HISTORY OF THE DEVELOPMENT OF THE COAL INDUSTRY.

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To attempt to deal with this vast subject in any degree of detail in the short space available here is, of course, impossible. I therefore propose merely to touch lightly on the early rise of the coal industry, noting briefly the principal landmarks of that period of its history and so pass on rapidly to the events of the present century which have such an important bearing on the state of the industry as it exists at the present day.

As a preliminary, it is perhaps as well to get some idea of the output and uses of coal in various countries at the present time. At present, some 50 countries are engaged in the mining of coal (including anthracite, bituminous, lignite and brown coal) and in 1936 these countries produced about 1,280 million metric tons of coal units (lignite and brown coals being converted into coal units thermally equivalent to the average of anthracite and bituminous).

Of this world total, about four-fifths is consumed as fuel and the remaining one-fifth as raw material.

As fuel.	*Per cent.*
Industry (mainly for steam-raising)	30
Railways	15
Electric generating stations	8
Ships' bunkers	2
Collieries	5
For domestic purposes	20
TOTAL	80
As raw material.	
Metallurgical works (mainly iron and steel)	15
Gas works	5
TOTAL	20

This world total consisted of:—

Bituminous coal	about	87·7
Anthracite	,,	7·6
Lignite	,,	4·8

The world output of nearly 1,300 million tons was distributed among the various countries as follows:—

TABLE 1.—Percentages of world output of raw coal by countries, 1934–1936.

(*Lignite converted into equivalent coal units.*)

Country.	1934.	1935.	1936.	Cumulative percentage, 1936.
United States	32·9	32·3	34·4	34·4
Great Britain	19·6	19·1	18·1	52·5
Germany	13·6	14·9 (*d*)	15·2 (*d*)	67·7
Saar	1·0	(0·9)	(0·9)	
U.S.S.R.	7·5	8·4	8·7	76·4
France	4·2	3·9	3·6	80·0
Japan (*a*)	3·1	3·2	3·0 (*e*)	83·0
Poland	2·6	2·4	2·3	85·3
Belgium	2·3	2·2	2·2	87·5
India (*b*)	2·0	2·0	1·8	89·3
Czechoslovakia	1·7	1·7	1·7	91·0
China (excluding Manchuria)	1·8	1·8	1·6	92·6
Manchuria	1·0	1·0	0·9	93·5
South Africa	1·1	1·2	1·2	94·7
Netherlands	1·1	1·1	1·0	95·7
Australia	0·9	1·0	0·9	96·6
Canada	0·9	0·9	0·9	97·5
Other countries (*c*) ..	2·6	2·9	2·5	100·0
TOTAL ..	100·0	100·0	100·0	
Total production (million metric tons)	1144·6	1179·9	1280·4	

(*a*) Without colonies.

(*b*) Including Native States.

(*c*) Of the other countries, the most important are Spain, Hungary, Turkey, Austria and French Indo-China.

(*d*) Including the Saar.

(*e*) Based on final estimate (38·1 million tons) instead of provisional (41·0).

These figures reveal the fact that over three-quarters of the output in 1936 was produced by four countries, the U.S.A. with 34 per cent, Great Britain with 18 per cent, Germany with 15 per cent, and the U.S.S.R. with 8·7 per cent, whilst other countries in Europe accounted for a further 10·8 per cent, giving a total for western Europe and the U.S.S.R. of some 53 per cent of the world's output.

Having got a slight idea of the magnitude and geographical distribution of the coal industry we will now trace briefly the various sequence of events that have had an important influence on its expansion and development.

The early history of the use of these fossil fuels as distinct from that of wood charcoal is somewhat obscure. This lack of reference to the value of coal in early literature merely lends emphasis to the fact that the development of the industry on an appreciable scale is of relatively recent date, being closely bound up with the deforestation of large areas of the countryside, resulting in a shortage of the more obvious and easily won sources of domestic fuel on

the one hand and by the wave of engineering invention and attendant rapid industrialisation dating from the latter part of the 18th century on the other.

Perhaps the earliest reference in which a definite distinction is drawn between fossil coals and wood charcoal is in the Greek writings of Theophrastus, a pupil of Aristotle who, about the year 371 B.C. in his treatise 'On Stones', mentions 'fossil substances that are called coals, which kindle and burn like wood coals' occurring 'in Liguria and in Elis, on the way to Olympias;—they are used by the smiths'.

In Great Britain, it is most probable that the use of 'stone coal' was known to the Romans at the time of their occupation, for among the ruins of Roman towns, forts, etc. especially in Northumberland, coal cinders have been found.

Time does not permit me to discuss the etymology of the word 'coal' and I would refer those interested to Dr. Fox's memoir entitled 'The Natural History of Indian Coal'. But it is apparent, from the nomenclature used in various countries, that fossil coal had been recognised from ancient times in many European countries, and although in India, there appears no definite mention of it in the literature till as late as 1774, it had doubtless been recognised at a much earlier date.

There is evidence to show that coal was mined in Great Britain during the ninth century and certainly in the continent of Europe during the tenth century.

Subsequent to that date, the coal industry in Europe expanded appreciably and in Britain, by Tudor times, an important trade had developed between Northumberland and Durham mines and the city of London and coal was exported to northern France. In Scotland it was mined for use in local industries.

As far back as those early times, the smoke nuisance was realised for it was reported in 1578 that the burning of coal was prohibited in the vicinity of the Palace of Westminster when Queen Elizabeth was in residence. To combat this smoke nuisance on the Continent, powdered coal was mixed with loam and made into balls, the resulting fuel proving economical, smouldering gradually away and producing no flame and little smoke. This practice continued in Belgium until recent years.

By the 17th century, coal was well known throughout Britain and a large part of Europe, and the industry was an extremely profitable one for the fortunate proprietors and land-owners, contrasting with the lot of the miners who worked under the most wretched conditions.

Expansion was assisted by the construction of canals in the European coal-producing countries, giving cheap transport to the sea and to various inland towns.

But by far the greatest impetus given to the coal industry was the invention and improvement of the steam-engine by James Watt of Greenock during the latter half of the 18th century, and secondly, by the introduction of railways,

which commenced with the improved locomotives of George Stephenson in 1815.

Ease of steam transport both by sea and land not only directly effected a tremendous increase in the demand for coal, but quite naturally gave an enormous impetus to the iron and steel and attendant carbonisation industries, and to manufacturing trades and domestic consumption in general. In fact, almost every important engineering invention, so numerous from the latter part of the 18th century onwards, added directly or indirectly to the demand for coal.

Blast furnaces, which together with steel account for some 15 per cent of the present world's output, had originated in Germany during the 15th century and were introduced into England about 1500. A scarcity of wood charcoal gave the incentive which led, about 1620, to the use of coke obtained from pit-coal, and during the succeeding century, the use of this fuel became the established practice. With improved types of blowing engines, following Watt's invention of the steam-engine, the blast furnace made huge strides.

In addition to the effect of the high temperature carbonisation industry to meet the needs of the iron and steel trade, further impetus was given to the coal industry by the large-scale introduction of coal gas as a means of lighting and heating. The coal gas industry dates back to the end of the 18th century when, in 1792, one William Murdoch illuminated his house at Redruth, Cornwall, with coal gas distilled in an iron retort. During the early years of the 19th century, the gas industry made great strides in Europe, and later in America, and additional impetus was given by the invention of the Bunsen burner in 1855 and the incandescent mantle in 1885, both being discovered at Heidelberg, Germany.

The foregoing summary briefly indicates the principal landmarks which directly and indirectly influenced the expansion of the coal industry during the period of industrial revolution at the end of the 18th and during the 19th centuries. Time does not permit me to discuss in any detail the more recent developments, such as the vastly increased development in steam and electrical power, the production of producer gas and water gas, the use of pulverised fuel as such and in coal-oil mixtures, the manufacture of smokeless fuel by low temperature carbonisation and, latterly, the use of coal for the production of liquid fuels by hydrogenation.

It is necessary to pass on and to give our attention to the *general* trend of events during the present century, and particularly since the War, in order to understand the position of the coal industry as it exists today.

During the several decades before the War, the coal industry was expanding rapidly in this country, and with increasing industrialisation and demand, conditions were relatively smooth-running and prosperous. Much the same thing was happening, though on a vastly larger scale, in Europe and America. However, in spite of this relative prosperity, complications arose. With the rapid opening up of new mining areas without sufficient forethought to the

question of a reasonable balance between output, prices, profits and wages, fluctuations in coal prices were bound to occur and conflicts between employers and workers naturally resulted, strikes occurring at intervals, often as a result of cuts in wages following falls in the sale prices of coal. Thus the necessity of the integration, amalgamation and control of the industry became increasingly realised and, though many schemes were proposed without being put into execution, yet certain measures were adopted even before the end of the 19th century, and the period 1900–14 was characterised in many countries by the introduction of legislation regulating conditions of working underground, ameliorating to an important extent the lot of the unfortunate miner.

As a result, when War broke out in 1914, some kind of equilibrium had been arrived at in the coal-mining industries of the various countries and to some extent in the international markets, though a great deal still remained to be done.

The War naturally created a great disturbance in the industry. Belligerent Powers experienced an internal shortage and could not meet the demands of foreign customers. As a result, in spite of the opening of new mines in many countries, prices tended to soar. To meet the situation, in practically all the belligerent countries, the coal industry was placed under Government control for stimulating production, rationing and fixing prices.

As shipments from Europe to the Far East were cut off, the industry in Australia, China, Japan, South Africa and in this country expanded very appreciably, and a similar expansion occurred in the U.S.A. in order to meet their enlarged industries and to supply certain European and South American countries. In the case of the European neutrals, Sweden and Switzerland developed their water-power and Spain and the Netherlands their own deposits of coal. Immediately following the War, in addition to the lasting effects of the changes that had taken place during 1914–18, further complications arose owing to political and economic developments.

The boom of 1919-20, combined with various factors limiting production and export in certain important countries, all combined to produce a world coal shortage, giving rise to high prices, further mining development, a search for substitute fuels and progress in fuel economies.

In 1921-22, an industrial depression followed, and coal prices collapsed.

This post-War confusion, together with labour unrest, stimulated a widespread effort towards a comprehensive reform of the industry and coal commissions were set up in various countries. Numerous proposals were suggested and a number were acted upon but the 'larger proposals for the nationalisation of the industry were not put into effect or, where enacted into law, resulted in arrangements which were far from the original intentions'.

Relative world prosperity and industrial expansion succeeded during 1925–29 and this greatly assisted the coal industry, so that by 1927 the world production exceeded that of 1913 for the first time. Even so, during that period, the general *malaise* of the world coal-mining industry and the concept

of a world 'coal problem' calling for international action began to gain ground. Among the events, the 10 months' stoppage in Great Britain in 1926 assisted other European countries and the U.S.A. temporarily, but with her return to the market the struggle in competition was renewed.

Late in 1929, collapse again occurred and, combined with the substitution of other fuels for coal and as a result of increasing fuel economies, the production and consumption of coal fell to unprecedentedly low levels.

In order to realise the nature and magnitude of the difficulties involved during the last few years we must momentarily retrace our steps to the events of the several preceding decades in addition to taking note of the happenings of the years succeeding the 1929 depression.

Throughout the 19th century and until the War, the world demand for coal had developed at an average rate of 4 per cent per year.

But between 1913 and 1937 this demand increased at a mean of only ·3 per cent annually.

During recent years, the factors tending towards a diminution of demand have, especially since 1929, appreciably exceeded in force the factors leading to expansion. These post-War factors of contraction of the demand for coal include:—

(*a*) the depressed state of the railways and steamship transport;
(*b*) displacement of coal as a fuel by mineral oils, natural gas and water-power;
(*c*) the production of a much greater proportion of the world's steel output direct from scrap iron than was the case in pre-War days;
(*d*) appreciably higher levels of fuel efficiency.

There is not time to discuss these various factors; I will merely draw your attention to the following data:—

(1) Excluding the navies of the world, in which almost complete replacement of coal by oil has taken place during the past 25 years, the coal-fired vessels fell in tonnage from 44 million or 97 per cent of the world total in 1914, to 32 million or 49 per cent of the world total in 1937. During that period, oil-fired vessels expanded in tonnage more than 15 times over to about 20 million tons, and motor-ships by 13·5 million tons.
(2) Regarding economies in the use of fuel the following statistics show the great influence of this factor on the coal trade during recent years.

In the U.S.A., the average fuel efficiency of industrial manufacturing concerns and railway transportation rose between 1909 and 1929 by approximately 33 per cent and continued to rise, but at lower rates in subsequent years.

In Great Britain, in electricity undertakings an improvement of 55 per cent occurred in fuel efficiency between 1920 and 1935. In gas-production there was a saving of 10 per cent of coal. In the case of blast furnaces, 2·06 tons of coke and coal were used to produce one ton of iron in 1913 as compared with 1·66 tons (of coke and coal) in 1936. In railway transportation there was an average increased thermal efficiency of 4·4 per cent between 1928 and 1934 alone. Realising the magnitude of these industries, it is easy to visualise the great influence these economies had on the coal industry. Similar economies were, of course, achieved in many other countries.

Another important development affecting the balance within the industry in recent years has been the greatly increased output per man shift as a result of the rapid introduction of machine mining, an increase which has varied from 10 per cent in the case of Great Britain to over 100 per cent in the Netherlands.

A further important development of the coal industry in recent years, to which reference must not be omitted, is the great expansion that has taken place in the output of coal in the U.S.S.R. From a production of 6 million tons in 1900, 36 million in 1913, and 48 million in 1930, rapid expansion resulted in an output of 126 million tons in 1936 and there is little doubt that during the past two years further increases have been recorded. Fortunately, however, for the world coal trade, this rapid expansion added little to the problems affecting the industry as a whole, for the fuel produced was almost all consumed internally by the equally rapidly expanding home industries.

In view of the above-mentioned trend of events, it is therefore not surprising to find that the world coal industry of the present century, and particularly of the past 10 years, has been and is still suffering from a large margin of surplus capacity for production and, it is believed, that this surplus capacity is at the root of the present coal problem. ['Surplus capacity' is defined as 'the difference between the amount which existing mines, *without any additional investment of fixed capital*, could produce and the amount of actual output '.]

In 1929, the Economic Committee of the League of Nations came to the conclusion that, in European countries, there were margins of surplus capacity amounting to one-fourth in Germany, one-fourth to one-third in Great Britain and one-half in Poland.

In the case of the output of bituminous coals of the U.S.A., the excess capacity was estimated to have risen from some 20 per cent in pre-War years to about 56 per cent in 1923. In 1929, it fell to 27 per cent, soared to over 90 per cent during the depression of 1932, and has more recently declined to about 46 per cent—the percentages being estimated as proportions of the actual output.

It is, therefore, apparent that, since the War and particularly since 1929, the coal trade both in the home and in the world markets has suffered from a serious unbalance between power to supply and volume of effective demand.

This has, on the one hand, given rise to various schemes—both national and international—for the control of output and prices and for the general amalgamation and regulation of the industry, and has led many countries to take steps in an attempt to improve their individual positions. The steps taken included the protection of the home markets by tariffs, etc.; the granting of subsidies to encourage the export trade; manipulation of the national currency in foreign exchange and preferential trade agreements and bartering arrangements.

Fortunately also, on the other hand, there has been progress towards international agreements as evidenced by the Anglo-Polish Coal Export Agreement of 1934, renewed with some modifications in 1937; and by the International Coke Cartel of 1937 allotting export quotas and fixing minimum prices in the case of the principal European exporters of coke—Belgium, Germany, Great Britain, Poland and the Netherlands. The necessity for readjustment on a world-wide basis is, therefore, being increasingly realised and, it is to be hoped that, on the return to stable political conditions, further measures on these lines will be adopted in order that a return to a lasting period of stability and welfare for all concerned in the coal industry of the world will be forthcoming.