from France of 290,000 (long) tons. During the last year or two, as the above figures for 1933 show, there has been a marked fall in Belgian exports to the United Kingdom. Other important markets for Belgium are the Netherlands, Scandinavia, India, China and Japan, South America, The Belgian Congo, and Germany.

		1929.			1933.
<i>Iron and Steel Bars.</i>					
U.K.		308	China.....		126
China.....		129	Germany		63
India and Ceylon ...		119	Argentina		47
Argentina		99	Denmark		36
U.S.A.		71	Egypt		35
Netherlands		68	U.S.A.		22
Germany		62	Other Countries		600
Other Countries		631			
Total		1,487	Total		929
<i>Sections, Shapes, etc.</i>					
U.K.		112	U.K.		94
Germany		78	Netherlands		52
India and Ceylon ...		49	China		34
Netherlands		43	Other Countries		322
Argentina		41			
Other Countries		282			
Total		605	Total		502
<i>Plates and Sheets.</i>					
U.K.		124	Netherlands		99
India and Ceylon.....		78	Norway		92
Netherlands		74	China		62
China		36	U.K.		49
Sweden		31	Denmark		35
Japan		30	Other Countries		368
Other Countries		306			
Total		679	Total		705
<i>Wire and Wire Rods.</i>					
U.K.		57	U.K.		27
India and Ceylon ...		39	Argentina		23
China		33	China.....		22
Argentina		31	Japan		22
Netherlands		17	India and Ceylon ...		18
Other Countries		216	Other Countries		153
Total		393	Total		265
<i>Rails, Sleepers, and Fishplates.</i>					
Belgian Congo		25	South Africa		19
Greece		22	Belgian Congo		9
Netherlands		22	Netherlands		8
U.K.		21	Switzerland		6
Argentina		15	U.K.		4
Other Countries		189	Other Countries		38
Total		294	Total		84
<i>Hoops and Strips.</i>					
U.K.		58	Japan		50
Japan		25	U.K.		45
Other Countries		89	Other Countries		75
Total		172	Total		170

THE SAAR.

The Saar has a population of rather more than 800,000. Before the war it was part of Germany; since January 1925 it has been part of the French customs area.

It is a highly industrialised area. At the 1927 census, 59% of the occupied population were engaged in industry. The largest industrial group was coalmining, with 73,000; iron and steel came second, with 36,000.

PRODUCTION.

In 1913, the Saar produced 1,371,000 tons of pig-iron and 2,080,000 tons of steel. In 1913, daughter companies of Saar works produced 674,000 tons of pig-iron in German Lorraine; nearly all this went to the Saar. There was also some import of pig-iron (64,000 tons in 1913) from Luxembourg (then within

the German Customs Union). After the war, a number of blast-furnaces were reconstructed on a larger scale and comparatively little pig-iron was imported. Thus in 1925 the Saar produced 1,450,000 tons of pig-iron and 1,579,000 tons of steel. The output of both pig-iron and steel increased steadily to a peak in 1929 of 2,105,000 tons of pig-iron and 2,209,000 tons of steel. The subsequent outputs were :

(000 tons.)

	Pig-Iron.	Steel.
1930.....	1,912	1,935
1931.....	1,515	1,538
1932.....	1,349	1,463
1933.....	1,592	1,676

The pig-iron is mainly "Thomas" (for basic Bessemer steel). Thus in 1929, 1,889,000 tons out of 2,105,000 were "Thomas," and in 1933, 1,442,000 tons out of 1,592,000. The rest is foundry pig-iron, and most of it is made into iron castings (mainly at the Halbergerhütte at Brebach, which is an important manufacturer of cast iron pipe).

The output of steel by kinds was :

(000 tons.)

	1913.	1929.	1933.
<i>Ingots</i>			
Bessemer basic	1,719	1,642	1,220
Open-hearth basic	342	529	431
Electric.....	14	15	10
<i>Castings</i>			
Acid	—	6	2
Basic.....	5	16	8
Electric.....	—	—	5
Total	2,080	2,209	1,676

The production of finished steel by-products was :

(000 tons.)

Products.	1913.	1929.	1933.
Semi-finished for Sale.....	156.1	156.7	127.3
Permanent Way Material	332.6	229.9	112.0
Girders, Beams, etc.	302.6	283.4	173.3
Steel Bars, Sections, etc.	482.2	497.3	432.9
Hoops and Strips	37.6	120.4	115.8
Wire Rods	116.2	157.1	164.3
Thick Plates.....	93.0	160.6	86.4
Other Plates and Sheets	55.6	96.7	110.0
Tubes	1.2	4.0	7.4
Other Finished Steel	0.5	0.6	1.2
Total	1,421.5	1,550.0	1,203.3

RAW MATERIALS.

(a) Iron Ore.

The Saar now has no iron ore. Nearly all its iron ore comes from the Lorraine field

(including Luxembourg). Thus the imports in 1929 and 1933 were :

(000 tons.)

	1929.	1933.
Lorraine	4,868	3,020
Luxembourg	295	271
Lahn, Dill, Upper Hesse	5,163	3,291
Rest of Germany	42	28
France (excluding Lorraine) ...	44	9
Russia.....	252	183
Other Countries.....	29	77
	80	25
Total	5,610	3,613

Nearly all the ore from Lorraine comes from the Metz-Thionville (Moselle) region, which before the war was German. In 1913 this region provided 3,617,000 tons as against only 303,000 tons from France (including Meurthe-et-Moselle). The Russian ore is all manganese ore. The Lorraine ore comes by rail (some 80 km.), usually in complete trains of owners' wagons.

(b) Coke.

There are no statistics of the amount of coke consumed in the Saar blast-furnaces. It is possible, however, to form a rough estimate from statistics of the production, import, and export of coke.

Most of the coke produced is produced in the cokeries attached to the five works which have blast-furnaces: the Burbacher Hütte, the Dillinger Hüttenwerke, the Neunkircher Eisenwerk, the Röchling'sche Eisen und Stahlwerke, and the Halbergerhütte. The rest is produced in the coke-ovens of the Mines Domaniales de la Sarre, at Heinitz. The amount produced was :

(000 tons.)

	Five Works.	Heinitz.	Total.
1913	1,366	250	1,615
1925	1,674	272	1,947
1929	2,187	236	2,423
1933	1,627	252	1,880

(In 1933, 102,000 tons of coal tar, 21,000 tons of ammonium sulphate, and 30,000 tons of benzol were produced as by-products.)

Much of the coke produced at Heinitz is exported: 127,000 tons in 1925; 81,000 tons (considerably less than usual) in 1929; 131,000 tons in 1933. This goes mainly to France (Lorraine) and, to a less extent, to Italy. The import of coke into the Saar is quite small: Germany sent less than 1,000 tons a year 1927-29, but this rose to 24,000 tons in 1932 and was 16,000 in 1933. We can conclude

that the consumption of metallurgical coke in the Saar is equal to the output of the cokeries attached to the works, plus a part of the Heinitz output and a little imported. This agrees with the estimate of "Das Saargebiet" that 1,100-1,200 tons of coke are consumed per ton of pig-iron produced. It does not correspond, however, with other statements often made or quoted. Thus one writer* says that 1,250 kg. of Saar coking coal are needed as against 1,000 kg. of Ruhr coking coal for a given quantity of coke, and that to make a ton of pig-iron requires 1,600 kg. of Saar coke and only 1,200 to 1,300 kg. of Ruhr coke. This implies that 5 tons of Ruhr coking coal are equivalent to about 8 tons of Saar coking coal (or rather less, allowing for by-products). This cannot be true, for if it were it would pay to use only Ruhr coal, despite the cost of transporting it to the Saar, for during recent years it has been about 20% cheaper at the pithead than Saar coal. The quality of the Saar coking coal, and of the coke made from it, cannot be so poor as most writers assert it to be.

Nevertheless, it is beyond dispute that the Saar coal is not very suitable for making metallurgical coke. About two-thirds of the output of the Saar mines is a bituminous coal suitable for coking; most of the rest is termed "flaming coal" and the remaining 5 or 6% is a lean dry coal which can be used only for domestic purposes. The yield of coke from the bituminous coal is relatively low: the coal contains too much gas and produces too much ash. The coke formed from it is hard but brittle, and very liable to break and crumble; therefore it is difficult to transport and is crushed by too heavy a charge in the blast-furnace. For this reason the old types of blast-furnaces in the Saar, some of which still exist, were small. To-day, however, blast-furnaces of 300 and even 400 tons daily capacity use entirely Saar coke.

The disadvantages of Saar coke have been lessened in various ways. The construction of blast-furnaces has improved since pre-war days.† The ore in some Saar works is crushed to small pieces (a procedure uncommon in the Lorraine area) before being charged into the blast-furnace. A stronger and better coke can be produced, as a result of experiments at Heinitz, by blending about 13% of Saar "flaming coal" with about 87% of Saar bituminous coal: the blending takes place after the coal has been dried and pulverised

* Dr. Camille Wagner, *La Sidérurgie Luxembourgeoise*, pp. 77-78.

† See "Betrachtungen über den Umfang des 'technischen Ausbaus' der saarländischen Hüttenwerke während der letzten zehn Jahre," *Ruhr und Rhein*, Dec. 27th, 1929.

and the "flaming coal" has undergone a process of semi-distillation.

Thus the coal used in the Saar coke-ovens is now mainly Saar coal (including some mined in Lorraine just over the Saar border), although a little German coal is still imported for mixing with Saar coal, to produce a better coke. (1925, 220,000 tons imported, 1929, 260,000 tons, 1933, 153,000 tons). In Lorraine (which took 316,000 tons of Saar coal for making metallurgical coke in 1925, rising to 652,000 tons in 1929 and 885,000 tons in 1930) Saar coal is still mixed with coking coal of better quality in the proportion of 1 ton of Saar coal to 2 or 3 tons of other coal.

LABOUR.

The following table shows the numbers engaged, the average total monthly wages bill (including social contributions) and the average hourly wage.

	Numbers Engaged.	Monthly Wages Bill (Mn. francs).	Average Hourly Earnings per Worker (francs).
1925	34,168	22.01	3.12
1929	36,939	38.74	5.06
1933	23,748	19.16	4.01

The cost of living index (1913 = 100) was 436 in 1925, 637 in 1929, and 541 in 1933. Employment was lowest (about 21,000) towards the close of 1932. Wages were highest in 1930, when average earnings per hour were 5.15 francs. They fell to around 4 francs at the close of 1932: a fall of over 20%. The number of foreigners employed is almost negligible.

EQUIPMENT AND FIRMS.

The combined daily capacity of the 28 blast-furnaces existing in 1913 was only 4,675 tons. In December 1933, there were 30 blast-furnaces, of which four were under repair. The combined daily capacity of the remaining 26 (of which 18 were working, 2 damped down, and 6 ready to be blown in) was 7,265 tons. The number actually working was 23 in 1925, 26 in 1926-29, 22 in 1930, 16 in 1931, and 17 in 1932.

The converter and steel furnace equipment at the beginning of 1934 was:

	Number.	Total Annual Capacity. (Tons).
"Thomas" converters	19	2,015,000
Bessemer (acid) Converters	7	12,600
Open-hearth Furnaces	24	867,000
Electric Furnaces	7	62,200

The following facts about the leading firms may not be quite up to date as concerns ownership. After the war several German holdings were sold to French groups. It is estimated that the French holdings were some 60% of the total in 1926 and were recently only 40%.

The Burbach works owned by Arbed are a large "composite" works (*i.e.* with blast-furnaces, steel works and rolling-mills). They have 8 blast-furnaces, 5 "Thomas" converters, and 3 open-hearth furnaces. The works were modernised recently. Arbed also operates a sheet rolling-mill at Hostenbach. In 1929 the two plants employed 8,300 men.

The Röchling works at Volklingen is a composite works completely controlled by German capital. The works were extended three or four years ago. They have 6 blast-furnaces and 5 "Thomas" converters. In 1929 they employed about 7,700 men.

The Neunkircher Eisenwerk at Neunkirchen is a composite works controlled by the German Otto Wolff group. They have 6 blast-furnaces, 5 "Thomas" converters, 4 open-hearth furnaces, and 1 electric furnace. In 1919 they employed 6,400 men.

The Dillinger Hüttenwerke is a composite works at Dillingen. The French Marine et Homécourt group own 60% and German capital 40% of the stock. They have 4 blast-furnaces, 4 "Thomas" converters, 6 open-hearth furnaces, and 1 electric furnace. In 1929 they employed 7,500 men.

The Halbergerhütte is at Brebach. It is owned 60% by Pont-à-Mousson and 40% by the German Stumm group. It has 6 blast-furnaces and is an important manufacturer of cast-iron pipes. In 1929 it employed 4,100 men.

These are the five largest concerns.* The others include the Hadir rolling-mills and a tube plant at Bous and another at Homburg.

In 1929 the four first-named works, the municipalities, and the Gasbetriebsgesellschaft Berlin formed the Ferngasgesellschaft Saar, which sold 12 Mn. cubic metres of gas in 1933. (The Berlin company transferred its holding to the Prussian Hibernia company.) An extension of the gas pipe-line to Ludwigshafen-Mannheim is projected.

COSTS OF PRODUCTION.

The ore from Lorraine comes mainly by rail, and costs in the neighbourhood of 20 francs a ton to transport. The coal, as shown above, is not of good coking quality, and is more

* The above information about them is based partly on an article by Vincent Delpont in the *Iron Trade Review*, March 21st, 1929.

expensive than most coking coal, as the following table shows. (Nevertheless, the French made a loss of 2.2 Mn. marks on the mines in 1928, and are said, although balance-sheets have not been published, to have made losses in subsequent years also.) The wages have been quoted: they are definitely higher than in Lorraine and Belgium. On balance it would appear that costs of production are as high in the Saar as in any of the countries considered in this memorandum.

PRICE OF COKING COAL.
(Gold marks per ton.)

	Saar.	Rhineland-Westphalia.	France (Nord and Pas de Calais).	Belgium (Charleroi and Centre).
1913	11.90	12.00	13.40	10.53
January 1927 ...	20.44	14.87	20.94	24.00
" 1928 ...	17.99	14.87	17.66	16.97
" 1929 ...	18.06	16.87	17.55	17.04
" 1930 ...	19.90	16.87	19.63	22.82
" 1931 ...	18.95	15.40	19.09	22.25
" 1932 ...	18.51	14.21	18.48	16.95
" 1933 ...	17.45	14.21	17.22	15.74
" 1934 ...	17.50	14.21	17.27	14.00

MARKETS.

The Saar produces ironmongery, machinery, rolling-stock, constructional works, and other products embodying iron and steel. These industries employed over 9,000 workers in 1929 and nearly 7,000 in 1933. Nevertheless, they can offer only a comparatively small market for the iron and steel output of the district, and well over 90% of this output has to be exported.

It is exported mainly in the form of rolling-mill products (including "semis"). The main "natural" market of the district is Germany, and especially South Germany, to which the Saar is the nearest large iron- and steel-producing region: it is considerably nearer than the Ruhr to this market. Before the war, most of the Saar's output was sold in Germany, France taking practically nothing. During recent years, the Saar has had the right (by the 1926 agreement) to send up to 1.3 Mn. tons a year duty free into Germany. In fact, she has only sent over 1 Mn. tons in one year (1927: 82,000 tons of pig-iron and 980,000 tons of rolling-mill products).

The Saar works are members of the German cartels, through which they sell in Germany, and are therefore subject, equally with German works, to cartel limitations of sales. Rather more than a third of her output has been sold in Germany during recent years.

The Saar is joined in a Customs Union with France, but by agreement its sales to France

are limited to a maximum of 500,000 tons a year. The Saar works are also members of the French cartels, through which they sell in France. During recent years rather less than a third of its output has been sold to France.

Thus the Saar has been in the fortunate position of enjoying free, if restricted, entry into the two large markets of Germany and France. If it returns to Germany as the result of the plebiscite next year, it may lose most of its French market; but compensating additional outlets in Germany have been promised it.

Since 1925, the foreign trade statistics relate to France and the Saar combined. These have already been given, in the section on France. *Saarwirtschaftsstatistik*, however, publishes statistics of sales made by the Saar to Germany, to France, and to other countries. These are reproduced below for 1913, 1929, and 1933.

SALES OF THE SAAR.
(000 tons.)

	1913.	1929.	1933.
<i>Pig-Iron and Castings.</i>			
Saar	10.1	19.6	2.2
Germany	140.2 *	84.4	42.4
France	0.1	8.3	12.0
Other Countries	82.5	53.2	27.8
Total	233.0	165.5	84.4
<i>Rolling-mill Products.</i>			
Saar	201.1	146.7	99.1
Germany	1,332.4	615.7	421.6
France	2.0	441.8	370.8
Other Countries	295.9	397.1	299.4
Total	1,831.4	1,601.3	1,191.0

* Including 17.6 to Alsace-Lorraine.

THE INTERNATIONAL STEEL CARTEL.

The International Steel Cartel (or, more strictly, Entente) was formed in September 1926, for a period of five years, between the representatives of the iron and steel industry in Germany, France, Belgium, Luxembourg, and the Saar. It was simply an agreement that these five territories should produce only a certain output, to be determined quarterly. A guarantee fund was set up to receive fines from countries producing more than the allotted output and to compensate countries producing less. The division of the total output was: Germany 43.2%, France 31.2%, Belgium 11.6%, Luxembourg 8.3%, Saar 5.7%. These percentages were based on average outputs in 1925. They were changed in 1930 to: Germany 45.5%, France 28.1%, Belgium 11.8%, Luxembourg 8%, Saar 6.5%. The

Entente was renewed on this basis, and continued its formal existence, but it ceased to have effective control: the slump in demand created too great divergences of interest among different producers.

The Entente was reconstituted on different lines in April 1933. The new agreement, for five years, came into operation on June 1st, 1933. It relates not to quantities produced, but to quantities exported. The percentage allotted to each country is to vary with the total export agreed upon. This arrangement was made to reconcile the interests of Belgium and Luxembourg, whose exports had fallen less than those of the other countries during the depression, and who therefore wanted the first quarter of 1932 as the base, with those of Germany and France, who wanted 1928-29 as the base. When total exports are 6.8 Mn. tons a year (corresponding to the rate of export in the first quarter of 1932) the division will be: Germany and the Saar 29%, France 21%, Belgium 29%, Luxembourg 21%. As total exports rise, the relative shares of Belgium and Luxembourg fall, until they remain unchanged, with total exports of 11.5 Mn. tons or over at: Germany and the Saar 34%, France 23%, Belgium 26%, Luxembourg 17%.

Within this framework there are international cartels to control the quantities exported and also the export prices of different products. Those for six of these, for "semis," merchant bars, large flats, thick plates, medium plates, and girders and joists, began to operate on June 1st, 1933. These cartels are part of the organisation of the International Steel Cartel; of course they maintain close relations with the various national cartels.

The international cartels for rails (I.R.M.A.), for tubes, for wire rods, and for drawn wire, continue side by side with the International Steel Cartel, as does the international cartel for hoops and strips, which began operating on May 1st, 1933.

The free entry, under the Treaty of Versailles, of products from the Lorraine area and the Saar into Germany, came to an end on January 1st, 1925. It was largely the desire to come to some arrangement about such imports which led to the formation of the International Steel Cartel in 1926. Four agreements were then made, and (although apparently with certain modifications) are still in force. They are as follows:

(1) An agreement between France and Luxembourg on the one hand and Germany on the other, giving the two former countries the right to sell in Germany "semis," railway material, sections, merchant steel, wire, and

plates, amounting to 3.75% for France and 2.75% for Luxembourg of the German consumption of these products. They are sold by the German cartels at their internal prices on behalf of the French and Luxembourg works, the latter paying the import duties.

(2) An agreement between the same countries by which Germany agrees to buy each month 7.895% of its pig-iron consumption from France and 3.772% from Luxembourg.

(3) A German-Saar agreement, by which free entry into Germany is given to the iron and steel products of the Saar. The annual quotas fixed as maxima are so large that they amount in effect to complete freedom of entry.

(4) A French-Saar agreement, limiting to 500,000 tons the iron and steel products sold by the Saar to France.

PRICES.

The following tables of prices must be treated with due caution. Prices for iron and steel products are not always quite firm, especially in bad times. The export prices are quoted in "gold" pounds per long ton. But there is discrimination between different export markets: the percentage added to obtain the sterling price quoted may be appreciably below the extent to which sterling has depreciated from its old gold parity, and in quoting to another currency in terms of its own currency the price may be different from the equivalent of the sterling price at the prevailing rate of exchange between that currency and sterling.

The railway freight rates also may contain pitfalls. The railways charge less for consignments over a certain weight; and where goods usually move in such consignments, the rates quoted are these lower ones (for example, 180 tons iron ore France). But still lower rates are given for goods moving in owners' wagons, and in some cases for larger consignments than those for which the rates are quoted in the table. Moreover, the rates between two equal distances within a country are not always the same, although there is less "annihilation of distance," by quoting lower rates to works in less favourable situations, than might be supposed. The Tables are given mainly to show differences between countries and years, and the lower ton-kilometres rates for export and for longer distances.

Again, the prices of shares have fluctuated very considerably at times during short periods. The yearly averages shown in the Table indicate only the trends, and enable a rough comparison to be made between the three countries and the three types of securities shown.

GERMANY.

Inland Prices (in Reichsmark per metric ton. Yearly averages).

	Pig-Iron (No. 3 Foundry (Ober- hausen).	Billets (Ruhrort- Dort- mund).	Steel Bars (Ober- hausen).	Joists (Ober- hausen).	Hoops (Ober- hausen).	Thick Plates (Essen).
1926 ...	86.00	101.35	133.62	130.95	153.87	148.75
1927 ...	83.33	97.50	134.00	131.00	154.00	151.93
1928 ...	82.00	102.48	139.46	136.46	161.71	160.72
1929 ...	83.89	104.00	141.00	138.00	164.00	165.00
1930 ...	83.91	101.96	138.67	135.67	161.08	162.08
1931 ...	77.61	94.95	126.50	123.54	146.25	149.33
1932 ...	68.00	83.40	110.00	107.50	127.00	130.90
1933 ...	63.00	83.40	110.00	107.50	127.00	129.10

FRANCE.

Inland Prices (in Francs per metric ton).

	Pig-Iron (No. 3 Foundry (Longwy).	Blooms (Eastern Works).	Steel Bars (Eastern Works).	Joists (Eastern Works).	Thick Plates (Eastern Works).
Aver. 1926	500.5	630	828	754	878
" 1927	471.5	466.5	599	559	743
" 1928	442	530	683	643	787
" 1929	473	586	743	700	803
" 1930	467.5	559.5	639.5	676.5	792
June 1931	305	470	515	550	725
Dec. "	250	325	500	550	700
June 1932	220	345	530	550	650
Dec. "	200	345	530	550	650
June 1933	200	380	560	550	680
Dec. "	205	380	560	550	680

BELGIUM.

Inland Prices (in Belgian francs per metric ton).

	Pig-Iron (No. 3 Foundry (Ougrée).	Billets (Liège).	Steel Bars (de- livered).	Joists (de- livered).	Thick Plates.
Aver. 1926	517.5	715	770	763	868
" 1927	647	790	845	887	1,089
" 1928	589	860	1,004	911	1,127
" 1929	615.5	945	1,032	940	1,124
" 1930	596	823	872	872	1,044
June 1931	465	660	645	630	735
Dec. "	380	425	495	490	600
June 1932	315	365	400	400	520
Dec. "	285	365	485	475	565
June 1933	295	440	535	535	675
Dec. "	300	440	535	535	675

RAILWAY FREIGHT RATES.
(In Reichsmark per metric ton.)*

	Distances in Kilometres.									
	25.	50.	75.	100.	150.	200.	350.	500.	800.	1200.
IRON ORE.										
<i>Germany</i>										
1930 : Inland	1·80	2·60	3·20	3·90	5·10	6·20	8·50	10·90	15·50	18·30
1930 : Export	—	—	—	—	—	—	—	—	—	—
1933 : Inland	1·70	2·50	3·00	3·70	4·80	5·90	8·10	10·40	14·70	17·40
1933 : Export	—	—	—	—	—	—	—	—	—	—
<i>France</i>										
1930 : Inland	1·95	2·83	3·41	3·89	4·79	5·59	7·91	10·01	14·07	18·69
1930 : Export	1·50	2·09	2·55	2·90	3·52	4·17	5·87	7·38	10·27	15·59
1933 : Inland	1·97	2·87	3·45	3·94	4·85	5·66	8·01	10·14	14·24	18·92
1933 : Export	1·52	2·11	2·58	2·94	3·56	4·22	5·94	7·47	10·39	13·75
<i>Belgium</i>										
1930 : Inland	0·82	1·11	1·40	1·77	2·22	2·63	3·84	—	—	—
1930 : Export	0·89	1·31	1·75	1·98	2·23	2·50	3·29	—	—	—
1933 : Inland	0·82	1·12	1·41	1·78	2·23	2·65	3·86	—	—	—
1933 : Export	0·89	1·32	1·76	1·99	2·25	2·52	3·30	—	—	—
COAL AND COKE.										
<i>Germany</i>										
1930 : Inland	1·80	2·70	3·50	4·30	6·00	7·70	12·70	14·10	15·00	20·30
1930 : Export	—	—	—	—	—	—	—	—	—	—
1933 : Inland	1·60	2·50	3·30	4·10	5·50	6·80	9·40	11·90	14·70	20·30
1933 : Export	—	—	—	—	—	2·50	4·00	5·50	—	—
<i>France</i>										
1930 : Inland	2·19	3·08	3·98	5·03	6·08	7·25	9·61	11·80	15·93	20·64
1930 : Export	1·54	2·09	2·70	3·24	4·13	4·95	6·45	7·84	10·47	13·47
1933 : Inland	2·22	3·12	4·02	4·92	6·15	7·34	9·73	11·94	16·12	20·89
1933 : Export	1·56	2·11	2·74	3·28	4·18	5·01	6·53	7·93	10·59	13·64
<i>Belgium</i>										
Coal 1930 : Inland	1·54	2·32	3·08	3·47	3·93	4·37	5·73	—	—	—
Coal 1930 : Export	0·69	1·04	1·39	1·66	2·06	2·27	2·92	—	—	—
Coal 1933 : Inland	1·55	2·33	3·09	3·49	3·95	4·40	5·76	—	—	—
Coal 1933 : Export	0·69	1·05	1·40	1·67	2·07	2·28	2·94	—	—	—
Coke 1930 : Inland	1·79	2·70	3·63	4·10	5·06	5·68	7·13	—	—	—
Coke 1930 : Export	1·59	2·47	3·32	3·73	4·51	5·02	6·26	—	—	—
Coke 1933 : Inland	1·80	2·72	3·65	4·13	5·09	5·72	7·17	—	—	—
Coke 1933 : Export	1·60	2·48	3·34	3·75	4·54	5·05	6·29	—	—	—
FIG-IRON.										
<i>Germany</i>										
1930 : Inland	2·10	3·20	4·20	5·30	7·30	9·10	13·90	17·80	22·60	24·90
1930 : Export	1·70	2·40	3·00	3·70	4·90	6·10	9·30	11·80	15·00	—
1933 : Inland	1·90	2·90	3·80	4·80	6·60	8·20	12·50	16·00	20·40	22·40
1933 : Export	1·30	2·00	2·70	3·40	4·60	5·70	8·80	11·20	14·30	—
<i>France</i>										
1930 : Inland	2·31	3·41	4·21	5·03	6·44	7·87	9·97	12·12	15·57	19·63
1930 : Export	1·31	1·77	2·24	2·66	3·20	3·79	5·41	6·56	8·92	12·04
1933 : Inland	2·34	3·45	4·27	5·09	6·52	7·97	10·09	12·26	15·76	19·86
1933 : Export	1·33	1·80	2·27	2·69	3·24	3·83	5·47	6·64	9·03	12·19
<i>Belgium</i>										
1930 : Inland	1·79	2·70	3·63	4·10	5·06	5·68	7·13	—	—	—
1930 : Export	1·26	1·63	2·30	2·63	3·06	3·45	4·61	—	—	—
1933 : Inland	1·80	2·72	3·65	4·13	5·09	5·72	7·17	—	—	—
1933 : Export	1·27	1·63	2·32	2·69	3·08	3·47	4·63	—	—	—
STEEL BARS.										
<i>Germany</i>										
1930 : Inland	2·90	4·60	6·20	8·10	11·20	14·20	21·90	28·20	36·20	39·50
1930 : Export oversea †	—	—	—	—	5·30	6·70	10·20	13·20	17·00	18·50
1930 : Export overland	2·10	3·40	4·60	6·00	8·30	10·50	16·20	20·90	26·80	29·20
1933 : Inland	2·40	3·90	5·40	7·00	9·70	12·20	18·80	24·20	31·00	34·00
1933 : Export oversea †	—	—	4·20	4·40	5·00	5·50	8·50	10·90	14·00	15·30
1933 : Export overland	1·90	3·10	4·30	5·60	7·80	9·80	15·00	19·40	24·80	27·20
<i>France</i>										
1930 : Inland	2·42	4·42	6·29	7·94	10·41	12·91	20·31	26·89	36·78	46·68
1930 : Export	1·39	2·36	3·00	3·82	4·83	5·72	7·68	9·70	12·51	16·18
1933 : Inland	2·45	4·47	6·37	8·04	10·54	13·07	20·55	27·21	37·23	47·25
1933 : Export	1·41	2·39	3·08	3·95	4·89	5·79	7·77	9·61	12·66	16·37
<i>Belgium</i>										
1930 : Inland	2·41	3·66	4·92	5·58	6·90	7·72	9·73	—	—	—
1930 : Export	1·52	2·29	3·06	3·45	3·55	3·74	4·90	—	—	—
1933 : Inland	2·42	3·68	4·95	5·61	6·94	7·76	9·78	—	—	—
1933 : Export	1·27	1·63	2·32	2·69	3·08	3·47	4·63	—	—	—

* Source : *Statistisches Jahrbuch für das deutsche Reich 1930 and 1933.*

† From Rhineland-Westphalia.

Export Prices (in "gold" £. s. d., f.o.b. Antwerp per long ton).

	Pig-Iron (Foundry No. 3).	Billets.	Merchant Bars.	Structural Shapes.	Plates.	Hoops and Strips.
June 1926.....	3 7 0	4 5 0	4 15 0	4 12 0	5 0 0	6 2 6
Dec. ".....	4 0 0	5 2 0	5 9 0	5 9 0	6 6 0	6 15 0
June 1927.....	3 0 0	4 7 0	4 13 0	4 12 0	6 0 0	5 16 0
Dec. ".....	3 2 0	4 7 0	4 18 6	4 8 0	6 0 0	5 17 6
June 1928.....	3 3 0	4 14 6	5 13 0	4 16 0	6 6 0	6 12 6
Dec. ".....	3 4 6	5 1 0	6 0 6	5 0 0	6 6 0	6 5 0
June 1929.....	3 12 0	5 7 0	5 17 3	5 4 9	6 7 3	6 7 6
Dec. ".....	3 8 0	4 11 0	5 5 0	4 19 3	6 4 0	5 12 6
June 1930.....	3 7 0	4 14 0	5 7 6	5 1 6	6 10 6	5 17 6
Dec. ".....	2 11 0	3 14 0	4 6 0	3 15 0	4 17 0	4 12 6
June 1931.....	2 7 6	3 2 0	3 7 0	3 5 6	4 0 0	4 2 6
Dec. ".....	2 4 6	2 9 6	2 14 6	2 13 6	3 7 6	3 11 9
June 1932.....	1 17 0	1 19 0	2 4 6	2 0 6	2 13 6	3 6 3
Dec. ".....	1 14 0	1 19 6	2 7 9	2 2 6	2 16 3	3 11 9
June 1933.....	1 14 0	2 7 0	3 0 0	2 15 0	3 18 6	3 12 6
Dec. ".....	1 16 6	2 7 0	3 2 6	2 17 6	4 1 0	3 17 6

INDICES OF SECURITY PRICES.

GERMANY.
(1924-26 = 100.)

	1928.	1929.	1930.	1931.	1932.	1933.	1934, March.
Metallurgical Shares.....	101	88	73	55	33	47	55
All Ordinary Shares.....	148	134	109	85	84	67	77
6% Bonds * ...	86	81	83	83	67	82	92

* Average actual value in Reichsmark.

FRANCE.
(1913 = 100.)

	1928.	1929.	1930.	1931.	1932.	1933.	1934, March.
Metallurgical Shares.....	197	290	243	126	85	75	54
All Ordinary Shares.....	415	507	437	308	245	232	198
Fixed Interest Securities ...	81	85	96	97	89	81	77

BELGIUM.
(January 1928 = 100.)

	1928.	1929.	1930.	1931.	1932.	1933.	1934, March.
Metallurgical Shares.....	160	146	93	65	48	39	33
All Ordinary Shares.....	117	101	65	50	36	35	32
Fixed Interest Securities ...	104	111	116	119	110	112	115

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The writer is most grateful to all who have assisted him with information or with permission to visit works.

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