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THE INDUSTRIES OF THE CLYDE VALLEY DURING THE WAR

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EDITOR'S PREFACE

In the autumn of 1914 when the scientific study of the effects of war upon modern life passed suddenly from theory to history, the Division of Economics and History of the Carnegie Endowment for International Peace proposed to adjust the programme of its researches to the new and altered problems which the War presented. The existing programme, which had been prepared as the result of a conference of economists held at Berne in 1911, and which dealt with the facts then at hand, had just begun to show the quality of its contributions; but for many reasons it could no longer be followed out. A plan was therefore drawn up at the request of the Director of the Division, in which it was proposed by means of an historical survey, to attempt to measure the economic cost of the War and the displacement which it was causing in the processes of civilization. Such an 'Economic and Social History of the World War', it was felt, if undertaken by men of judicial temper and adequate training, might ultimately, by reason of its scientific obligations to truth, furnish data for the forming of sound public opinion, and thus contribute fundamentally toward the aims of an institution dedicated to the cause of international peace.

The need for such an analysis, conceived and executed in the spirit of historical research, was increasingly obvious as the War developed, releasing complex forces of national life not only for the vast processes of destruction but also for the stimulation of new capacities for production. This new economic activity, which under normal conditions of peace might have been a gain to society, and the surprising capacity exhibited by the belligerent nations for enduring long and increasing loss—often while presenting the outward semblance of new prosperity—made necessary a reconsideration of the whole field of war economics. A double obligation was therefore placed upon the Division of Economics and History. It was obliged to concentrate its work upon the

problem thus presented, and to study it as a whole; in other words, to apply to it the tests and disciplines of history. Just as the War itself was a single event, though penetrating by seemingly unconnected ways to the remotest parts of the world, so the analysis of it must be developed according to a plan at once all embracing and yet adjustable to the practical limits of the available data.

During the actual progress of the War, however, the execution of this plan for a scientific and objective study of war economics proved impossible in any large and authoritative way. Incidental studies and surveys of portions of the field could be made and were made under the direction of the Division, but it was impossible to undertake a general history for obvious reasons. In the first place, an authoritative statement of the resources of belligerents bore directly on the conduct of armies in the field. The result was to remove as far as possible from scrutiny those data of the economic life of the countries at war which would ordinarily, in time of peace, be readily available for investigation. In addition to this difficulty of consulting documents, collaborators competent to deal with them were for the most part called into national service in the belligerent countries and so were unavailable for research. The plan for a war history was therefore postponed until conditions should arise which would make possible not only access to essential documents but also the co-operation of economists, historians, and men of affairs in the nations chiefly concerned, whose joint work would not be misunderstood either in purpose or in content.

Upon the termination of the War the Endowment once more took up the original plan, and it was found with but slight modification to be applicable to the situation. Work was begun in the summer and autumn of 1919. In the first place a final conference of the Advisory Board of Economists of the Division of Economics and History was held in Paris, which limited itself to planning a series of short preliminary surveys of special fields. Since, however, the purely preliminary character of such studies was further emphasized by the fact that they were

directed more especially towards those problems which were then fronting Europe as questions of urgency, it was considered best not to treat them as part of the general survey but rather as of contemporary value in the period of war settlement. It was clear that not only could no general programme be laid down *a priori* by this conference as a whole, but that a new and more highly specialized research organization than that already existing would be needed to undertake the Economic and Social History of the War, one based more upon national grounds in the first instance and less upon purely international co-operation. Until the facts of national history could be ascertained, it would be impossible to proceed with comparative analysis ; and the different national histories were themselves of almost baffling intricacy and variety. Consequently the former European Committee of Research was dissolved, and in its place it was decided to erect an Editorial Board in each of the larger countries and to nominate special editors in the smaller ones, who should concentrate, for the present at least, upon their own economic and social war history.

The nomination of these boards by the General Editor was the first step taken in every country where the work has begun. And if any justification was needed for the plan of the Endowment, it at once may be found in the lists of those, distinguished in scholarship or in public affairs, who have accepted the responsibility of editorship. This responsibility is by no means light, involving, as it does, the adaptation of the general editorial plan to the varying demands of national circumstances or methods of work ; and the measure of success attained is due to the generous and earnest co-operation of those in charge in each country.

Once the editorial organization was established there could be little doubt as to the first step which should be taken in each instance toward the actual preparation of the history. Without documents there can be no history. The essential records of the War, local as well as central, have therefore to be preserved and to be made available for research in so far as is compatible with public interest. But this archival task is a very great one, belonging of right to the governments and other owners of historical sources

and not to the historian or economist who proposes to use them. It is an obligation of ownership ; for all such documents are public trust. The collaborators on this section of the war history, therefore, working within their own field as researchers, could only survey the situation as they found it and report their findings in the form of guides or manuals ; and perhaps, by stimulating a comparison of methods, help to further the adoption of those found to be most practical. In every country, therefore, this was the point of departure for actual work ; although special monographs have not been written in every instance.

This first stage of the work upon the war history, dealing with little more than the externals of archives, seemed for a while to exhaust the possibilities of research. And had the plan of the history been limited to research based upon official documents, little more could have been done, for once documents have been labelled ' secret ' few government officials can be found with sufficient courage or initiative to break open the seal. Thus vast masses of source material essential for the historian were effectively placed beyond his reach, although much of it was quite harmless from any point of view. While war conditions thus continued to hamper research, and were likely to do so for many years to come, some alternative had to be found.

Fortunately such an alternative was at hand in the narrative, amply supported by documentary evidence, of those who had played some part in the conduct of affairs during the war, or who, as close observers in privileged positions, were able to record from first or at least second-hand knowledge the economic history of different phases of the great war, and of its effect upon society. Thus a series of monographs was planned consisting for the most part of unofficial yet authoritative statements, descriptive or historical, which may best be described as about half-way between memoirs and blue-books. These monographs make up the main body of the work assigned so far. They are not limited to contemporary, war-time studies ; for the economic history of the war must deal with a longer period than that of the actual fighting. It must cover the years of ' deflation ' as well, at least sufficiently

to secure some fairer measure of the economic displacement than is possible in purely contemporary judgments.

With this phase of the work, the editorial problems assumed a new aspect. The series of monographs had to be planned primarily with regard to the availability of contributors, rather than of source material as in the case of most histories; for the contributors themselves controlled the sources. This in turn involved a new attitude towards those two ideals which historians have sought to emphasize, consistency and objectivity. In order to bring out the chief contribution of each writer it was impossible to keep within narrowly logical outlines; facts would have to be repeated in different settings and seen from different angles, and sections included which do not lie within the strict limits of history; and absolute objectivity could not be obtained in every part. Under the stress of controversy or apology, partial views would here and there find their expression. But these views are in some instances an intrinsic part of the history itself, contemporary measurements of facts as significant as the facts with which they deal. Moreover, the work as a whole is planned to furnish its own corrective; and where it does not, others will.

In addition to this monographic treatment of source material, a number of studies by specialists is already in preparation, dealing with technical or limited subjects, historical or statistical. These monographs also partake to some extent of the nature of first-hand material, registering as they do the data of history close enough to the source to permit verification in ways impossible later. But they also belong to that constructive process by which history passes from analysis to synthesis. The process is a long and difficult one, however, and work upon it has only just begun. To quote an apt characterization, in the first stages of a history like this one is only 'picking cotton'. The tangled threads of events have still to be woven into the pattern of history; and for this creative and constructive work different plans and organizations may be needed.

In a work which is the product of so complex and varied co-operation as this, it is impossible to indicate in any but

a most general way the apportionment of responsibility of editors and authors for the contents of the different monographs. For the plan of the History as a whole and its effective execution the General Editor is responsible; but the arrangement of the detailed programmes of study has been largely the work of the different Editorial Boards and divisional Editors, who have also read the manuscript prepared under their direction. The acceptance of a monograph in this series, however, does not commit the editors to the opinions or conclusions of the authors. Like other editors, they are asked to vouch for the scientific merit, the appropriateness and usefulness of the volumes admitted to the series; but the authors are naturally free to make their individual contributions in their own way. In like manner the publication of the monographs does not commit the Endowment to agreement with any specific conclusions which may be expressed therein. The responsibility of the Endowment is to History itself—an obligation not to avoid but to secure and preserve variant narratives and points of view, in so far as they are essential for the understanding of the War as a whole.

J. T. S.

PREFACE

This volume aims at showing how the economic and social life of a Scottish industrial district was affected by the War. The region known as the Clyde Valley is remarkable not only for the magnitude, but also for the diversity of its industries, which are to a large extent inter-connected. Also it had special facilities for the production of many things for which there was a most urgent demand during the years of war. It follows that there was a very great diversion of energy towards war industry, and that the greatness of this effort presented many serious problems when the war was over. The study of such a sudden shifting of the centre of gravity in industry, the degree of disorganization which ensued, the still greater difficulties in the attempt to adopt the productive energy of the district, as it was at the end of the war, to the new needs of peace, together present a series of social and economic conditions of special importance. Necessarily, the end is not yet in sight, but the development has proceeded far enough to show the consequences, particularly in unemployment, of the change in the balance of productive forces through the increase in the plant of the engineering and shipbuilding industries, especially when there was a failure in demand.

The pressure during the war was such that many firms were compelled to carry on their office work with very inadequate staffs, and thus it not infrequently happens that there were developments of which no written record remains. For

information reliance has to be placed on the memory of those who were concerned in these transactions. We acknowledge, very gratefully, the pains taken both by firms and Trade Unions to provide information upon several questions. Our special thanks are due to the Board of Admiralty and the Ministry of Munitions for permission to print certain of their records.

W. R. S.
J. C.

April, 1922.

CONTENTS

APPENDIX

CHAPTER I

THE CLYDE VALLEY BEFORE THE WAR

I. *Its Physical Characteristics.* Physical features of Scotland—the Highlands, the Lowlands, and Uplands; geological characteristics of the Lowlands; the Clyde; the Firth of Clyde.

II. *Economic Development of the West of Scotland.* Beginnings of economic life; start of sugar refining and the chemical industry in 1667; the tobacco trade in the eighteenth century; the introduction of the steam-engine and the development of textiles; the iron and steel industries, also the progress of shipping in the first half of the nineteenth century; shipbuilding and engineering; diversity of industry at beginning of the twentieth century.

III. *The Commerce and Industries of the West of Scotland in 1913.* Character and interaction of the industries of West of Scotland; population; coal; iron ore; iron and steel; shipbuilding; engineering; chemicals; textiles; tobacco and sugar; character of overseas trade; imports and exports in 1913; transition to war-time industry.

I. *Its Physical Characteristics*

The intense industrial activity in the West of Scotland during the Great War depended upon the productive capacity which had been developed in this district in the past, and which in some of its aspects was caused by events which had their beginnings in remote times. On the one side this productive capacity is based in part upon natural conditions, and on the other upon a system of organization which had been built upon these over a very long period. From their nature the resources of the Clyde Valley were such as required time to be developed. Two great epochs in the economic progress of the district are so outstanding as to have excited general notice. These were the opening of trade between America and the West of Scotland after the union with England in 1707, and the development of the coal, iron, and shipbuilding industries in the nineteenth century. It is perhaps not unnatural that,

remembering the 'Tobacco Lords' and the great iron-masters, it should appear that Glasgow in the seventeenth century was only 'a poor fishing village', but it must not be forgotten that at that time most towns were small, and that a rise so rapid would not explain the facts. If Glasgow and some of the other Clyde towns had not had considerable experience in comparatively large commercial enterprises, the rapidity with which Glasgow gained upon Bristol in the tobacco trade would be inexplicable. Further, the economic development of the West of Scotland is a testimony to Beaconsfield's claim for 'the irresistible influence of the individual', rather than to that later disposition to submerge him in the vague drift of a general tendency. It is indisputable that much of the later progress of the West of Scotland is to be assigned to organizers and inventors of the eighteenth century as well as to the others who succeeded them, and it is improbable that the former group would have been so effective had not very considerable progress been made in the seventeenth century and even earlier. And so it is not too much to say that in the mediaeval period a foundation of enterprise and character was laid which was developed and rewarded by subsequent opportunities.

Turning first to the natural conditions which contributed to this development, we should recall that as a first rough approximation Scotland may be regarded as consisting of three great belts of country. North of the Border is the region described as the Uplands, consisting of high land, remarkable for a great complexity of geological structure, but composed in the main of hard grey wacke, with occasional bands of limestone belonging to the Silurian system.[1] North of this and running from east to west is the belt variously described as the Lowlands, the Midland Valley, or the Midland Plain. North of this again are the Highlands, the region of mountains and heather, composed to a large extent of gneiss and schists.

The preliminary picture of Scotland, divided into three transverse bands with mountains in the north, next a plain,

[1] Geikie, *Scenery of Scotland, viewed in connection with its Physical Geology*, London, 1901, pp. 119, 310.

and then higher ground to the south, requires modification in at least two respects. The lower ground is not, strictly speaking, either a valley or a plain. In it are included a number of hills, some of which reach an altitude of 1,800 feet. Further, while the main trend of the Lowland Plain is from east to west, it is prolonged on the east coast both to the north and the south. Thus in the former direction the county of Caithness (which includes Dunnet Head and John o' Groat's) lies low on the side next the North Sea. To balance this on the west, the mountainous country stretches towards the south and reaches the Clyde in the vicinity of Glasgow, which thus has some claims to be termed a city on the margin of the Highlands. For instance, the Cowal peninsula of Argyllshire, which projects into the Firth of Clyde and is about the same latitude as Glasgow, is a mountainous district with hills of 3,000 feet, and has most of the features of the Highlands. To the south lies the Island of Arran in the Firth of Clyde with Goat Fell of 2,866 feet. The proximity of Glasgow to country of the Highland type has been important in several ways, particularly in its close connexion with the Highlands, whence labour for its industries has been long recruited. There were interesting instances of this during the War, as in cases of some Glasgow munition factories, when the prevailing language was not English, but Gaelic.

Considering the midland plain of Scotland more in detail, this may be described as the waist of the country, since it is narrowed to half the general width of the regions to the north and the south of it by the deep indentations by the sea in the Firth of Forth on the east and the Firth of Clyde on the west. To the north this plain is bounded by the hills of Kilpatrick and Campsie near the lower reaches of the Clyde and more to the east by the long ranges of the Ochils and the Sidlaws, and to the south by the edge of the Silurian Uplands. The geology of this plain is not only interesting in itself but of considerable industrial importance. At that remote period when the Thames may have been a tributary of the Rhine, this midland valley was a great inland sea which stretched from what is now the North Sea to the north of Ireland. Therefore it

has not been subject to the process of denudation to which the Highlands and Uplands have been exposed. In the process of geological change the Highland Hills have been swept and scoured till in most cases only the gneisses and schists remain. The midland plain was protected, and it therefore retains later formations. In the Pentland Hills and in part of Lanarkshire the strata of the Upper Silurian period are exposed, but in the remainder of the region Old Red Sandstone, Upper Red Sandstone, and the Carboniferous strata remain. The latter comprise sandstones with shales, coals, fire-clays, limestones, and ironstones.[1] Doubtless the original coal-field was continuous, extending from St. Andrews on the east to Dumbartonshire on the west, but by geological changes it has been divided, consisting at present of an eastern and a western area. Through the intrusion of igneous rocks the latter is again divided into the Lanarkshire and Ayrshire coal-fields. The rivers are the Tay and the Forth flowing into the North Sea, and the Clyde into the Atlantic.

The geographical history of the Clyde is remarkable. This river originally rose in the Argyllshire Highlands to the north-west of Glasgow and flowed south-eastwards, finding an outlet into the North Sea by the lower Tweed. It now flows in the reverse direction, discharging into the Atlantic through the Firth of Clyde, which has been eroded from the original plateau by the swift torrents from the Argyllshire Hills. The combined effect of this erosion and of earth movements resulted in the river no longer finding an outlet through the Biggar Gap towards the east, and its course became fixed in a general north-westward direction.

As the Clyde is at present, it is the chief British river flowing north-westwards. It is 98 miles long and drains an area of 945 square miles. It rises in the Lowther Hills which form part of the Southern Uplands, and during the earlier part of its course it flows almost due north. At this stage it is only some seven miles distant from the Tweed. After passing near Biggar it

[1] James Bryce, *Geology of Arran and Clydesdale*, Glasgow, 1865, pp. 135–48, 296–322; *Local Industries of Glasgow*, Glasgow, 1901, pp. 3–5.

flows north-westwards, entering the Firth of Clyde at Dumbarton. In its upper reaches the river is swift, and at one place falls 230 feet in a distance of 3½ miles. During the last fifty miles the total fall is little more than half this amount; the average fall being 3·4 feet per mile. The twelve miles nearest the Firth have been very greatly changed in the last century and a half. The unimproved river gradually widened, so that at high tide it extended over a wide area on each side of the channel. Being shallow it was subject to serious floods. For instance, in 1712 there was a very great flood which is recorded to have risen 18 feet 6 inches above ordinary high-water mark.[1] Thus there is no reason to doubt early maps, extending from Ptolemy's plan of Britain to that of Blaeu in the seventeenth century, which depict the lower reaches as a comparatively wide expanse of water which was extended by floods or high tides up to the foot of the low ranges of hills on each side, and various accounts show that this alluvial land was only made available for purposes of continuous cultivation in comparatively recent times. A picture of the Lower Clyde as a wide straggling expanse of water, which was frequently several miles wide, is essential to an understanding of the development of the West of Scotland, and it is even more important to recollect its extreme shallowness. According to reports made by Smeaton in 1755 and 1758 and confirmed by James Watt in 1769, at one point the depth at low tide was no more than 1 foot 2 inches to 1 foot 3 inches.[2] Indeed it is not long since old men stated that in their youth they had waded across the harbour of Glasgow, where ships drawing 20 feet of water are now moored. Thus it may well be claimed that the Clyde in the twelve miles nearest the Firth is 'nearly as much an artificial navigation as the Suez Canal'.[3]

While Nature in diverting the Clyde from its former course did little to provide a means of transport, she was extraordinarily generous to the Firth. This estuary seems to have

[1] MacGeorge, *Old Glasgow*, p. 255.
[2] James D. Marwick, *The River Clyde and the Clyde Burghs*, Glasgow, 1909, p. 180.
[3] J. Deas, *The River Clyde*, Glasgow, 1876, p. 1.

been designed for the convenience of shipping and allied enterprises. In the long process of erosion of the original table-land, an outer margin, known as the Peninsula of Kintyre, was left enclosing a large expanse of water with good anchorage, and moreover so broken up that there is ample shelter for small craft. This characteristic was important in the days of very small vessels. This irregularly-shaped expanse of water may perhaps be pictured as resembling a huge, much battered octopus which is impaled on two spikes of rock in the islands of Bute and Arran. All the suckers on the south and west are gone, but on the north they straggle out in various lengths. These deep inundations of water, which in some respects resemble the Fiords of Norway, constitute the Channels worked by the torrents from the hills of Argyllshire. To the north-west there is a long deep cutting on Loch Fyne, next come the shorter indentations of Loch Ridden and Loch Striven opening from the Kyles of Bute. Farther eastwards but still looking north is the inner Firth of Clyde, which between Innellan and Wemyss Bay is about four miles wide. It is extended to the north by Loch Long, out of which open Holy Loch and Loch Goil. The remaining arm is the Clyde itself, which opens into a short inner estuary below Dumbarton and faces towards the west. From this opens the Gare Loch, a favourite loch for the trial of submarines, as the adjoining loch, Loch Long, has long been for that of torpedoes.

There are few expanses of water which afford such facilities both for coasting craft and deep-sea vessels. It was in the days of the former that preparation was made for the achievements of the latter, and the Firth of Clyde has been the nursery of builders and seamen for both. Not only was it eminently suitable for small boats, but it opened up two extensive fields for the adventure or commerce of the early navigators. The distance to the north-east coast of Ireland is short, while off the west coast of Scotland there is a barrier of islands extending from Islay to Skye. It was possible to sail in narrow protected waters by the Sound of Mull, the Sound of Jura, and the Sound of Sleat along upwards of one-half of the western coast-line.

For those who faced the wider waters of the Minch, the Outer Hebrides lay beyond. Some comparatively extensive navigation extends back into the remote distance of pre-historic times. An early canoe or boat, dating from the neolithic age, has been discovered in which there is a cork plug,[1] showing that even at this remote period there existed some means by which the products of Scotland were exchanged against those of Spain. Early in the Christian era communication with Ireland had developed so much that Scots from Ireland had established themselves in Argyll and the Islands and had founded the kingdom of Dalriada.[2] In the mediaeval period navigation to the Islands developed, and it is recorded in the middle of the seventeenth century that the long-recognized routes were to sail round Kintyre in the summer, but in winter the coasting boats were dragged over the narrow neck of land at Tarbert, Loch Fyne (Tarbert in Gaelic, like Portage in French-Canadian, meaning a piece of land over which boats were carried), whence access was obtained to the Sound of Jura.[3]

II. *Economic Development of the West of Scotland*

From their nature the resources of the Clyde Valley required time for their development. Yet the form which that development assumed was largely based on what had happened far back in the past—indeed there are few industrial regions in which, under external change, the element of continuity has been so persistent.

It is difficult to picture mediaeval Glasgow. Above all else it was an ecclesiastical city, and it was a very beautiful one. The Cathedral and the other buildings connected with the life of the Church stood on the north side of the Clyde, on the banks of one of its tributaries—the Molendinar. Here the residences of Church dignitaries nestled amongst the apple

[1] J. W. Gregory, ' Glasgow and its Geographical History ' in *The City of Glasgow*, 1921, p. 4.

[2] T. H. Bryce, ' The People of Glasgow ' in *The City of Glasgow*, 1921, p. 19.

[3] Report of Thomas Tucker on the Revenues of Customs and Excise, 1656, printed in *Miscellany Burgh Records Society*, 1881, p. 26.

trees, and here came the country clergy, the tenants of the Church, pilgrims and a multitude of other persons from the Islands on the west and from the lands of the Church on the east.

In the mediaeval period the beginnings of trade can be traced. Pilgrimages brought intercourse, and intercourse led to trade. As far back as 1250 the Abbot of Glenluce in Dumfriesshire was importing corn from Ireland. Wine and other luxuries were imported and in time Glasgow became a dépôt for the redistribution of these to the Highlands and along the Lowlands of the west. The chief exports from the thirteenth to the fifteenth centuries were salmon from the Clyde and herring from the Firth. Since the West of Scotland did not produce salt for curing the fish, this commodity was imported, as was also timber.

There had, even at this early period, been considerable experience of coastal navigation, and the West of Scotland was not long content to rely on foreign ships to carry on its trade with the Continent. Early in the sixteenth century there is mention of a ship being built at Dumbarton and a few years later of a galley having been launched at Glasgow—perhaps an early presage of the shipbuilding of the Clyde. By 1597 there were six ships owned in Glasgow, the total tonnage of which was 279, and the largest of which was 92 tons.

The position as regards coal during the Middle Ages is slightly obscure. There is mention of the working of coal as far back as 1210–19, and in 1294 the Abbey of Paisley had coal-mining rights. In 1497 it was being worked in Ayrshire, and in 1578 there was a ' tack ' or lease of a coal-pit near Glasgow. By 1596 the town of Irvine had been granted an impost on coal to meet the cost of harbour repairs, showing that at that time coal was being regularly shipped.

Towards the end of the Middle Ages a trade, largely independent of the ecclesiastical connexion, was developing in and about Glasgow. That connexion had given the city a position of dignity in the West of Scotland, and it had helped it in the long and involved struggle with the neighbouring

burghs of Dumbarton, Renfrew, and Rutherglen. On the other hand, it may be guessed that in the sixteenth century the centring of activity in the Church may have been in danger of cramping the material progress of the city. However this may have been, the Reformation provided a test of the possibilities of development under new conditions. Hitherto Glasgow had been sheltered from many of the political storms which convulsed other parts of Scotland, and at first it suffered from the new conditions which it had to meet. The earlier half of the seventeenth century was a time of economic depression, in which there is to be found a vigorous effort to develop manufactures and other industries. As far back as 1517 a 'walk' or fulling mill had been established on the banks of a tributary of the Clyde, and in 1648 efforts were made to establish a woollen manufactory, but it was not till 1681 that an enterprise of this kind succeeded. After 1660 new industries in the west came quickly. Two of these were of special significance. One was the starting of sugar-boiling in 1667, which was the foundation of the refining industry which has continued ever since. In the same year soap-making was begun, from which perhaps the modern chemical industries may be traced.

The end of the century was a time of some depression. The shipping industry had suffered during the war with France. In 1692 Glasgow owned fifteen ships with a tonnage of 1182, but seven were abroad and their return was uncertain. Ayr had lost forty ships in the last twenty or thirty years. Then there came the unfortunate Darien scheme. It was commanding in its conception (being a seventeenth-century anticipation of the economic essentials of the Panama Canal) and miserable in its execution. The country had invested very much more than it could afford to lose, and the collapse of the scheme brought great distress. There were some 500 vacant houses in Glasgow and the population showed a decline. A municipal census was taken in 1708 giving 12,766 as the number of inhabitants in the city.

The collapse of the Darien enterprise made the Union with

England an economic necessity.[1] When this had been accomplished in 1707 the whole centre of gravity of the economic life of Scotland was changed. Hitherto the direction of trade had been eastwards, and the trend of traffic was towards the eastern ports and thence to Europe. Trade from the West of Scotland to Europe was less direct and suffered from obvious disadvantages, while, prior to the Union, it was only possible to trade with America through English ports. After 1707 all this was changed, and before long a large colonial trade was developed. The period between the Union and the American War of Independence, which (as far as Glasgow was concerned) synchronized with the Industrial Revolution, was one of great progress, which constituted the connecting link between mediaeval and modern organization. Its dominating characteristic was the tobacco trade. This began in a typically British way. It is related that the first ship, chartered from Glasgow, to trade directly with America was one in which the skipper acted as supercargo. On his return the merchants asked him for a statement, and his reply was to produce a ' hoggar ' or seaman's bag bursting with coin. The merchants thought that, if a rude sailor could produce such satisfactory results, a trained business man should do even better. A person with these qualifications was sent in charge of the next ship, and, when he returned, he produced beautiful accounts—but no hoggar. Still the trade grew. It gained rapidly on that of the English ports. The ships came back ladened with tobacco, and tobacco dominated the business life of the city. Then came the day of the ' tobacco lords ', the outstanding figures in eighteenth-century Glasgow. Streets were named after the new trade—as for instance Virginia Street—and the burden of ships was rated in hogsheads of tobacco. There was much activity in providing exports for the use of the colonists. Linen, gauzes, cambrics, carpets, thread, ropes, brushes, copper utensils, kitchen ware, delft, nails, saddlery, and jewellery were made in the district for export. The trips were round voyages, the ships completing

[1] W. R. Scott, ' The Fiscal Policy of Scotland before the Union,' *Scottish Historical Review*, i. 173–90 ; *Records of a Scottish Cloth Manufactory*, 1681–1703, p. xliv.

their cargoes from Irish ports. As the trade developed a large re-export trade in tobacco was established, and Glasgow became an important distributing centre. In 1771–2 the imports of tobacco amounted to 46 million lb. of which nearly 44 million lb. was re-exported. In 1768 the population was 28,300, having more than doubled in sixty years.

The American War of Independence interrupted trade, and although the tobacco trade still remains an important industry, the check it sustained from 1770 to 1780 served to direct attention to the series of changes which go by the name of the Industrial Revolution and perhaps to hasten the transition in the West of Scotland. While the colonies were framing their Declaration of Independence, Watt was perfecting his inventions in relation to the steam-engine,[1] while Adam Smith was correcting the final proofs of his *Wealth of Nations*. Each event was the portent of a new era. The West of Scotland was early in the field. It had cotton mills before Lancashire, the first of which was started at Rothesay, in the Island of Bute, in 1778. Nine years later there were nineteen mills in Scotland, of which two-thirds were in the west. Amongst them was the factory at New Lanark, with which Robert Owen was associated. As yet these were driven by water, but in 1792 the steam-engine was introduced. Progress was extraordinarily rapid. In 1817 there were fifteen weaving factories in the vicinity of Glasgow containing 2,275 looms, as against 2,000 in Lancashire at that time. By 1838 there were 198 cotton factories in Scotland, of which 177 were in the Clyde Valley. In 1861 the factories in the latter district numbered 148, the spindles 1,674,788, the power looms 28,340, and the persons employed 37,548. Other textiles showed considerable increase, though linen cloth was developing more in the east than in the west. Like the tobacco trade, textiles are still important. The chief of these were the thread industry of Paisley and that of muslins.

The coming of the new iron age presented the West of

[1] The invention of the condenser was suggested to Watt by his work in repairing a model of a Newcomen engine at Glasgow University in 1764, a patent was obtained in 1765 and an Act extending the patent in 1775.

Scotland with two alternative lines of development. It might proceed in exploiting its early lead in the textile industry, or it might devote itself to the production of iron and machinery. Though the latter was the less tried industry—in the third quarter of the eighteenth century the average annual production of iron in the whole of Scotland was only about 1,500 tons—yet there were several advantages. On the one hand, natural conditions were favourable, and so many mechanical inventions had been made in the district, that it was advantageous that machines should be manufactured there. The Carron Iron works (where carronades were made and whence they took their name) were founded in 1760, those at Wilsonstown in 1774, the Clyde Iron Works and the Swan Iron Works (both in Glasgow) in 1782. In 1787 furnaces were started at Muirkirk in Ayrshire and at Omoa in Lanarkshire in 1788. Musket and Neilson were connected with the Omoa furnaces. The former was the discoverer of black band iron-stone in 1801, and the latter of the hot-blast in 1827. By 1796 there were seventeen iron furnaces in Scotland, all in the west. Their annual production was 1,600 tons, being rather more than one-eighth of the total made in Great Britain. In 1806 the Scottish output had risen to 23,000 tons, and in 1830 to 37,500.

Meanwhile the introduction of the marine steam-engine by Bell in 1812 led to a new type of engineering work. By 1828 there were 53 steamships plying from the Port of Glasgow. After half a century of effort the river had been considerably improved, and shipping had increased. In 1806 the ships owned by the chief Clyde ports, Glasgow, Greenock, and Port Glasgow, numbered 546 vessels with a tonnage of 64,126. Twenty-five years later the respective figures were 729 and 108,200.

Besides marine engines other types of machines were being made. Sugar machinery had been produced from the eighteenth century, and in 1823 spinning machinery was being made, while tube-making was in existence in 1835. The introduction of iron into shipbuilding about 1838 and the coming of the railway era prepared the way for great development in the

cast-iron and steel industries and also in marine engineering and shipbuilding after 1860. This meant a progressive advance in the output of pig-iron. From 37,500 tons in 1830, it grew to 311,600 tons in 1843, to 534,000 tons in 1848, and it reached a million tons in 1860.

The Industrial Revolution has left ineffaceable marks upon the Valley of the Clyde. Glasgow has long ceased to be the dignified cathedral city it was before the Reformation, and which an enthusiastic visitor in 1661 described as rivalling Oxford. By the middle of last century its wealth of iron and coal was beginning to be developed, and the black country in the coal-fields of Coatbridge and Wishaw was in process of formation. As yet, however, the export trade in coal had not been pushed very far, since as late as 1860 the total amount sent overseas from Scotland was only half a million tons, towards which the western ports—Glasgow, Greenock, Troon, and Ardrossan—contributed no more than 164,000 tons. As was the case with other industrial centres, there had been a great increase of population, which had grown from 28,800 in 1768 to 403,142 in 1861.

It is noteworthy that since the middle of the eighteenth century each great advance in the prosperity of the West of Scotland has followed a period of war, though usually after an interval of some depression. It was so in the case of the American War and again after the Napoleonic wars, though in both cases the real causes may have been less obvious. The same result came again after the Civil War in America. The initial effect was unfortunate in so far as the supply of cotton was interrupted, and the textile industries suffered severely. Increased attention began to be paid to shipbuilding, indeed many of the blockade runners of the period were built on the Clyde. Between 1863 and 1871 the tonnage launched varied between 196,229 (1871) and 108,024 (1867); from 1872 to 1875 the annual total exceeded 200,000 tons (reaching 262,430 tons in 1874). Then there was a relapse in the years of crisis, and the figure for 1877 was 157,383 tons. During the four years 1881–4 it rose rapidly and reached the maximum of the period

in 1883 when it was 404,383 tons. The next three years 1885–7 were years of depression yielding an annual average of 211,000 tons. Since that time remarkable progress has been made. With a few exceptions each year gave an increase on the previous total, and in 1913 the tonnage was 756,976 tons.

The growth of shipbuilding in the quarter of a century before the war was conditioned on the one hand by the unremitting efforts to improve the port, on which almost £7,250,000 had been expended from 1810 to 1897. On the other hand it was influenced by natural advantages and by the skill and equipment available for the metal industries. On the Clyde or in its immediate vicinity most kinds of engineering are carried on, as well as the heavy metal industries. These include general iron founding, boiler-making, marine engines and locomotives, machine tools, textile, agricultural and sugar machinery, sewing machines, brass and coppersmiths' work, electrical engineering, bridge, roof and railway engineering, pipe founding and sanitary and hydraulic appliances.

The great expansion in shipbuilding and engineering was reflected in a further increase in the population of Glasgow which was almost a million in 1911, and over a million in 1921.[1] It is interesting to observe the effects of successive stages in the industrial development of Glasgow. These are divided into periods of about half a century. Starting about the time of the Union with a population of under 13,000, this was more than doubled by 1768, which was near the end of what may be termed the tobacco period. This was succeeded by the textile period, which by 1821 yielded an increase no less than five times the figure of the year 1768. Then came a transitional period up to 1861 in which textiles and the iron trade were both prominent, and in it the population of 1821 was trebled. Then came the supremacy of the shipbuilding and engineering trades, which gave a population two and a half times as great as that of 1861 or an increase of as much as 600,000 in the last sixty years. Even greater proportionate increases have taken place in the

[1] There have been extensions of the city boundary, but these would not modify the very general statement above.

neighbouring towns, and at the last census, Dumbarton, Greenock, Paisley, Port Glasgow, Renfrew, and Rothesay had a total population of close on 250,000.

Though for the sake of brevity one speaks of a tobacco period, or a shipbuilding period, this is not to be understood as if a particular industry supplanted others by causing them to die out. What distinguishes the industry of Glasgow from that of many other towns is that, with the exception of salmon fishing (which later developments rendered impossible), no important industry which was once established has been suffered to disappear. It is characteristic of the psychology of Glasgow business that each industry which has been established in the district has been retained there. Thus the peculiar character of the industry of the Clyde Valley is its diversity. Though at the beginning of the twentieth century immense resources had been expended on shipbuilding and engineering, Glasgow still remained a great centre for sugar, tobacco, textiles, chemicals, and explosives.

III. *The Commerce and Industries of the West of Scotland in 1913*

The West of Scotland might almost be said to have experienced two Industrial Revolutions during the last hundred and fifty years. First came the great inventions of machinery, to which were added during the last half-century the remarkable developments in the iron and steel trades, and in shipbuilding. In the previous pages the process of economic evolution has been traced by successive stages, and it remains to picture the productive capacity of the district as it existed just before the outbreak of war. It is significant that most observers have drawn attention to the unique variety of the industries of this district which affords a certain element of compensation, since it is rare for so many trades to be depressed at the same time. The grouping together of specialization, and large scale enterprise, with the successful prosecution of many important industries is to be assigned to a combination of circumstances, some natural, some historical, and others of a more personal kind. Under modern conditions the advantages of extensive

coal-fields near a great water-way, such as the Firth of Clyde, are obvious. These have been added to by the protracted and costly labour of making the Clyde navigable. To a large extent the district is relatively self-contained, while its communications with other industrial areas are most favourable. From north to south there are two main railway lines, from west to east there are several and in addition the Forth and Clyde canal. During the war these were supplemented by an oil pipe line. There is a highly trained supply of labour, and it is possible to increase it, if required, from the highlands and western islands which constitute a species of natural industrial recruiting ground for the industries of the West of Scotland. There is usually a considerable amount of migratory labour which finds employment in Glasgow and other towns of the district during the winter, and returns to agriculture and fishing in the summer. This characteristic showed itself in a special form during the war when many women formerly employed in the fish-curing industry (which is prosecuted in the Hebrides, West Highlands, Shetland and the north-east coast) flocked to munition works. Then again, as compared with many other industrial towns, Glasgow had an early start in commerce, and was able to take advantage of successive opportunities as these presented themselves.

Such a compact industrial district with a population of over two millions, half of which is in its chief city, Glasgow, with excellent facilities both for domestic and over-seas trade, with coal and iron, and a long industrial tradition, is admirably equipped for transacting an immense business both in the production and the distribution of commodities.

The basis of the modern industry of the Clyde Valley is to be found in its coal production. In 1913 the United Kingdom produced 287·5 million tons of coal. Of this about one-seventh was mined in Scotland, and three-fifths of the Scottish output was obtained from the western mines, the remainder from those in the east. The figures for the former were 25·5 million tons, and for the latter seventeen million tons.[1] Of the coal

[1] *Report H.M. Inspector of Mines (Scotland) for 1913*, Cd. 7439, p. 7.

raised in Scotland the east exports more than the west, which requires large quantities for its industries; thus while in 1913 the output in the west exceeded that in the east by 50 per cent., the shipments of the latter were greater by 100 per cent. The total exports from the western coal-fields in that year were estimated at three and three-quarter million tons, of which as much as two million tons were shipped from Glasgow. Italy was the largest purchaser, taking nearly half a million tons. Belgium imported 325,000 tons, Norway, Spain, Sweden, and the Argentine each over 100,000 tons.[1] The number of workers employed in the industry, both above and below ground, in Scotland is returned at 147,549, and the output per man was 287 tons, as compared with 256 tons for the United Kingdom. The coal-cutting machines in use numbered 876, the majority being electrical. The proportion of the output obtained mechanically was 21·9 per cent. of the whole.

The iron industry of Scotland is less favourably situated than that of England in respect to its supplies of iron ore. During the thirty years before the war Scotland had come to depend to an increasing extent on imported ore. Comparing the average of the period 1882–5 with 1911 the quantity obtained in England had increased slightly, whereas that raised in Scotland had declined by two-thirds.

OUTPUT OF IRON ORE IN THOUSANDS OF TONS[2]

	Scotland	*United Kingdom*
1882–5 (average) . .	2,090	16,744
1891–5 ,, . .	785	12,055
1901–5 ,, . .	821	13,556
1911 . .	689	15,519

In 1913 the local supply had fallen to 591,600 tons, and the ore imported in that year was 1,820,000 tons, of which the amount obtained from Spain exceeded the Scottish supply.

[1] *Report on Prices of Exported Coal, 1914*, No. 242, p. 34.
[2] *Return relating to Iron and Steel, 1911*, No. 402, p. 55.

Out of the total quantity of pig-iron smelted in the United Kingdom 37 per cent. is produced in Cleveland and Durham, and 14 per cent. in Scotland. During the last thirty years the Scottish production increased more rapidly than that of England—the rate of growth of the former being 32 per cent., against 15 per cent. for the latter. The absolute increase during the period was 347,000 tons in Scotland as against 4,093,000 tons in England. In 1913 there were 102 furnaces in Scotland. On the 30th of September of that year there were 85 furnaces in blast, of which 47 were working hematite, 34 forge and foundry, and 4 basic. The output for the year was 1,378,000 tons, one-eighth of that of the United Kingdom. In addition over 600,000 tons of pig-iron were brought from England, 1,039,000 tons consumed in Scotland, and 231,000 tons exported. At the outbreak of war considerable stocks were held by the makers.

The Scottish steel output had not shown the same progress, relatively to that of England, as had been the case with that of pig-iron. Thirty years ago Scotland had produced nearly half the total of that made in the United Kingdom, and before the war its proportion had sunk to less than one-third.

OUTPUT OF OPEN HEARTH STEEL INGOTS

(In thousand tons)

	Scotland	*United Kingdom*
1882–5 (average) . .	212	458
1891–5 ,, . .	472	1,544
1901–5 ,, . .	1,045	3,316
1911 . .	1,257	5,000

The Scottish Steel production was divided as follows in 1913: plates 589,375 tons, sections 230,764 tons, rails, joists and other material (except castings and forgings) 152,513 tons.[1]

The consumption of steel in the Clyde shipyards is very great, and much is required for the numerous types of engineering work which are unrelated to shipbuilding and which flourish

[1] *Evidence Board of Trade Committee on Shipping and Shipbuilding*, March 1919.

in the district. The year 1913 yielded the largest output of ships up to that date. In the number of vessels the Clyde produced one quarter of the total for the Kingdom, one-third of the tonnage and nearly half the indicated horse-power. Both in tonnage and engine power the Clyde exceeded very materially the whole production of Germany, and its indicated horse-power was more than double that of the Tyne.

SHIPBUILDING IN 1913 [1]

(Tonnage and h.p. in thousands)

	Vessels	*Tons*	*I.H.P.*
United Kingdom . .	1,474	2,264	2,261
The Clyde . . .	370	757	1,111
Germany . . .	417	646	776
The Tyne . . .	106	429	522

The tonnage of 1913 consisted of 692,601 tons for the mercantile marine, and of 64,195 for the navy. Of the indicated horse-power three-fifths were for the former and two-fifths for the latter.

In engineering (including the making of engines and electrical engineering) the Census of Production returned the value for Scotland in the year of the census at sixteen millions.[2] Much of this industry is concentrated in the Clyde Valley. In 1911 the number of men returned as employed in engineering and machine making in Lanark and Renfrew amounted to over 78,000. Structural engineering and the making of machinery and locomotives were particularly important. In the last industry 24,000 men were employed in 1913, and again most of these were working in the Clyde Valley. There is a very large export of locomotives to the Colonies and the Argentine. An analysis of the destination of the output for the five years 1895–1900 showed that 36 per cent. was retained in the United Kingdom, 48 per cent. was exported to the Colonies,

[1] *Shipbuilding, Engineering and Commerce Supplement of the Glasgow Herald*, 1913, p. 26.

[2] *Census of Production, Preliminary Tables*, Part II (Cd. 5005), 1910, p. 29.

and 16 per cent. was sent to foreign countries.[1] Railway-carriage and wagon building was returned in 1906 with an output of a million per annum for Scotland—this being one-third of the total for the United Kingdom.

Allusion has already been made to several of the early stages of the chemical industry in the West of Scotland. In its early history this trade was in intimate association with the soap and textile industries, and this connexion remains, but it has been extended to include other branches. In 1876 the soda trade was carried on by the Leblanc process, and in that year about 50,000 tons of soda ash and caustic soda were made. By 1895 more than half the quantity of salt dealt with in alkali works was treated by the ammonia soda process, and after that date alkali making declined in Scotland. In 1913 the quantity of pyrites burned in alkali works was over 137,000 tons, and the bones and phosphates solved more than 63,000 tons.[2] In the West of Scotland chemical works produced sulphuric acid, salt cake, hydrochloric acid, bleaching powder and soda crystals. During some years before the war there was a marked increase in the production of ammonium sulphate. On the other hand there was some contraction in the manufacture of dichromates of potassium and sodium through the starting of new works abroad. Explosives have been manufactured since the sixties by Nobels at five works in the West of Scotland. A comparatively recent addition to the list of chemical products is cyanide, which was made in Glasgow in 1888–9 and very greatly improved by Beilby's process of 1890, which has been in operation on an extensive scale since 1893.[3] According to the Census of Production the number of persons employed in the chemical industries of Scotland was 3,520.[4]

Though the textile industries have not been developed to the extent that seemed possible in the first quarter of the nineteenth century owing to the more favourable prospects of the iron, steel,

[1] *The Organizer*, January 1920, p. 105.
[2] *Fifteenth Report Alkali Works*, no. 369, 1914, p. 148.
[3] *Local Industries of the West of Scotland*, 1901, pp. 161–80.
[4] (Cd. 5162), p. 59.

and shipbuilding industries, they still remain important. The West of Scotland has specialized. Not only is there the thread industry at Paisley, but Turkey red dying, bleaching, the manufacture of plain and art muslins, calico and ginghams, and calico printing are prosecuted in the district. The value of the output of Scottish cotton factories, as far as recorded by the Census of Production, has returned at upwards of two and a half millions and 13,000 persons were employed.[1] The linen and woollen manufactures have died out in the West of Scotland, except in Ayrshire.

The tobacco trade still continues, but it has changed its character. Up to the War of Independence it was chiefly a re-export trade. In the nineteenth century it became definitely established as a manufacturing industry. The Scottish figures are not stated separately in the Census of Production; but on the basis of the number of persons returned by the census of 1911, as employed in the manufacture of tobacco taken in relation to the total employed in the Kingdom, it may perhaps be estimated that the value of the Scottish output before the war was about one million per annum. In 1913 the quantity of unmanufactured tobacco imported into Glasgow was given as 4¼ million lb.. The sugar-refining industry has for long been transferred to Greenock, where the import in 1913 was 4 million cwt. The value assigned to the production of Scottish refineries in the Census of Production was 2¼ millions, which is rather over one-fifth of that of the Kingdom.[2]

The character of the industry of the West of Scotland is based upon an extensive overseas trade, and this trade at the beginning of the twentieth century stood next to shipbuilding in importance. For both of these the improvement of the river was essential. In fact the progress of Glasgow during the last sixty years is closely connected with the improvements of its harbour, and in this connexion it is significant that one half of the total quayage has come into existence in the last twenty years.[3]

[1] (Cd. 4896), p. 20.
[2] *Final Report Census of Production*, Part IV, 1913, pp. 522, 538.
[3] *Glasgow Chamber of Commerce Year Book*, 1915, p. 151.

During the three years 1911–13 the sea-borne trade of London declined by 5 per cent., that of the provincial ports increased by 45 per cent., and Glasgow had its share of this increase. An unusually large proportion of the sea-borne trade of the Clyde is carried in British ships, and finds its destination in the Dominions or British Colonies.[1] The total tonnage trading with ports within the Empire exceeds considerably that sailing to foreign countries.

ARRIVALS AND DEPARTURES OF SHIPS, GLASGOW, 1912 [2]

	Arrived		*Departed*	
	Ships.	*Tons (thousands)*	*Ships.*	*Tons (thousands)*
Foreign countries	1,088	1,735	1,456	2,309
British possessions	1,022	2,022	1,657	3,204

The variety of goods handled at Glasgow harbour is very great. There are over 700 kinds in the classification of the Trustees. The imports are particularly varied. As is to be expected, they fall into two main groups, the one consisting of the food for a dense population which could not be fed from local supplies, and the other of raw materials for the industries of the district. In the former group the cereals imported in 1913 exceeded 550,000 tons, valued at about five millions, while the fruit was valued at three quarters of a million. The most important raw materials were ores, limestone, and pig-iron, which together came to close on $2\frac{1}{4}$ million tons. Amongst the exports coal amounted to nearly 2 million tons, valued at $1\frac{1}{2}$ million. Machinery and manufactured metals amounted in quantity to nearly $\frac{3}{4}$ of a million tons, and in value to over 11 millions, cotton manufactures to $5\frac{1}{4}$ millions, and chemicals to less than 1 million. Linen and jute together (which were produced almost altogether in the east of Scotland) accounted for more than $3\frac{1}{4}$ millions. It seems that the export of spirits nearly equalled in value that of ships, and in some

[1] *Statist*, xcvi, p. 683.

[2] *Statement of Navigation, Shipping*, 1912, p. 139.

recent years has exceeded it, the explanation being that only about one sixth of the tonnage launched was sold to colonial and foreign owners. The export of spirits, like that of jute manufactures, is chiefly a transit trade from parts of the country outside the Clyde area. In the latter district the chief seat of distilleries is at Campbeltown in Kintyre, near the entrance to the Firth of Clyde, and in the neighbouring island of Islay. The total trade of the port of Glasgow in 1913 was over fifty-four millions, of which two-thirds was exports and one-third imports.

OVERSEAS TRADE OF GLASGOW (INCLUDING BOWLING) IN 1913

(In thousands)

Imports	*Quantity*	*Value*	*Exports*	*Quantity*	*Value*
Total imports .	—	18,485	Total exports .	—	35,917
Chief Imports			Chief Exports		
Corn, grain (cwt.)	12,637	5,198	Coal, coke, and manufactured fuel (tons) .	1,989	1,367
Cotton, raw (centals of 100 lb.) .	11	34	Chemicals .	—	826
Fruit (cwt.) .	1,085	739	Cotton manufactures .	—	5,236
Machinery and parts thereof (tons) . .	4	364	Jute . .	—	946
Iron ore (tons) .	1,122	1,078	Machinery (tons)	120	5,016
Tobacco (lb.) .	4,562	159	Linen . .	—	2,786
Wood and timber (loads) . .	303	1,099	Metals manufactured (tons)	590	6,157
			Oil . . .	—	491
			Paper (cwt.) .	538	568
			Ships and boats, new, not registered as British (tonnage) .	134	2,834
			Spirits, British and Irish (gallons)	8,745	2,598

When the Great War came it was necessary to divert the productive capacity of the West of Scotland from the industry of peace towards its part in the prosecution of hostilities. The developments of the last half-century indicated clearly the

manner in which this would be most effective. The Clyde had a long experience in shipbuilding, and also in the construction of warships. Situated as it was on the west with an entrance from the Firth which was easily defended against raids from the sea, while a boom with submarine nets on the upper Firth at Dunoon secured immunity from attack by under-water craft, the shipyards were sufficiently safe to allow of construction proceeding without interruption from the enemy. While less convenient for small or urgent repairs than the yards on the east coast, the Clyde was able to relieve the congestion of the former, and was suitable for all repairs to ships used by the Navy which were not so greatly damaged as to be unable to pass through the Pentland Firth. It was also within easy reach of Scapa Flow. When the mercantile marine suffered from the submarine campaign, the building of this class of vessels was increased. Thus the Navy had priority as regards the productive capacity of the district, and this involved not only claims on the shipyards, but also on the related branches of engineering.

The need for munitions called for all the remaining productive capacity which was not already used by the Navy. The surplus engineering and the heavy iron and steel industries all found a place in this great effort. Moreover, the diversity of the industries of the district provided a valuable reservoir first of trained labour, and later of workers who had some acquaintance with modern industrial processes, while subsequently completely unskilled labour from the rural districts was drawn upon. In the second stage the textile industries (which were depressed during the war) provided workers, as well as the great variety of distributive trades which gradually contracted. Thus, in spite of the claims of recruiting, the supply of labour was fairly adequate when allowance is made for the large amount of female labour which was gradually mobilized, the latter being drawn partly from the women of the district, partly from the Highlands, and other rural districts.

CHAPTER II

THE COAL INDUSTRY

Position of the coal industry on the eve of the war; general effects of the war on the industry; the decline of output and efforts to stimulate production; labour shortage, enlistment, absenteeism, idle days and holidays; mechanical coal-getters; the transport reorganization scheme and its effects; exports and export policy; the supply of coal to industries and to the domestic consumer; prices and price policy; labour; the condition of the industry at the end of the war.

THE pre-war position of the coal industry of Scotland, described in the previous chapter, is summarized in the following table:

YEAR 1913

	United Kingdom	*Scotland*		
		Total	*West*	*East*
Output (tons) . . .	287,412,000	42,457,000	25,449,000	17,008,000
Numbers employed				
Underground . .	903,800	118,967	—	—
Above ground . .	218,900	28,573	—	—
Total . . .	1,122,700	147,540	—	—
Output per worker (tons) .	256	287	—	—
Shipments (tons) . .	97,000,000	16,550,000	5,500,000	11,050,000
Exports to British possessions and foreign countries (tons) . . .	73,400,000	10,437,000	2,184,000	8,253,000

In view of the events of the war period it is significant that the Scottish output had already declined relatively to that of the United Kingdom in the ten preceding years, the production of the latter having advanced during that period by 23·6 per cent., that of Scotland by only 19·7 per cent. During these ten years, also, the output per worker fell in the case

of the United Kingdom by 7·3 per cent., in the case of Scotland by 8·5 per cent. In foreign markets, in spite of the competition of English, Welsh and continental coal, with their higher carbon content and consequently higher calorific value, Scotland was increasing her hold; Scottish exports to foreign countries and British possessions having risen from 6,126,000 tons (17·2 per cent. of output) in 1904, to 10,437,000 tons (24·5 per cent. of output) in 1913. The bulk of this work was done by the east coast ports, whose exports in 1913 amounted to 8,253,000 tons as against 2,184,000 tons from the west coast ports. Both the east and the west ports sent coal to Europe, but while the former supplied chiefly the northern European countries, the latter had more business with the Mediterranean, and did in addition a considerable trade with South and Central America.[1]

The outbreak of war resulted immediately in two difficulties which threatened international trade. The first, the financial difficulty, was speedily overcome; the second, the scarcity of tonnage, continued to a varying degree right through the war period and increased with the intensification of the submarine warfare. The tonnage scarcity affected all industries; in the case of coal, depending as it did as to one quarter of its output on foreign markets, this scarcity caused an amount of idleness at the pits which was serious, but which would have been worse but for the enlistment of large numbers of miners and the increased demand at home for industrial coal consequent on the pressure in other industries. The full advantage of the latter fact, however, failed to reach the mines on account of the scarcity of means of transport, with the result that 'the output of the collieries has, at any rate since the middle of 1915 . . . been in excess of the transport—sea and land—necessary for its conveyance'.[2]

The effects on the Scottish trade are given in statistical detail in the appendix.[3] The total Scottish production fell from 42 million tons in 1913 to less than 32 million tons in 1918.[4]

[1] See Appendix III, p. 196.
[2] *Glasgow Herald Supplement*, 1917, p. 43.
[3] Appendices II–V, pp. 195 ff.
[4] Appendix V, p. 197.

The decline was relatively greater in the east than in the west. Scottish exports fell from 10,437,000 tons in 1913 to 8,378,000 tons in 1914, and thereafter continuously till 1918 when the small total of 2,412,000 tons was reached. This was followed by a slight recovery in the first post-war year, but the figure fell away again to 1,336,000 tons in 1920.[1] The importance of the east and west coast ports as regards exports was reversed; in 1917 and 1918 the east coast was exporting less than the west; and the destinations to which the coal was sent had been greatly changed.[2]

A mere statistical review, however, fails to bring out the varying nature of the problems which had to be faced from time to time. What was required was that in spite of increasing difficulties there should be maintained, at reasonable prices, a steady supply of coal for the domestic use of the inhabitants of the Clyde Valley, for industries on which the prosecution of the war depended, and for the increasing needs of the Allies. Conditions arose, however, in the course of the war which complicated the issue. Political, military, and diplomatic no less than commercial and industrial considerations determined export policy. In production, military and economic objects frequently conflicted. And, by gradual stages the control of the industry passed from the hands of the owners into those of the State, so that the degree of responsibility left with the coal-masters was ultimately slight.

After the stagnation of the first few weeks, which affected coal as it affected all other industries, the first problem was that of an increasing demand for coal, accompanied by an increasing difficulty of supplying it. It is true that the demand from Germany (which took 2,900,000 tons of Scottish coal in 1913) was cut off, and that access to Russia (which bought 850,000 tons in 1913) became impossible except by Archangel which is closed for seven months out of the twelve. To this extent pressure on our coal-fields was relieved. But demand was increased by the fact that the coal-fields of Belgium and northern France were damaged or came into enemy hands at an

[1] Appendix III, p. 196. [2] Appendix IV, p. 196.

early stage. Again Germany, formerly a considerable exporter,[1] was no longer a competitor, and the Scottish fields had to contribute towards meeting the deficit. Internally the increasing pressure of business in the iron and steel industries intensified the demand. Difficulties of supply at the same time began to emerge, and the falling output gave rise in Scotland as in England to apprehension of a serious shortage and to attempts to meet the problem by legislative and other measures.

The actual decline in output in the months immediately following the outbreak of war was in Scotland as follows :[2]

For August 1914, a loss of 422,981 tons as compared with August 1913.							
Sept.	„	„	619,781	„	„	Sept.	„
Oct.	„	„	679,597	„	„	Oct.	„
Nov.	„	„	477,598	„	„	Nov.	„
Dec.	„	„	640,326	„	„	Dec.	„
Jan.	1915	„	569,776	„	„	Jan.	1914.
Feb.	„	„	520,703	„	„	Feb.	„
March	„	„	445,085	„	„	March	„
April	„	„	616,525	„	„	April	„
May	„	„	439,283	„	„	May	„
June	„	„	563,005	„	„	June	„
July	„	„	101,948	„	„	July	„

The situation which had thus emerged was considered by a Departmental Committee appointed to inquire into the conditions prevailing in the coal industry due to the war, which issued three reports.[3] In the returns received by that committee from one hundred and forty-nine Scottish owners, representing some 89 per cent. of the industry, the fall in output was attributed (according to the first report) to a number of causes summarized as follows :

'(1) Enlistment of (*a*) face-workers, 114 owners ; (*b*) haulage hands and other underground workers, 99 owners ; (*c*) surface hands engaged in manipulating coal, 59 owners ; (2) shortage of railway

[1] In 1913 the exports of Germany to certain European markets were as follows : To Sweden, 170,000 tons ; Norway, 20,000 tons ; Denmark, 220,000 tons ; Holland, 7,200,000 tons ; Italy, 900,000 tons.

[2] Calculated from returns in Cd. 8147, *Second Report on Conditions in Coal Mining due to the War.*

[3] Cd. 7939, 1915 ; Cd. 8147 and Cd. 8345, 1916, *Reports on Conditions in Coal Mining due to the War.*

wagons, difficulties in transport, shipping, &c., 46 owners; (3) other causes: absenteeism, 15 owners; restricted shipping facilities (Leith dock strike and closing of ports), 12 owners; scarcity of labour, 11 owners; inferior workmen, 8 owners; men leaving for more remunerative work, 3 owners; drink, 2 owners; bad trade, 2 owners; bad weather, 1 owner; closing of German markets, 1 owner; shortage of prop wood, 1 owner; holidays taken in July and August, 1 owner; local causes (exhaustion of seams, &c.), 15 owners.' [1]

The two difficulties which attracted most attention were, therefore, scarcity of labour and lack of means of transport. In the case of the former, the loss of mining labour through enlistment was in the early months the main cause of falling output. By February 1915, 21·4 per cent. of the Scottish miners had joined the colours; and by August 1915, 26·8 per cent. The following table shows in descending order the percentage of enlistments in the various Scottish districts:

	District	*No. employed July 1914*	*No. enlisted by Feb. 1915*	*Percentage*	*No. enlisted by Aug. 1915*	*Percentage*
East Coast Fields	Haddington	3,518	1,088	30·9	1,231	36·5
	Edinburgh	10,759	2,916	27·1	3,581	34·3
	Fife, Kinross, and Clackmannan	31,530	8,695	24·3	10,126	32·1
West Coast Fields	Argyll, Dumbarton, Dumfries, and Renfrew	4,176			1,200	28·7
	Stirling	10,535	1,976	18·8	2,534	25·1
	Lanark	52,676	10,166	19·3	12,815	23·7
	Linlithgow	6,219	1,206	19·4	1,437	22·2
	Ayr	14,220	2,366	16·6	2,962	20·9
	Scotland	133,633	28,413	21·4	35,886	26·8

The greater loss of men through enlistment in the east than in the west is attributable to some extent to the lack of opportunity of export, on which the east so much depended; in the west the local industrial demand kept the mines going. But the whole of Scotland suffered a greater depletion of miners through

[1] Cd. 7939, 1915, p. 29.

this cause than any other part of the United Kingdom, during the first year of the war; the percentage for August 1915 being: Scotland, 26·8 per cent.; England, 22·9 per cent.; Wales, 22·5 per cent.; Ireland, 2·6 per cent.

The loss was in some degree compensated by the influx of labour from other sources, which went on concurrently with enlistment. In this way, 13,800 workers had joined the industry in Scotland between August 1914 and August 1915, making the net diminution at the end of the period 16·5 per cent. But in comparing output with numbers employed it must be borne in mind that the majority of those who joined the colours were actual coal-getters, and other underground workers,[1] and that those who replaced them, being oncost workers, or inexperienced hands, were seldom so efficient.

A comparison of output with number of workers yields the somewhat surprising result that instead of a progressive decline in output as enlistment increased, the fall in output was greatest in the first few months, and became less as the year advanced, until, in July 1915, when the reduction in numbers was greatest, the loss of output was least. For the whole year, August 1914 to August 1915, the loss of output as compared with the preceding year was 15 per cent. During the first six months of the period, the average monthly loss was 568,343 tons; during the second six months, 447,758 tons. The explanation is that the early stagnation was due to other causes than the enlistment of miners, and that as adjustment to new conditions took place, the rate of production returned more nearly to the normal. Indeed for the whole year 1915, the output per miner rose to a higher level than it had reached in 1913, being 291 tons as compared with 287 in the former year.

The improvement may be attributed to several causes. In the first place in mines which were formerly over-staffed a diminution in the numbers of underground workers did not mean a proportionate reduction in the output of coal. Beyond a point, an increase in such workers means diminishing returns, for the coal-getters have to wait for trucks to get their coal

[1] See Appendix V, p. 197.

dispatched. Again, the loss of workers led to the concentration of the remaining labour on the actual work of coal-getting; development and experiment were postponed, and labour was withdrawn from extensions which had already begun. Lastly, to some slight extent the attempt was made to compensate for the loss of labour by the use of mechanical coal-getters, although this cause added but little to the tonnage raised. Of the total output 23·5 per cent. was cut by machinery in 1914, and 24·3 per cent. in 1915 as compared with 21·9 per cent. in 1913.

The net result, therefore, was an increase in the production of coal per worker in 1915 as compared with the last pre-war year; but at the same time a considerable drop in the total output. To prevent further loss of labour power, therefore, and to make greater use of that which was available, attention was directed to three questions, recruiting, absenteeism, and idle days and holidays.

The policy with regard to recruiting was the same as that which was adopted for the rest of Great Britain, and need not, therefore, be described in detail. It varied with the changing military situation. The large number of enlistments led in November 1915 to the decision that all underground workers and certain classes of surface workers should be regarded as 'barred' classes, permitted to attest, but not to leave the pits till called upon. In 1916 after the passing of the Military Service Act, Recruiting Courts were formed in the several colliery districts, to deal with the enlistment of workers. Working under the direction of the Central Colliery Recruiting Court, the district courts exempted practically all the 'barred' classes and a very considerable proportion of the unbarred classes. In June 1916 it was decided to prohibit any further enlistment of miners, and moreover to recall all those in the ranks of home service units, who were unfit for foreign service, as well as such others as had entered the home service units after August 1st, 1915. Finally, in 1918 under the new 'combing-out' scheme, Scotland lost some 6,000 or 7,000 miners as her share of the extra 50,000 called up to meet the greater military needs of the

time. The effect of this fluctuating policy, so far as the numbers of workers was concerned, can be traced in the table given in the appendix.[1] The greatest withdrawal of workers from the Scottish mines had taken place by 1915, when the reduction as compared with 1913 was 17 per cent. (made up of 19 per cent. of the underground workers and 10 per cent. of the surface workers). The reduction was cut down to 12 per cent. in 1917, but rose again to 16 per cent. in 1918. But after 1915 the rate of output per worker dropped regularly, being 284 tons in 1916, 263 in 1917, and 256 in 1918 (which, however, be it noticed, was equal to the general average for the United Kingdom in 1913). In the post-war period the same tendency continued to operate.

In addition to the policy of retaining as many workers as possible for the pits, attention was also directed to the problem of securing a greater measure of regularity on the part of the workers. The facts of absenteeism varied from district to district; they were affected by custom, by the conditions of work and the number of regular holidays, as well as by the general character of the workers. In Scotland absenteeism was less than in England and Wales. For the period July 1914 to February 1915, the shifts lost for all workers above and below ground in Scotland amounted to 6·20 per cent. of the total which could have been worked. This compares with an absenteeism for the whole of the United Kingdom of 9·8 per cent. for the same period. It was estimated that 5 per cent. of this, being due to accident, sickness, &c., was unavoidable.[2] Efforts to reduce the avoidable loss in the first instance took the form of exhortation. Later they took on a remote semblance to an application of the principle of self-government; absentee committees were formed throughout the country composed partly of miners, and in their hands was left the duty of bringing about a reduction of absenteeism. The timidity of the approach to the democratic principle may account for the lack of apparent improvement. At any rate the increase in regularity shown in the following table is slight.[3]

[1] p. 197. [2] Cd. 8345, 1916, p. 5. [3] Cd. 8345, 1916, p. 6.

SHIFTS LOST AS A PERCENTAGE OF POSSIBLE WORKING SHIFTS

	United Kingdom		*Scotland*	
	1914–15	*1915–16*	*1914–15*	*1915–16*
December . .	9·5	9·8	5·9	5·9
January . .	9·9	9·8	6·8	7·1
February . .	10·3	9·9	6·2	5·9
March . . .	10·2	9·8	6·3	6·1
	10	9·9	6·3	6·2

It may be a matter of causal relation that in Scotland, which shows the smaller percentage of absenteeism, the working week of the miner is on the whole shorter than in England. Up to 1915 the Lanarkshire miners generally had ten working days and two idle days in the fortnight; whereas in the rest of Scotland and in England the usual custom was to have one idle day and eleven full working days in the fortnight. In 1915 the Lanarkshire miners yielded to representations so far as to concede the extra day, and throughout the rest of Scotland it was agreed to work on the fortnightly idle day if the mines were closed on any of the usual working days in the fortnight.

The above efforts at reducing the fall in output cannot be said to have met with any outstanding success. Both total output and production per worker continued to decline with little intermission. The failure to respond was in part attributable to the human factor in the person of the miner; but to accuse the miner in general of lack of patriotism is to be blind to his military record. The cause was partly psychological, the result of the growing dissatisfaction with the conditions of the industry which had already operated in the same direction before the war, and which was to lead to the greater conflicts of the post-war period. But in part also it was the natural result of the dilution of efficient miners with large numbers of inexperienced workers. On the other hand other factors operated besides the human. As the war proceeded many pits fell into considerable disrepair, pit timber was lacking, there was

a scarcity of tubs and trucks at the mines, and a scarcity of wagons and transport facilities generally throughout the country. It might have been expected that an attempt would be made to check the decline by the introduction in greater numbers of mechanical coal-getters. Before the war, the use of such appliances was more general in Scotland than in England, but it was limited by the belief that they were uneconomical in the case of thick seams which require a relatively smaller amount of cutting to free a certain quantity of coal. It can be readily understood, therefore, that in normal times there was in most cases little inducement to the extended application of mechanical power whether by means of electricity or of compressed air ;[1] and in 1913, machines were used in only 25 per cent. of the mines of the United Kingdom, and in these only partially. During the war, however, questions of economy and remunerative working had to give way to questions of maximum output of coal, and but for the great difficulty in getting machines delivered their application would have been much more common than it was. Actually, the number of coal-cutting machines used in Scotland increased from 876 in 1913 to 913 in 1914, and to 1,081 in 1918.[2] During the period, electrical machines gained on those which made use of compressed air, and the amount of mineral cut by the latter fell from 1,608,000 tons in 1913 to 909,000 tons in 1918 ; while by the former it increased from 7,727,000 tons to 9,293,000 tons. Altogether, the total amount of coal mechanically cut increased slightly in absolute amount—from 9,335,000 tons in 1913 to 10,202,000 tons in 1918 ; but this meant an increase in the percentage of total output from 21·9 to 31·9.[3] Unfortunately, much of the advantage derived from the use of mechanical cutters was lost, in 1915 and 1916, by the decline in the use of mechanical conveyors, the number of which fell from 128 in 1914 to 102 in 1916.

Reference has been made to the lack of transport facilities

[1] But the restriction does not seem to apply in the United States, where machinery is used in seams of any thickness, and where, in 1913, 50 per cent. of output was mechanically cut, as against 8 per cent. in the United Kingdom.

[2] *Report of Chief Inspector of Mines*, Part I (Cmd. 339), 1919, p. 20.

[3] Cf. *Statist*, xciv, p. 728.

as one of the factors in the decline of output. Locomotives and railway stock had been sent by the railway companies to France; wagons had fallen into considerable disrepair, and labour was lacking to keep them fit for use. Partly from these causes, partly from the increase in military and industrial traffic, there was bad congestion on the railways, and by 1917 it was seen that in the interests of coal production some change of policy would be necessary.

Wagons for transport of coal are sometimes owned by collieries and merchants, sometimes[1] (as in the case of some Scottish Railway Companies) by the railways, which include wagon hire in the railway rate for coal. The economic disadvantage in private ownership by collieries and merchants is that frequently the wagons perform their return journey empty; but it has the advantage that, since the wagons are confined to routine journeys, the necessary repairs can be speedily affected. When the scarcity became obvious, representations were made to the railway companies and to private merchants to pool their wagons. The Scottish railway companies agreed; but the merchants and collieries considered the scheme impracticable. A compromise, however, was affected by which after September, 1917, collieries could put to other uses any wagons belonging to a private merchant in excess of those necessary for the quantity of coal to which he was entitled. This arrangement, along with heavy penalties on demurrage, relieved the congestion.

A more ambitious programme was the complete reorganization of the railway transport of coal. The scheme was brought into operation in July 1917 by an Order of the Board of Trade made under Regulations 2F to 2JJ and 9G of the Defence of the Realm Regulations. The Order was issued with a view to avoiding the long journeys which coal frequently travelled between the mine and the ultimate consumer (for example from Northumberland and Cumberland to Scotland), and reducing the consequent cross-traffic. It applied only to inland-borne coal for steam, manufacturing, gas, cooking and domestic

[1] *The Coal Industry Commission Report*, vol. i (Cmd. 359), Evidence of Mr. Frank Tatlow, Qq. 2764–6.

consumption; and affected neither water-borne coal (whether coast-wise or for export or bunkers) nor anthracite or coke of any description. Directions were issued under Section 3 of the Order, dividing Great Britain into twenty areas of production. The general aim was to make each of these areas self-sufficing as far as possible, but movement between certain areas was allowed for certain purposes without special permit. Scotland was divided into four areas, numbered 17 to 20. Area 17 comprised the south-eastern counties (the Lothians); 18 the north-western (Lanark); 19 the north-eastern (Fife); and 20 the south-western (Ayr). The following table shows the movements of coal permitted as between these areas.

AREAS TO WHICH THE FORWARDING OF COAL BY PUBLIC RAILWAY FOR INLAND CONSUMPTION WAS CONFINED BY THE DIRECTIONS

	Area of Production		
Scotland	*Steam and manufacturing*	*Gas and coking*	*House*
No. 17. South-eastern . . .	17	17	17
No. 18. North-western . . .	18	18	18
No. 19. North-eastern . . .	17, 18, 19	19	17, 18, 19
No. 20. South-western . . .	18, 20	20	20

For these four Scottish areas the Scottish District Coal and Coke Supplies Committee (formed in February, 1916) was responsible, giving instructions for the disposal of coal, and notifying each colliery owner in its area of the factors, merchants and direct consumers to whom coal was to be supplied after 8th September 1917, and of the descriptions and quantities to be supplied to each. It lay with the Coal and Coke Supplies Committee to clear up any doubtful points that might arise through the operation of the scheme.

The general object being to relieve transport, the scheme was based on four main principles:[1] that consumption of coal should take place as near the point of production as possible; that in view of the superior facilities afforded by the main

[1] *Coal Transport Reorganization Scheme*, explanatory Mem., p. 9.

trunk lines, the movement of coal should follow those routes as nearly as possible; that it should go, when possible, in well-defined directions, such as from north to south, east to west; and that an area producing less coal than sufficed for its own needs should not send any of its output to other areas, while one producing more than it required should distribute the balance only to adjacent or convenient areas. It was estimated that by the operation of the scheme some forty-two million tons of coal would be carried much shorter distances than formerly,[1] and that a saving in railway transport would be effected to the extent of 700 million ton-miles annually.

The net effect of the scheme in the way of transport economy was never completely estimated; but a statement was compiled by one Scottish Railway Company in January 1918, showing the effect on the traffic of that company during the month of October 1917 as compared with October 1916.[2] The net result in the case of that company was that the average distance which each ton of coal was carried dropped from 25·12 to 22·50 miles, a decrease of 2·62; which meant a saving of 2,675,600 ton-miles in the single month. As the average tonnage carried in each wagon on that line was eight tons, the saving in wagon-miles effected in the period of one month was 334,450. On the basis of a constant coal traffic throughout the year, the saving for this single company works out at over

[1] For example, in June 1917, before the issue of the order, cross transport of coal took place in Scotland as follows (*Munitions Archives, Glasgow Area Records*, Parcel 9: 8394/2):

Area	*Forwarded to prohibited areas*	*Imported into the area*
	Tons	*Tons*
No. 17	53,749	63,772
No. 18	137,191	95,760
No. 19	37,577	65,785
No. 20	46,081	35,592
	274,598	260,909
Less cross traffic with England	22,238	8,549
	252,360	252,360

[2] *Munitions Archives, Glasgow Area Records.*

thirty million ton-miles and about four million wagon-miles per annum.

The scheme at its inception had to withstand a considerable amount of adverse criticism. Some annoyance was necessarily caused by the unavoidable friction incident on a system worked out at a time of great pressure. Certain firms complained that under the scheme they had to get their coal from much greater distances than formerly; a fact undoubtedly true, but not affecting the saving of transport on the whole. More legitimate criticism came from certain gas companies who could not with the coal they were compelled to take maintain their output of the by-products, char and sulphate of ammonia, or whose retorts, suited for nuts, could not accommodate the round coal. In some of these cases slight adjustments made the scheme workable; in others permits were granted for coal to be received from a prohibited area.

While the endeavour was being made to maintain production at something like the pre-war figure, the necessity of allocating the given output to its most urgent uses was not forgotten. For the ordinary consumer and as the basis of industries essential to the prosecution of the war, coal was of course urgently required at home; but export could not be entirely neglected, partly for the commercial reason that coal, which in 1913 formed nearly 10 per cent.[1] of the exports of United Kingdom produce, was the most important article of exchange for the food and war produce of foreign countries; and partly for the political reason that our Allies depended on us more and more for their supplies of fuel. The case of the domestic consumer was never the most urgent; but as between home industries and export to Allies, policy changed with changing conditions. The natural difficulties of transport would in any case have reduced exports, but the greater part of the reduction was deliberate, and dictated by the necessity of maintaining home industrial supplies. As regards destinations there are evidences

[1] In 1913 the value of coal, coke, and manufactured fuel exported was £53,659,660 and of all U. K. produce £525,245,289. *Statistical Abstr. U. K.* (Cmd. 1246), 1921, pp. 202 and 219.

that in the early stages the principle of selection was that of preventing the coal reaching enemy countries; but after the first period of suspicion had passed, export policy was dictated more and more by the need of economizing in transport, and of getting return cargoes in exchange for coal.[1]

At first control of export was exercised by means of the customs regulations, considerably stiffened. In May 1915, by an Order in Council, Government assumed power to prohibit the export of coal to neutral countries, and from then onwards no coal could be shipped without the consent of the War Committee of the Board of Trade. Licences for export were issued by the Coal Exports Committee which later came under the Coal Controller's Department and added to its work the regulation of the export prices of coal in its various grades and qualities.

The system of licences may be said to have worked as well as could be expected. Criticism in trade circles was directed not so much against the principle, which was held to be just, as against what was stated to be the inefficiency of administration. But as the trade became accustomed to the new system, the procuring of the necessary licences became a part of the regular routine. Nevertheless the alternate grant and refusal of licences to particular countries, inevitable as it was, and dictated as we have seen by varying conditions, was trying; as it led to alternate periods of slackness and pressure at the pits and in the industries dependent on coal.

Regulation of export prices did not commence till 1916. Meantime, in July 1915, the Price of Coal (Limitation) Act limited the price of coal for home consumers to 4*s*. a ton in excess of the price in the corresponding month of the year ended July 1914. As a result the export trade became suddenly more remunerative, giving a premium to pits whose output was chiefly for export; and since at this time licences for export to our Allies were procurable without difficulty, prices soared, and freights became correspondingly high. France and Italy

[1] e. g., Order issued April 1916, that shipments to Norway, Sweden, and Denmark be subject to return cargoes being arranged.

protested, and in May 1916 the Board of Trade brought the case of France before coal owners and shippers, and maximum rates and freights were drawn up to be effective from 1st June 1916. French orders were to come through Paris, and to be dealt with by the District Coal and Coke Supplies Committees, which undertook the distribution of the orders among the owners, the supervision of their execution and the arrangements for shipping. Five months later, similar arrangements were made in the case of Italy. The resulting restrictions on rates and freights continued in the case of France and Italy till May 1919. In June 1917 there was issued by the Coal Controller the first general schedule of coal export prices, which in the case of Scotland ran as follows :

		s.
Lanarkshire	best splint	30 per ton.
,,	best ell coal	28 ,,
,,	first navigation	30 ,,
Fifeshire	first-class steam	28 ,,
,,	third-class steam	24 ,,
,,	first navigation	31 ,,

All f.o.b. at nearest port.

These prices were to be taken as fixed in the case of France and Italy and as minima in the case of neutral countries. From time to time the schedule was modified. Ultimately in May 1919 the maxima became minima and the schedule was divided into two parts, Schedule A and B, applicable respectively to France and Italy on the one hand, and to neutrals on the other. The two schedules were as follows :

MINIMUM PRICES OF COAL

		Schedule A France and Italy	*Schedule B Neutral Countries*
		s. per ton	*s. per ton*
Lanarkshire	best splint	37	70
	best ell	35	63
	first navigation	37	70
Fifeshire	first-class steam	35	70
	third-class steam	31	60
	first navigation	38	70

All f.o.b. at nearest port.

This differentiation in price as between Allies and neutrals would have been impossible apart from control of export. But as the general control of the industry was stiffened, the destination of supplies was more carefully scanned; priority was given in the order named to Government needs, home markets, allied markets, coaling stations, and neutral countries; and the whole of the work of allocation, under the general direction of head-quarters in London, was handed over, in the case of Scotland, to the Scottish Coal and Coke Supplies Committee sitting in Glasgow, and containing representatives of the four main divisions of the Scottish coal-fields, Fifeshire, the Lothians, Lanarkshire, and Ayrshire. The work of this authority would probably have been as useful and less unpopular but for the frequent overruling of its decisions by the London authority.

The reduction of exports and the control of destinations affected differently the various coal-fields of Scotland. On the whole the west suffered less inconvenience and less interference with its normal course of trade than the east. This was due to the greater dependence of the east on export, and in part to the difference in the normal destinations of the coal from the east and the west respectively. Further, the coal from the east fields was chiefly steam and navigation, and in the ten years before the war the semi-anthracite mined in Fifeshire had gained considerable esteem in Scandinavia and other Continental markets convenient to the east coast of Scotland but now shut off by war exigencies. West-coast coal, on the other hand, was chiefly industrial; the splint variety, being hard, rich in chemicals, free from phosphorus, and with a high percentage of volatile matter, was in demand for blast furnaces, and was used in the iron and steel industries at home, and shipped to France and Italy for similar purposes, as well as to Spain for use in factories and to Central and South America for commercial purposes. The destinations of the coal from the east-coast ports were, therefore, in the first instance subject to the strictest scrutiny of the Customs officials, and, under the later allocation system, held the lowest place in the scheme of priority. To these difficulties must be added the dangers of the

North Sea, from which the west coast was free, the closing of the Forth ports, and the necessary restriction of the work on the east-coast ports to the hours of daylight. As a result, east-coast shipments fell continuously from 8,253,000 tons in 1913 to 910,000 tons in 1917. As regards destination, the east-coast trade with the northern European countries had fallen by 1914 from seven million to five million tons, and by 1915 to three millions. Its trade with the Mediterranean declined from just over one million tons in 1913 to 972,000 in 1914, and to just over 640,000 in 1915. The unimportant trade with West and South Africa in 1914 was cut off altogether in 1915, and in the same year the South American trade had all but disappeared.

The west coast fared by no means so badly. Indeed up to 1915 exports of coal from the west continued to rise above the pre-war figure, a fact due to the greater immunity of its traffic from the dangers of war, to its greater distance from the war area, the less need of such precautions as were necessary in the east coast, and the consequent lower freights for coal transport. Besides, its chief markets in Europe lay round the less dangerous Mediterranean, and it was little affected by the early restrictions against exports to Scandinavian countries. Later, when priority as well as price preference was given to France and Italy, the west again benefited, as these were two of her customary markets. Thus what the west lost in the first two years of war in its trade with the northern European countries it more than gained in exports to the Mediterranean group. To the former, between 1913 and 1915 exports fell from 476,000 tons to 110,400 tons; to the latter they rose from 1,400,000 to 2,400,000 tons. During the same period the west coast exports to North, South, and Central America only showed a slight decline. The general result was an increase in west coast coal exports from 2,184,174 tons in 1914 to 2,724,005 in 1915. In the later years of the war, the west also suffered like the east from the submarine warfare and the scarcity of tonnage, and by 1918, exports from the west were down to 1,213,000 tons.

These facts might have been expected to divert a con-

siderable amount of coal from the Lothians and Fife to the west, either for home use or for export. In the early stages such cross transport took place; Fife coal was sent through, as early as December 1914, to Glasgow and other west-coast ports for shipment. But the transport became increasingly difficult; and the scarcity of wagons led to congestion on the railways, long delays, and high demurrage charges. And the transport reorganization scheme, great as were its advantages in other directions, did nothing to ease the situation. It cut off Fife and Lothian coal from the western markets, and on several occasions it was reported that surplus coal of certain grades, urgently required in the west, lay in thousands of tons in trucks in the east.

The net effect of the export restrictions as regards the war period was that up to and including 1916 Scotland maintained her place relatively to England in the export of coal, being responsible for about one-seventh of the whole; but from 1917 onwards she rapidly lost her position, contributing in that year only $2\frac{1}{2}$ millions out of 35 million tons, and in 1920 only $1\frac{1}{3}$ million out of about 25 million tons. Secondly, the east coast of Scotland began to lose its relative superiority over the west immediately on the outbreak of war; and by 1917 was contributing actually less than the west (910,000 tons against 1,564,000). With the end of the war and the passing away of the difficulties directly connected with it, the east began to recover its position, and in 1920 was contributing 1,227,000 tons against 109,000 tons from the west. The following table shows for east and west respectively the percentage proportion of home and export trade to total output:

	1913		*1914*		*1915*		*1916*		*1917*		*1918*	
	Home	*Export*	*H.*	*E.*	*H.*	*E.*	*H.*	*E.*	*H.*	*E.*	*H.*	*E.*
	%	%	%	%	%	%	%	%	%	%	%	%
West	92	8	91	9	88	12	91	9	93	7	94	6
East	48	52	58	42	71	29	76	24	92	8	89	11

The result of the export policy was to leave for other purposes in Scotland a quantity which remained fairly constant throughout the war in spite of the declining output. The difference, in the case of Scotland, between total output and total exports to foreign countries and British possessions was for the several years as follows: 1913, 32,020,000 tons; 1914, 30,470,000 tons; 1915, 29,025,000 tons; 1916, 30,892,000 tons; 1917, 31,772,000 tons; and 1918, 29,481,000 tons. These remaining quantities had to be distributed between bunkers, the Admiralty, the domestic consumer, and industries. The most pressing case, apart from the Admiralty, was that of the industries, and everything was done to meet their needs. After the first period of stagnation, the iron and steel and shipbuilding trades adjusted themselves to the new conditions, and there was a great increase in the demand for 'splint', washed doubles and singles, and washed pearls. In the Clyde Valley the need for manufacturing fuel soon became pressing, and by the beginning of 1915 large quantities of 'smalls' were being sent from Fife and the Lothians. The increasing difficulties of shipping, however, eased the home situation, but not before prices had risen considerably above the pre-war figure. In 1916 heavy shipments of splint and of smalls in the early months led to scarcity for home industries, and to a curtailment of licences. Similar variations took place throughout the four years; but on the whole industries were well supplied, and but for the transport difficulties, would have suffered little disturbance through lack of coal. In particular localities during the first two years there was a scarcity of special kinds of fuel. Lanarkshire, for example, had to get large quantities from other districts; but by 1917 the reduction in shipping had considerably eased the situation, although from time to time after the introduction of the new transport scheme permits had to be granted for the import of special kinds of fuel, from prohibited areas, owing to a temporary scarcity in Lanarkshire.

Lack of coal, however, proved a real handicap in the attempt made in 1917 to increase materially the output of pig-

iron in Scotland. Scotch blast furnaces, owing to the scarcity of good coking coal in the Scottish mines, are run mainly on so-called ' splint ' coal, a term given to apply to any hard coal. It was estimated [1] that the average amount of fuel consumed per blast furnace in Scotland was 504 tons weekly, made up of 400 tons ' splint ' coal, 80 tons of furnace coke and 24 tons of gas char (proportions which, owing to the inability of splint to support a heavy charge in the process of smelting, set a limit to the maximum capacity of the Scotch furnace). For the eighty-six furnaces in blast in December 1916 therefore the quantity of ' splint ' required was 34,000 tons per week. To meet the needs of the 119 furnaces which would be necessary to produce sufficient pig-iron for the increased steel producing capacity of Scotland other 13,300 tons of ' splint ' per week or 52,400 tons per month would have been necessary. But the total quantity of ' splint ' dispatched from the Scottish collieries in December 1916 was only 317,446 tons (298,343 from Lanark and Ayr, and 19,103 from Fife and the Lothians). Of this, 30,495 tons were exported, and 135,037 used in other industries and for household consumption. The quantity for the latter purpose could not be greatly reduced without infringing on other equally essential industries ; and therefore, even if all export were stopped, the required quantity of pig-iron would not have been forthcoming. Only increased production of ' splint ' from the Fife pits [2] along with good transport to the western furnaces would have met the difficulty.

A similar difficulty existed in the case of coke. Good coking coal is found only in small areas in Scotland, and there in small quantities. The average weekly output of coke in December 1916 was 10,263 tons, of which 2 per cent. was produced in beehive ovens and the remainder in by-product ovens. The maximum weekly output from the working ovens was estimated at 11,000 tons, which could be increased by 1,500 tons a week by using some idle ovens. Of the existing production 30 per cent. was used for other purposes and for export. For the additional

[1] *Report on Pig Iron Production in Scotland,* 1917.
[2] Lanark ' splint ' is going soft.

blast furnaces required to meet the pig-iron demand, therefore, an additional 2,500 tons of coke per week would have been required or an additional output of 8,000 tons per week of coking coal. Thus the reduced output of 'splint' and coking coal prevented the maximum utilization of the increased steel producing capacity in Scotland.

The domestic consumer of coal remained nominally free from rationing during practically the whole of the war period; but the scarcity of coal combined with the limitation of price for inland consumption restricted his supplies. By 1917 a campaign of voluntary economy had been started, and in October 1918 the Household Fuel and Lighting Order made general throughout the country the restriction of household coal consumption which had been introduced in London as early as 1917. The Scottish Coal and Coke Supplies Committee allocated supplies, and the Local Fuel Overseers, acting under the local authorities, dealt with permits to individual consumers. In the last seventeen weeks of 1917 the average weekly amount of coal for domestic consumption passed to Glasgow by the Coal Supplies Committee was 19,000 tons.[1] The price of this coal was fixed in the first instance by the Price of Coal (Limitation) Act of July 1915 at 4*s.* in excess of the price in the corresponding month of 1913–14; this was later raised to 6*s.* 6*d.*, and ultimately by 1918 prices were about 10*s.* 6*d.* per ton above pre-war prices. Householders, however, represented that they were not getting the benefit of the Act, owing to the fallacious belief of merchants and middlemen that they did not come under its provisions; consequently the 1915 legislation was supplemented by the limitation of factors' profits under the Wholesale Coal Prices Order, and of retail prices at dépôts by the local authorities under the Household and Lighting Order. In the West of Scotland the profits of middlemen and merchants were thus limited to 1*s.* 6*d.* a ton except in the case of small merchants with less than 1,500 tons annual turnover, who in addition to the 1*s.* 6*d.* were allowed what was equivalent to the wage of a foreman carter.

[1] *Munitions Archives, Glasgow Area Munition Records.*

During the war period the relations of labour and capital in the West of Scotland coal industry did not issue in any open rupture. Before the war, and up to the assumption of control of the industry in 1917 by the Government, the wages of the Scottish miners were dealt with by the Scottish Conciliation Board; during the war, the determination of wages and other working conditions came under the Coal Controller's department. At the outbreak of war the wage of the Scottish miner stood at the nominal figure of 7*s.* a day, or 75 per cent. over the 1888 standard, and the Scottish Conciliation Board was discussing a demand of the owners for reduction. With the beginning of the war the owners waived their demand, and as the cost of living increased, wage advances were granted from time to time first by the Conciliation Board and later by the Coal Controller. The net effect of these advances was to raise the wage of the Scottish miner between July 1914 and the Armistice by 6*s.* a day, making the 1918 wage (including bonus) nominally 13*s.* a day. The following table[1] gives the list of wage awards during the period:

Date	*Advance*	*Above 1888 basis*	*Nominal wage per day*	*Granted by*
1915		%	*s.* *d.*	
May 3 . .	18¾%	93¾	7 9	War bonus
June 29 . .	12½%	106¼	8 3	Sir G. Askwith
Aug. 24 . .	6¼%	112½	8 6	,,
Nov. 23 . .	6¼%	118¾	8 9	,,
1916				
Apr. 4 . .	6¼%	125	9 0	J. H. Balfour Brown
June 6 . .	12½%	137½	9 6	Lord Strathclyde
Aug. 22 . .	12½%	150	10 0	,,
1917				
Sept. 17 .	1*s.* 6*d.*	187½	11 6	War bonus
1918				
June 30 . .	1*s.* 6*d.*	225	13 0	,,

[1] *Glasgow Herald Supplement*, 1918, p. 42.

The average earnings per shift in November 1918 as compared with June 1914 in Scottish mines employing over fifty workmen are shown in the following table: [1]

Workers	June 1914				November 1918			
	Daily average number on pay-rolls	*Total man-shifts*	*Total earnings*	*Average wage per shift*	*Daily average number on pay-rolls*	*Total shifts worked*	*Total earnings (including war wage)*	*Average wage per man per shift*
				s. d.				*s. d.*
Underground adults .	72,210	1,429,502	553,401	7 8·9	56,359	1,173,442	894,301	15 2·9
Surface adults	14,584	347,775	82,218	4 8·7	12,671	309,057	156,527	10 1·5
Total adult labour .	86,794	1,777,277	635,619	7 1·8	69,030	1,482,449	1,050,828	14 2·1
Youths and boys . .	10,103	198,495	41,056	4 1·6	10,240	210,600	87,777	8 4·0

Whatever may be said of the stimulating effect of the war on other industries, there can be no doubt that the coal industry of the West of Scotland, in common with that of the rest of the country, emerged from the war greatly impaired in its productive capacity. The exports from the west, which in 1913 amounted to 2,184,000 tons, were down to 109,000 tons in 1920, the second peace year; and those of the east had fallen from 8,253,000 tons to 1,227,000 tons. The loss of export trade had a serious effect in retarding mine development and curtailing normal expansions; the total output of Scotland was reduced to 31 million tons in 1920 as compared with 42 million tons in 1914; the output per worker in 1920 was down to 205 tons per annum as compared with 287 tons in 1913; and the Government found itself faced, at the beginning of 1921 with a loss of £100,000,000 per annum on the industry. The years following the beginning of peace therefore were the most

[1] *Coal Industry Commission*, vol. iii, p. 108.

critical period in the history of the industry, and the international situation, combined with the dissensions of capital and labour internal to the industry, prevented its rehabilitation. The three months' coal stoppage following on the decision of the Government to decontrol the industry as from 31st March 1921 was the culminating point in the struggle. The output per person employed in the Scottish collieries slowly increased after the resumption of work, from 15 tons per month in July to $19\frac{1}{3}$ tons per month in November 1921; and in spite of the three months' complete stoppage, the exports of Scotland for the first eleven months of the year amounted to 1,539,200 tons as compared with 1,120,830 tons for the corresponding months of 1920.

CHAPTER III

THE IRON AND STEEL INDUSTRIES

The pre-war position; the war period; iron ore; pig-iron; steel for shell and for commercial purposes; scarcity of steel; measures adopted to increase supply; restriction of exports; increase of imports; extension of mills; allocation of steel; the increased steel-producing capacity of Scotland; prices during the war; changes in firms; labour; transition to peace conditions.

It has been shown in Chapter I [1] that in the production of steel Scotland had failed in the years before the war to keep pace with the English rate of advance. The United Kingdom as a whole had during the same period contributed a gradually contracting proportion of the world's steel output; while in the production of pig-iron this country had between 1871 and 1913 fallen from the first to the third place. In 1913 nevertheless Great Britain was still the largest exporter of iron and steel in the world. But 1913 was a record year in these as in other industries, and by the beginning of 1914 signs were not wanting that Great Britain would have to fight hard for its markets. In Scotland there was much talk of German competition, particularly in ship-plates; and the demands for Scottish pig-iron in the early months of 1914 were falling off in spite of continuously receding prices. An indication of the course of trade is given in the following merchants' quotations for makers' special brands of pig-iron: [2]

	Jan. 1913	*July 1913*	*Jan. 1914*	*July 1914*
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
Clyde No. 1	82 0	76 0	69 6	66 6
No. 3	77 0	71 0	64 6	61 0
Gartsherrie No. 1	83 0	76 6	70 0	66 6
No. 3	78 0	71 6	65 0	61 6
Langloan No. 1	83 6	77 6	70 0	66 6
No. 3	78 6	72 6	65 0	61 6

[1] p. 18.

[2] *Glasgow Herald Supplement*, December 1914, p. 43.

The quotations (highest and lowest) for the three principal articles of manufacture[1] tell the same tale. The rise in 1913 and the fall in 1914 to something like the level of 1911 will be noticed in each case :

Year	*Ship-plates*				*Angles*				*Boiler-plates*			
	High			*Low*	*High*			*Low*	*High*			*Low*
	£	*s.*	*d.*	£ *s.* *d.*	£	*s.*	*d.*	£ *s.* *d.*	£	*s.*	*d.*	£ *s.* *d.*
1910 . .	6	7	6	6 2 6	6	10	0	5 15 0	7	12	6	6 17 6
1911 . .	7	2	6	6 17 6	6	15	0	6 10 0	7	17	6	7 12 6
1912 . .	8	7	6	7 2 6	8	0	0	6 15 0	9	2	6	7 17 6
1913 . .	8	7	6	6 7 6	8	0	0	6 0 0	9	2	6	7 17 6
1914 . .	7	5	0	5 12 6	7	0	0	5 10 0	7	10	0	5 17 6

The depression which had already begun was carried forward into the first few months of the war, and the iron and steel trades had to bear their share of the slump which was affecting industry as a whole. Pig-iron had a momentary spurt, consequent on the shutting out of Continental competition, but it soon became evident that exclusion acted both ways, and that not only imports but exports would be affected. Scottish shipments of pig-iron, indeed, were already declining by the end of August 1914. The causes were obvious—the difficulty of making financial arrangements with foreign buyers, the dangers of oversea navigation, the consequent high freights, and the dullness of home trade in general. The initial effects on steel plates were similar—a temporary improvement when it became clear that Belgium and Germany would no longer be competitors, followed by a falling off in output as demand declined. But with adjustment to the new conditions home trade revived and the work of the Navy made export trade possible. The war itself added greatly to the demand on the iron and steel producers ; and the needs of the Government and Allies for shipbuilding material and for the munitions of war soon made it evident that on the iron and steel producers of Britain would

[1] *Ibid.*, p. 42.

depend to a large extent the ultimate success or failure of the Allies. It may be remarked at this point that the steel industries rose to the occasion; and that they emerged from the war period, not only with an enormous output to their credit, but with a greatly increased productive capacity.

But for the lack of the necessary local supplies of iron ore, the iron and steel and shipbuilding industries of the West of Scotland would form a self-contained group. The principal local steel-using industries demand high-quality steel produced by the acid open-hearth process, and for this purpose the best ores are those which are high in iron content and low in phosphorus and sulphur, namely the magnetites, the red hematites, and a few of the brown hematites. The magnetites come chiefly from Spain, and the hematites from Spain and from certain parts of England (chiefly Cumberland, Northampton, and Lincolnshire). The Scottish product consists of carbonates from the coal-measures of Ayr, Renfrew, and Lanarkshire, which are good only for forge, foundry, and basic iron, and which are insufficient even for the Scottish make of these qualities, yielding only 30 per cent. of the quantity annually produced. For the rest of foundry, forge, and basic iron and for all the hematite, the ore comes from England or from the Mediterranean countries. For war purposes high-quality steel was required in increasing quantities, and the stiff specifications originally set by the War Office made a demand which could not be met with the existing or the possible raw materials. The specifications were eased in October 1915, permission being granted to use both open-hearth and acid Bessemer steel, and later even basic steel was allowed.[1] This made it possible to utilize the home ores to better advantage and to reserve the short supplies of hematite for purposes for which it was absolutely essential (e. g. tool-making, parts of aeroplanes, guns, the moving parts of motors, &c.).

But even so the declining import facilities threatened to make the available supplies of ore insufficient. In England the possibility of meeting the demands for the highest classes of

[1] Hatch, *Iron and Steel Industry, 1914–18.*

steel from the pig-iron of Cumberland and for the lower grades of steel from the phosphoric ores of the east of England was considered. In the latter case the pig-iron would have had to be roasted and made into steel on a basic hearth. But so far as Scotland was concerned, the distance from the east England ores put this scheme out of court. The maintenance of imports therefore became essential.

But this was a difficult proposition. As regards Spain, the chief source of Scottish supplies, the rate of exchange was an obstacle from the first. The normal rate, 25·20 pesetas to the £1 fell to 25 in 1915, and to less than 20 in 1917, only recovering at the cessation of hostilities to 24. Tonnage was scarce; and high outward freights for coal caused boats to hurry back empty rather than wait for return cargoes of ore. Rates, Bilbao to Glasgow, rose from 4*s.* 3*d.* in August 1914 to 21*s.* in 1915 and to 26*s.* 6*d.* in 1916;[1] and were only stabilized at 18*s.* when Government took control of chartering in 1917. On this side scarcity of labour and of wagons, and congestion at the docks impeded the removal of ore which had arrived. The problem was particularly serious at Glasgow Docks, through which come four-fifths of the ore imported into Scotland. The scarcity of tonnage necessitated a quick turn-round of vessels. To this end, the Docks were put under military control; two battalions of Transport Workers, the 16th and 17th Scottish Rifles, were stationed in the area for the discharge of ships; vessels were diverted to the quickest docks; the Clyde Trust worked day and night discharging ore; consignments were diverted from one consignee to another; and the Ministry of Labour introduced payment by piece to the labour discharging ore, and saw that the railways provided the necessary wagons. A central dump for ore was suggested but did not materialize; but storing facilities at the furnaces were increased, and one small dump at Rothesay Docks was provided. To prevent conflict of interests a Co-ordination Committee for the Port of Glasgow was established, in which there were representatives of the Admiralty, the War Office, the Port Authority, and Civil

[1] *Glasgow Herald Supplement*, December 1914, 1915, 1916.

Traffic. These measures led at the time to a speeding-up in the removal of ore. The pre-war rate of handling was generally doubled, and the following quantities of ore were discharged at Glasgow : [1]

	Ships	*Tonnage*
July to Nov. 1916 . . .	133	435,100
Dec. to Nov. 1916–17 . . .	272	1,128,671
,, 1917–18 . . .	351	1,322,146

The record was established in November 1918, when twenty-five vessels with a tonnage of 37,923 were discharged. Over the whole war period the ore imports into Scotland (which are practically confined to the Clyde ports) were as follows : [2]

IMPORTS OF IRON ORE INTO SCOTLAND

	1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
Ardrossan .	387,973	208,470	142,892	217,169	254,267	202,138	252,971
Ayr . .	146,761	127,775	158,573	140,557	80,880	67,169	21,065
Glasgow . .	1,122,023	1,002,893	1,150,459	1,107,869	1,120,401	1,346,050	872,892
Grangemouth .	198,927	89,568	—	—	—	—	67,390
Troon . .	73,261	67,682	105,024	119,919	53,075	30,515	54,755
Scotland . .	1,928,945	1,496,388	1,556,948	1,585,514	1,508,623	1,645,872	1,269,073

The chief sources of origin of these imported ores were in 1918 : [3]

North Spain	760,655 tons
Spanish Mediterranean . . .	309,591 ,,
North Africa	135,177 ,,
France	10,947 ,,
Sweden and Norway	5,582 ,,
Greece	15,731 ,,

The measures adopted, therefore, were sufficient by 1918 to increase imports over those of the earlier war years. But they were no permanent solution of the problem of improving the rate of discharge, which would necessitate the use of mechanical

[1] *War Activities in Scotland, Munitions Archives.*
[2] *Annual Statement of Trade of the U. K.*, 1917 and 1919.
[3] *Statist*, xciv, p. 722.

appliances on a much greater scale, and a simplification of the operations between the ship and the furnace.

To increase the output of home ores the ironstone and limestone quarries of Scotland were taken over by the Ministry of Munitions in the autumn of 1916, and the labour supply was supplemented by German prisoners. In March 1917 the Home Ore Supply Committee was formed. The Scottish output of iron ore, which in 1913 had been 591,600 tons, had fallen by 1915 to 365,748 tons. This was inevitable as the ironstone of Scotland was mainly derived from the Scottish coal-fields; and a diminishing coal-output necessarily meant a diminishing output of ironstone. The only other source of ore in Scotland was the lias ironstone from the island of Raasay, which in 1917 was responsible for 65,985 tons;[1] but the inferior content of this ore limited its uses to basic pig. Together these two sources in 1917 yielded 437,409 tons of ore, which was equivalent to an output of 2,000 to 2,500 tons per week of Scottish foundry, forge, and basic pig-iron, or 25 per cent. of the total output of these makes in Scotland. The remainder was made from imported ores.[2] In January 1918 an attempt was made to stimulate the Scottish output by the offer of the following inducements: (*a*) Allowing certain approved collieries working ironstone to count the latter as coal (at the rate of 1 to 3) for the purpose of the mine-owners' accounts with the Coal Controller; (*b*) Giving to iron-masters an additional bonus of 5*s*. a ton on calcined ore used in the blast furnaces over and above the tonnage used in 1917. The increase in the total Scottish output was, however, slight, the quantity produced in 1918 being 445,420 tons against the 437,409[3] of 1917; and of the increase nothing was due to the coal-fields, which produced less than in the preceding year. The island of Raasay, however, in whose iron-mines 300 German prisoners of war were employed, increased its output from 65,985 to 88,047 tons.

Thus in 1918, the last war year, there was available for the

[1] Hatch, *Iron and Steel Industry, 1914–18.*
[2] *Ibid.*
[3] *Ibid.*

production of iron and steel in Scotland a quantity of iron ore equal to 1,775,563 tons, made up of

Imports	1,269,073 tons
Scottish production	445,420 ,,
From England and Ireland	61,070 ,,
Total	1,775,563 ,,

In 1913 the quantity available had been

Imports	1,820,000 tons
Scottish production	591,600 ,,
Total	2,411,600 ,,

Pig-iron is the second stage in the conversion of iron ore into steel. Hematite pig is made from the high-grade ores rich in iron and low in phosphorus; basic, forge and foundry pig are made from the lower grade ores. Both hematite and basic pig can be used for steel, but in the former case the acid process is used, in the latter the basic. Foundry and forge pig are used for forgings, castings, &c. Scottish steel producers have always favoured the acid process, and consequently used hematite almost exclusively. In 1913 the total quantity of basic pig manufactured in Scotland was only 69,269 tons, equal to 5 per cent. of the total pig-iron output.[1] Consequently when the pressure by the Government for steel began, it was to the production of hematite pig that the iron works first turned their attention.

Up to 1916 the production of pig-iron in Scotland, together with the quantity imported from England, was sufficient to supply the needs of the Scottish steel-makers, except for special qualities of iron; and a sufficient quantity of coal and coke was available for the existing blast furnaces. When war broke out considerable stocks of pig-iron were held by the makers.[2] At

[1] Since 1904 the Registration Societies have allowed either acid or basic, so long as the open-hearth process is used. The Thomas Gilchrist or Bessemer process is not acceptable. The proportion of basic to acid steel produced in Great Britain was in 1900, 16 per cent.; in 1905, 22 per cent.; in 1910, 34 per cent.; and in 1913, 36½ per cent. In Scotland the proportion of basic was much smaller.—Minutes of Evidence of Scotland Steel Producers before the Board of Trade Committee on Shipping and Shipbuilding, March 1919.

[2] Lobnitz, *Report on War Activities in Scotland, Ministry of Munitions Archives*, Appendix 19.

the 31st December 1914 the stocks in the Scottish makers' yards stood at 230,815 tons.[1] Till the middle of 1915 these were not drawn upon to any extent, but in the second half of that year, the demand increased greatly, and in hematite at least it was believed that by December the stocks had been practically wiped out.[2] Various circumstances combined to put pressure on the hematite makers; there was a brisk foreign demand, a steadily increasing demand by the steel works at home and by those of our Allies, and a falling off in the deliveries in this country of American billets. The production of hematite pig thus stimulated rose from 606,745 tons in 1914 to 710,486 tons in 1915, representing an increase from 53 to 64 per cent. of the total pig-iron output. But in spite of this increase the production was still insufficient, and as a first step restriction of export was enforced, the shipment of hematite to neutral countries being prohibited in 1915. As a matter of fact the restriction did not greatly affect Scotland, the bulk of whose exports were to France and East Italy.[3] As an additional measure the supplies of hematite pig were in July 1916 brought under control, and quantities were allocated to consumers according to the urgency of the needs which they served. But the mere restriction of exports and the allocation of supplies could not remedy the defect of an insufficient production. In England the situation was met by a programme of blast furnace extensions, drawn up originally in July 1916, and added to in 1917 and 1918, under which, by the repair and relining of existing furnaces and the building of new ones, it was hoped to

[1] *Glasgow Herald Supplement*, December 1915, p. 42.

[2] *Ibid.*

[3] The total exports of Scotch pig-iron during this period were:

Year	*Foreign*	*Coastwise*	*Rail to England*	*Total*
1913 . .	107,175	152,193	8,716	268,084
1914 . .	70,740	120,670	7,365	198,775
1915 . .	68,980	92,467	22,584	184,031

Report on Pig-iron Production in Scotland, Ministry of Munitions Archives, Parcel 9, 8653/4B.

increase the output of hematite. But in Scotland the 'splint' coal [1] and iron ore [2] available could already be dealt with by the existing furnaces, and the programme, therefore, did not officially apply in this country. Nevertheless the statistics of furnaces in blast in Scotland [3] show that the number of furnaces running on hematite in Scotland increased during 1916 and 1917, reaching the maximum of sixty-four in March 1917. At the same time the Scottish hematite output increased to its maximum of 798,196 tons in 1916, which was considerably in advance of the 1913 production, and was equivalent to 70 per cent. of the total Scottish pig-iron output.[4]

Meantime, the rising price of ore and the advance in the price of splint coal in March 1915 had a depressing effect on ordinary forge, foundry, and basic pig-iron, and the increasing pressure of the Government demand for high-class steel stimulated the production of hematite to the exclusion of the lower grades. The production of forge and foundry iron fell away from 491,885 tons in 1914 to 393,900 tons in 1915, or from 43 per cent. to 36 per cent. of the total output. The production of basic pig ceased altogether in 1915. But the difficulty of procuring the necessary foreign ores for hematite forced the Scottish makers, in spite of their prejudices, to turn their attention to the possibility of an increased output of basic (in this following England, where the hematite part of the programme of blast furnace extensions had had to be abandoned). A survey made early in 1917 showed that in the case of Scotland four blast furnaces were available, capable of turning out 1,500 tons of basic pig per week. Already one Glasgow firm had five basic furnaces in blast; [5] and the total production of basic rose from zero in 1915 to 19,013 tons in 1916 and to 105,140 in 1917.

Before the war, Scotland had imported considerable quantities of pig-iron from England chiefly for forge and foundry purposes. But while these imports continued, the pressing need of the English industries for their own pig-iron, together

[1] *Supra*, p. 45. [2] *Supra*, p. 56. [3] Appendix VIII, pp. 198, 199.
[4] Appendix IX, p. 200. [5] Colville's.

with the transport difficulties, meant that little was to be hoped for in this direction for a solution of the shortage difficulty. On the contrary, the frequent interruption to transport due to the lack of railway wagons caused the Scottish iron-foundry industry to be held up for lack of English pig. The total imports from England were in 1913, 613,000 tons; in 1914, 504,000 tons; and in 1915, 473,500 tons.

The net result of the exertions of the pig-iron producers in Scotland will be seen in the tables in the Appendix[1] which give the statistics of blast furnaces and pig-iron output. The average number of blast furnaces in operation, while it never reached the 1913 level, rose steadily from 1914 when it was $71\frac{3}{4}$ to 1918 when it was $84\frac{5}{8}$. The output per furnace, however, increased to such an extent, that in 1916 and 1917, with fewer furnaces, more pig-iron was being produced than in 1913. The maximum output of all grades was reached in 1917, when 1,156,924 tons were turned out. The maximum weekly output was in December 1916, when 25,700 tons were produced, with an average of 85·3 furnaces in blast. As to the qualities, both hematite and basic increased during the period in proportion to total production; the former from 53 per cent. in 1914 to 70 per cent. in 1916, falling afterwards to 67 per cent. and 60 per cent. in 1917 and 1918 respectively, and the latter rising to 9 per cent. in 1918. The increase in these qualities was at the expense of forge and foundry, which dropped from 491,885 tons in 1914 to 327,823 tons in 1918.

It is in relation to the production of steel that the foregoing facts of ore and pig-iron supplies have their significance. The outstanding fact was that as the need for steel increased, the steel-making capacity of the Scottish firms developed so rapidly that they outran the powers of the pig-iron manufacturers. The outbreak of war left the steel-makers somewhat puzzled. The competition of Germany and Belgium, a menacing fact in 1913 and the first half of 1914, when German steel ship plates, to pass Lloyd's survey, were being delivered on the

[1] pp. 198–200.

Clyde at fully 20*s*. per ton cheaper than those of the most up-to-date Scottish works,[1] was no longer to be reckoned with. On the other hand it was clear that exports would be considerably restricted; and it was not realized how lengthy the war would be, or what place the steel-makers would have in deciding its issue. Its influence on the trade, therefore, was not foreseen, and a sudden slump in prices was followed by a lull which continued till the middle of November 1914. At that time heavy demands began to be made by the Admiralty and the War Office, the former causing pressure on the armament, ordnance, and dependent businesses, the latter, chiefly a demand for shells, affecting other types of business. By the beginning of 1915 the steel works were feeling the pressure and during that year the demands for shell-steel passed all estimates.

Extensions took place as a natural consequence, without, in the first instance, Government intervention. Additional mills were erected; other mills, formerly on plates, were altered and began to roll sectional material. During 1916 almost half of the steel manufactured in Scotland was rolled into billets or bars for shell-making for the British or Allied Governments.

This increase in the demand for shell-steel, followed by similar demands on the part of the Admiralty for high tensile and other qualities of steel plates, led to a great scarcity of steel for other purposes. Many plate works were unable to fulfil their contracts, and little or no ordinary business was placed on the Clyde.[2] In 1917, the intensification of the submarine warfare accentuated the need for mercantile tonnage and caused the scarcity of ordinary steel to be acutely felt. By this time, however, considerable stocks of shell-steel and finished shell were in hand, and it was possible to turn attention to the output of steel for ordinary purposes. As a result the make of shell-steel fell off considerably in the second half of 1917 and in

[1] *Glasgow Herald Supplement*, December 1920. Article by Sir John Hunter. Compare evidence of the Scottish Steel-makers, *infra*, p. 65, and Appendix X, p. 201.

[2] *Glasgow Herald Supplement*, 1916, p. 40.

1918, and that of steel for mercantile, ship-building and constructional work increased.

The steel problem was thus from the first and throughout the whole period a critical and complex one; and the utmost foresight was required to eke out the total steel resources and to direct them to their most urgent uses. The control of the production of iron ore and pig-iron, already indicated, was one means to this end. In addition, after the first year of the war, and the failure of free enterprise, in spite of quite considerable achievements, to meet the requirements of the time, the Government in November 1915 assumed control of all the iron and steel works in Scotland. This general control was followed by detailed interference in many directions. Restriction of exports was the first measure adopted; and prohibition was extended from hematite pig in 1915 to finished steel and iron. As a matter of fact the export trade was already falling off as a natural result of shipping difficulties and the increasing competition of America. In the early part of 1915, for instance, Japan, a good customer of the Scottish makers, was buying from U.S.A. at prices more favourable than Scotland could offer; Canada, as in 1914, was getting her supplies from the same source; and in Australia, in spite of preference for British material, American steel was making its way. By 1916 the export trade from Scotland to neutral countries and to the Colonies had practically ceased. The combined effect of natural changes and Government restrictions is seen in the following figures of Scottish exports of iron and steel and manufactures thereof: [1]

Year	*Tons*	*Year*	*Tons*
1913 . .	638,100	1917 . .	325,783
1914 . .	469,517	1918 . .	171,942
1915 . .	524,477	1919 . .	384,403
1916 . .	631,355		

[1] *Statement of Trade of U. K. with British Possessions and Foreign Countries*, 1919 and 1917.

In addition to restriction of exports, the attempt was made to add to our resources by increased imports from other countries. With the cutting off of Belgium and Germany in 1914, the United States of America remained the only important source of supply. American billets were for some time imported by the Scottish sheet-maker; but in 1915, with increasing freight difficulties, and the improvement in American home industries, the American makers retained their supplies for their own country, and Scotland's imports of billets were much reduced. Thenceforward Scotland had to depend for supplies of steel on its own efforts, and on the help of England and Wales. These facts are illustrated in the following table,[1] which shows the imports into Scotland of iron and steel (exclusive of iron-ore) during the war period:

	1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Pig-iron and puddled bars	1,617	8,488	10,122	3,356	6,000	9,072	24,914
Bars, angles, rods, and sections	44,014	31,666	291	1,008	49	2	2,828
Steel ingots, billets, blooms, &c.	114,086	81,248	66,230	11,026	2,748	1,057	15,235
All other iron and steel including unenumerated)	236,081	154,351	153,791	100,296	23,161	33,017	84,433
Total	395,798	277,753	230,434	115,686	31,958	43,148	127,410
Add value of ammunition, arms, &c.	£ ?	£ ?	£ 9,077	£ 6,598	£ 3,714,721	£ 10,070,190	£ 3,687,811

These two measures, along with the concentration on steel-making iron, already alluded to, were yet insufficient to meet the very critical situation which had developed; there remained the possibility of increasing the number of Scottish steel works to provide an improved output. Much additional plant had already been laid down, but in 1916 arrangements were made for an increase of thirty-nine new steel furnaces, thirty-one being basic, and eight acid, and it was reckoned that when these extensions were completed, the capacity of the Scottish

[1] *Statement of Trade of U. K. with British Possessions and Foreign Countries*, 1919 and 1917.

works would be 56 per cent. in advance of the pre-war output.[1]

During 1917 the capacity of the Scottish furnaces increased as follows :

Weekly output

March 1917	Ord. Hem.	20,600 tons
	Basic	5,000 ,,
Dec. 1917	Ord. Hem.	21,600 ,,
	Basic	7,600 ,,

This represented an increased capacity by December 1917 of 35 per cent. over the pre-war capacity.[2] The following record of the output of one Scottish Company is interesting in this connexion : [3]

OUTPUT OF STEEL INGOTS

	Basic tons	*Acid tons*	*Bessemer tons*	*Total tons*
1914	55,811	262,189	—	318,000
1916	61,357	616,643	—	678,000
1918	217,395	505,633	69,316	792,344
1919	204,311	416,640	35,818	656,769
1920	330,505	484,876	—	815,381

The net result of the various measures adopted for the increase of the steel output of Scotland is summed up in the table on page 64.

From the end of 1916, when it was seen that the shortage of steel was likely to be a permanent condition, the distribution of supplies was carefully scrutinized. On the one hand firms could not receive supplies without a Priority Certificate issued by the Priority Department and granted or withheld according to the degree to which the firms served a war purpose. In Glasgow the work of the Admiralty Superintendent, in whose

[1] Evidence of the Scottish Steel-makers, Board of Trade Committee on Shipbuilding, 1919.

[2] *Report on Pig-iron Production in Scotland*, December 1917.

[3] Colville's.

STEEL INGOTS AND CASTINGS [1]

	United Kingdom	*Scotland*	*Scotland's proportion of United Kingdom*
	Tons	*Tons*	*Percentage*
1911 . . .	—	1,250,000	—
1913 . . .	—	Not available	—
1914 . . .	—	Not available	—
1915 . . .	8,550,015	1,230,574	14·4
1916 . . .	8,991,729	1,713,669	19
1917 . . .	9,716,544	1,900,721	19·6
1918 . . .	9,539,439	1,932,496	20·3
1919 . . .	7,894,000	1,596,000	20·2
1920 . . . (At rate in first half-year)	9,754,000	2,238,000	22·9

PLATES

1913 . . .	—	589,375 [a]	—
1914 . . .	—	Not available	—
1915 . . .	1,160,327	486,616	41·9
1916 . . .	1,153,385	520,132	45·1
1917 . . .	1,326,584	550,704	41·5
1918 . . .	1,348,761	547,205	40·6
1919 . . .	1,260,000	546,010	43·3
1920 . . . (At rate in first half-year)	1,686,648	748,468	44·3

[a] Estimation Mem. of information furnished by Scottish Steel-makers, Board of Trade Committee on Shipbuilding, 1919.

hands lay the allocation of steel to the shipyards, met with much appreciation. On the other hand, in order to secure the most economical use of the steel mills, to avoid change of rolls, and to see that each piece of work was given to the firms which were best adapted to the purpose, orders were distributed under a scheme of allocation. For this purpose Great Britain was divided into six steel areas of which Scotland was one. For the Scottish District a Committee of steel manufacturers was appointed; and a steel Superintendent, representing the

[1] From information supplied by the Lanarkshire Steel Co., Motherwell.

Ministry of Munitions, was set over the area. The Superintendent received from the Steel Department details of the quantities and kinds of steel to be produced in his area, and it was his business, with the help of the area committee, to place the orders among the most suitable firms. It was not till July 1917 that this scheme came fully into operation.

Scottish steel prices before the war were fixed by the Scottish Steel Makers' Association, the Boiler Trade part of which was formed in 1897, and the Ship Plate part in 1904. At first not a particularly powerful association, it had become by 1904 sufficiently strong to control prices, and by October 1911 to offer a rebate of 5*s.* a ton to purchasers who confined their purchases to the Associated Steel-makers during a period and gave notice when they wanted to retire.[1] This regulation of prices in the home market continued till March 1914, when foreign competition necessitated the abolition of the understanding which had existed among the producers.

The prices thus fixed were high compared with German prices on the one hand, and with English prices on the other. The Scottish Steel-makers point out[2] that the Scottish quoted price per ton delivered on the Clyde was subject to 5 per cent. discount, and to the further rebate of 5*s.* a ton to regular customers. But allowing for these deductions, the net price, in the case of ship-plates, compared unfavourably with that of the German manufacturer.[3] The disparity was greatest in August 1913, when the difference in net quoted prices delivered on the Clyde per ton was £2 1*s.* 8*d.* The difference decreased towards the end of 1913 and during 1914; and in July 1914, after the abolition of the price understanding, the Scottish price was less than the German for the first time since 1911. It is true that the German plate was basic while the Scottish was acid, and that, particularly in the case of boiler-plates, the high

[1] Evidence of the Scottish Steel-makers before Board of Trade Committee on Shipbuilding, 1919.

[2] *Ibid.*

[3] See Appendix X, p. 201.

quality of the Scottish article was recognized abroad. Nevertheless, both in the case of ship-plates, angles, and boiler-plates, the German article was good enough to pass Lloyd's survey.[1] The disparity between Scottish and English prices, in favour of the latter, was due to the better situation of the English producers with regard to pig-iron.

The price of shell steel was fixed by Government in June 1915; of commercial steel and hematite and basic pig in March 1916; and of materials which enter into iron and steel, at various dates throughout the war. As the cost of each of these materials depended on the price of the raw materials, labour, &c., entering into it, it was necessary either that the controlled price should be revised from time to time, or that, the controlled price remaining constant, the producers should be subsidized for any loss incurred in production. The latter policy was adopted in the case of steel and hematite, and after one or two adjustments, in the case of ordinary pig-iron.

SCOTTISH IRON AND STEEL PRICES[2]

	Jan. 1913	*July 1913*	*Jan. 1914*	*July 1914*	*Jan. 1915*	*July 1915*	*Dec. 1915*
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	*s.* *d.*
Pig-iron							
Langloan No. 1	83 6	77 6	70 0	66 6	74 0	85 0	97 6
No. 3	78 6	72 6	65 0	61 6	69 0	80 0	92 6
Gartsherrie No. 1	83 0	76 6	70 0	66 6	74 0	85 0	98 6
No. 3	78 0	71 6	65 0	61 6	69 0	80 0	92 6
Clyde No. 1	82 0	76 0	69 6	66 6	73 6	85 6	98 0
No. 3	77 0	71 0	64 6	61 0	68 6	80 6	92 0
Scotch hematite .	—	—	62 6	62 0	80 0	105 0	132 6
Steel (less 5 per cent. delivered Clyde)							
Ship-plates . .	8 7 6	6 7 6	6 7 6	5 12 6	7 5 0	9 15 0	£11 10*s.* to £12
Angles . .	8 0 0	6 0 0	5 10 0	5 10 0	7 5 0	9 10 0	£13
Boiler-plates .	9 2 6	7 7 6	7 7 6	5 17 6	7 15 0	10 5 0	£12 10*s.* to £13

The course of Scottish prices from the beginning of the war to the commencement of price control is shown for pig-iron and steel in the table above. It will be noticed that not until

[1] *Glasgow Herald Supplement*, December 1920, article by Sir John Hunter.

[2] Compiled from reports in *Iron and Coal Trades Review*, *Glasgow Herald Supplement*, &c.

July 1915 did prices rise to the 1913 level, but that thereafter the rise continued.

Shell steel was the first to be controlled in price. In June 1915, at a meeting of representatives of the leading steel firms, of the Ministry of Munitions and of the French Government, standard prices were fixed as follows :[1] For the British Government, rounds and billets, 3″ to 6½″ (i. e. up to 6″ shell), £15 a ton f.o.t., at steel-makers' works; and for the French Government, 82 mm. bars, from phosphoric pig-iron in basic-lined open-hearth furnaces, £14 10*s*. a ton; and from hematite pig-iron in acid-lined open-hearth furnaces, £15 10*s*. a ton. Before this the ruling price for these qualities was £17 a ton.

The control of commercial steel prices necessarily followed; otherwise its production (at the free, and therefore more remunerative prices) would have been carried on at the expense of the output of shell steel. In March 1916 maximum prices for various classes of steel were set out in elaborate schedules. The chief classes were: ship-plates, £11 10*s*.; angles, £11 3*s*. 6*d*.; boiler-plates, £12 10*s*.

The control of steel prices necessitated the fixing of the price of pig-iron. Scottish hematite was fixed at £6 2*s*. 6*d*. in March 1916 (at the Scottish furnaces), and of No. 3 best quality brands at £5 15*s*. 6*d*. at the producers' works.

Finally, the fixing of the price of steel and iron involved the control of prices of coke, scrap, bricks, ferro-manganese, and ore, both home and foreign. In the case of the last-named the problem was met by the central chartering of steamers by the Ministry of Munitions; and on the basis of a fixed rate of freight, iron ore merchants agreed to quote prices to consumers on the condition that the Government would agree to reimburse the buyer to the extent of the difference between the price so paid and the standard rate.[2] Similarly it was agreed that the pig-iron maker would be 'reimbursed for any excess outlay on ore above a fixed price'.[3]

[1] Hatch, *Iron and Steel Industry, 1914–18*.
[2] *Ministry of Munitions Archives, Glasgow Area Records*.
[3] *Glasgow Herald Supplement*, December 1916, p. 40.

Thus in the case of pig-iron, the principle of subsidizing the iron-masters was agreed on from the first; and from time to time, following on advances in price of labour and materials, increased subsidies were granted, and the maximum price fixed in March 1916 remained constant throughout the period of control. The adoption of the method meant a considerable simplification in negotiations. In the case of steel no settled policy was arrived at till the end of 1917. It had been recognized since the fixing of prices that on commercial steel there was little, and on shell steel a considerable margin of profit, and various plans for equalizing advantages had been considered. Ultimately, in November 1917, it was decided that prices of both should be maintained at the figures originally fixed, but that the shell-steel makers should refund 25*s.* per ton to the Government, and that commercial steel-makers should receive a subsidy from the Ministry amounting to 20*s.* a ton on plates and 15*s.* a ton on joists and angles. Subsidies to steel-makers were thus uniform throughout the country, unlike those to pig-iron manufacturers, which were settled by districts.

This policy of unvarying prices was the simplest solution of a difficult problem. It was desirable that prices should be so stabilized, inasmuch as iron and steel entered into most contracts for the manufacture of munitions; and it was made possible by the fact that the Government was itself the purchaser, to the extent of 98 per cent., of the total output of iron and steel.[1] Labour, however, complained that it was an attempt to evade the principle under which iron and steel workers' wages were fixed on a sliding scale varying with the price of product. In this connexion it was agreed that the question of taking the subsidy into account for the purpose of determining wages should be left to negotiation.

Steel was decontrolled on the 1st February 1919, when the subsidies which had been in operation were withdrawn. The subsidies on pig-iron were removed on 30th April. The sub-

[1] Birkett, 'Iron and Steel Trades during the War,' *Statistical Journal*, vol. lxxxiii, p. 368.

sequent movements of prices are indicated in the following table of home market prices :

SCOTTISH PRICES [1]

	Steel ship-plates	*Boiler ship-plates*	*Angles*
1919	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Controlled price	11 10 0	12 10 0	11 2 6
On withdrawal of steel subsidies, 1st Feb. 1919	14 0 0	15 0 0	13 12 6
On withdrawal of pig-iron subsidies, 1st May	17 10 0	19 10 0	17 0 0
1st July, after advance in pig-iron, coal, wages, &c.	19 5 0	21 5 0	18 15 0
Dec.	19 15 0	24 10 0	19 5 0
1920			
Jan.	19 5 0	24 0 0	19 5 0
Highest	27 0 0	31 10 0	26 10 0
Dec.	25 10 0	31 10 0	24 10 0
1921			
Jan.	25 10 0	31 10 0	24 10 0
Oct.	12 10 0	16 0 0	12 10 0

SCOTTISH PIG-IRON PRICES

	Hematite	*Ordinary pig, No. 3 quality, best brands*
1919	£ *s.* *d.*	£ *s.* *d.*
Controlled price	6 2 6	5 15 6
May	9 3 0	8 10 0
July	10 3 0	9 15 0 to £9 17*s.* 6*d.*
1920	14 5 0	12 0 0

Similarly, after the withdrawal of the subsidies on pig-iron on 30th April 1919, the price of pig-iron showed a considerable advance. Hematite rose from the controlled price, £6 2*s.* 6*d.* per ton, to £14 5*s.* per ton in 1920. Ordinary pig-iron advanced up to July 1919, when a strike of Yorkshire colliers caused the

[1] Compiled from reports in *Glasgow Herald Supplement, Iron and Coal Trades Review*, &c.

stoppage of iron and steel works in Yorkshire, and closed outlets for Scottish pig. On 21st July coal was advanced by the Coal Controller 6*s*. a ton, bringing about an advance of 12*s*. on the price of pig-iron. These changes are summarized above (p. 69).

The advance in prices between the beginning and the end of the war is shown thus :

SCOTTISH PRICES: PIG-IRON AND STEEL, 1914 AND 1919

	1914	*1919*	*Per cent. increase*
Pig-iron	£ *s.* *d.*	£ *s.* *d.*	
No. 3 quality, best brands .	3 12 0	9 15 0	171
Scottish hematite . .	3 0 0	10 10 0	250
Steel			
Ship-plates	5 12 6	19 15 0	251
Angles	5 10 0	24 10 0	345
Boiler-plates . . .	5 17 6	19 5 0	227

The progress of the iron and steel industries in Scotland was little interrupted during the war period by internal disputes between labour and capital, a state of matters due to the long standing habits of conciliation in the industries. The wages of the melters and millmen, who are the skilled workers, being fixed at a rate per ton of output determined by a sliding scale according to the selling price of the product, rose automatically with the rise in the price of steel during the war. In the case of the other workmen, including gas producermen, discharge hands, ladlemen, &c., wages were generally paid by the hour or day, with, in some cases, a bonus on output added to the datal rate. Between these various classes of workers the difference in earnings is very great. Disputes are settled under a scheme of conciliation by which, failing agreement, matters are referred to an Emergency Committee, representative of the two sides, with an appeal to an arbiter. The representatives in Scotland are expressly appointed for each dispute when it occurs.

The iron and steel industries of the West of Scotland emerged from the war considerably changed in their productive potentialities. Several factors contributed to this result.

As already noted, the aggregate steel-producing capacity was increased during the war, partly owing to individual initiative and partly to Government intervention ; and the actual figures of steel output for the post-war years 1919 and the first half of 1920 show an absolute increase and also a relative increase as compared with the United Kingdom as a whole. Meantime internal changes took place in the industry, particularly in the linking up of formerly distinct concerns, and the bringing under the co-ordinated control of a single firm, of several successive stages in the production of steel and of finished steel goods. The importance of this tendency in its effects on economy of production, and in the problems it raises as regards the relations of producer and consumer, and of labour and capital, justifies a brief account of a particular case. Up to the outbreak of war the private limited liability company of Messrs. David Colville, with no outside connexions, had made the Dalzell Iron and Steel Works, Motherwell, the largest individual steel works in the country. In January 1915 the firm took a controlling interest in the new concern, the Fullwood Foundry Co., just starting in the manufacture of ingot moulds, &c. Thereafter it reached out in several directions, back to the raw material and forward to the finished product. To ensure regular coal supplies the company in January 1915 purchased the business of Messrs. Arch. Russell, Ltd., who owned extensive collieries in Lanarkshire and Stirlingshire, employing some 6,500 men, and producing in its twenty-four pits about a million and a quarter tons per annum of a large variety of coal. In the other direction an interchange of shares took place, about the same date, between the company and its largest consumer, Messrs. Harland and Wolff, Ltd., Shipbuilders, Belfast and Glasgow, and while the interchange did not give to either company a controlling interest in the other, the arrangement ' put on a commercial basis the friendly relations which had long subsisted between the firms '. During the war also the firm acquired the two large steel works at Clydebridge and Glengarnock, the last-named in itself a complete establishment for the manufacture of steel sections from the raw ore. Drawing its iron from a local ore mine, it

worked it up to the finished stage in its own blast furnaces, basic Bessemer steel department, rolling mills and structural department, and it had its own chemical recovery plant and basic slag manure plant, and in addition a Siemens open-hearth department for foreign ores. After the Armistice the company acquired the control of the sheet and galvanizing works of Messrs. Smith and Maclean, Ltd., and it held the bulk of the shares of the new 'Clyde Alloy Steel Co., Ltd.'. Altogether, the company and its allied concerns employed after the war about 18,000 workers.[1]

On the other hand the continued inadequacy of transport facilities, and the lack of sufficient supplies of coal and limestone (both due in some measure to the railway situation) retarded output throughout the West of Scotland and forced furnaces to go on 'slack blast'. Add the general difficulties involved in the industrial change over to peace conditions, the strike in 1919 on the Clyde over the forty-hour week, and the strike of furnace bricklayers in Scotland, and we have the explanation of the fact that in spite of the great world shortage of iron and steel products, the output of pig-iron in Scotland should have dropped from 1,369,259 tons in 1913 and 1,144,766 tons in 1916 to 956,000 tons in 1920. Unfortunately 1920 did not mark the bottom of the decline. The great trade depression of 1921 resulted in the closing down of many Scottish works and the running of most others at not more than 25–30 per cent. of their capacity. Iron ore imports for the year fell to about one-sixth of the normal. The productions of Scottish pig-iron rapidly declined in the first three months of the year, till at the end of March only forty furnaces were in blast. The coal stoppage which followed reduced the trade to its lowest ebb, the Scottish makers, who depend on coal, being more rapidly affected than the English, who were able to continue for some time with their stocks of coke. No improvement was perceptible in the months which followed the settlement of the coal dispute, and the year ended with only nine Scottish furnaces in blast. The price of No. 3 finished at about £6 per ton, or about 70 per cent. over pre-war prices. In steel the depression and the

[1] *Colville's Magazine*, January 1920, p. 3.

fall in prices resulted in October in the abolition of the joint control of prices by the English and Scottish Steel Associations, and later in the complete freedom from control of the prices of steel plates and angles. The freedom, however, was only temporary. In February 1922 the British steel-makers reverted to the system of non-competitive prices.

In the meantime other countries have had their own difficulties to contend with. America's productive capacity developed enormously during the war, but the promise of the Armistice period has not been altogether fulfilled in the later years. The great fall in production which America experienced in 1919 was due to the serious troubles of the early part of that year, but the average output both of steel and iron still remained, during the first half of 1920, the lowest since 1915. France's recovery was retarded by the coal shortage, which made it impossible for the French steel industries in the first post-war years to take advantage of the regained mines of Lorraine with their estimated annual output of 42,000,000 tons of iron ore. Belgium's recovery was remarkable and continuous. Out of 54 blast furnaces in operation in 1913, 51 had been destroyed by the time of the Armistice; by June 1920, 17 of them were again in operation. The average monthly output of pig-iron and of steel in these countries is compared in the following table for 1913 and the first half of 1920:

AVERAGE MONTHLY OUTPUT OF PIG-IRON AND STEEL

	1913		*1920 (First six months)*	
	Pig-iron	*Steel*	*Pig-iron*	*Steel*
United Kingdom	855,000	869,500	691,000	813,000
Scotland	115,000	—	79,500	186,500
U.S.A.	2,623,000	2,651,000	3,072,500	3,560,500
France	434,000	368,000	212,000	196,000
Belgium	207,000	205,000	71,500	86,500

CHAPTER IV

SHIPBUILDING AND MARINE ENGINEERING

Shipbuilding the main war contribution of the Clyde; the early concentration on naval output; the Clyde record of naval construction; variety of types of vessels produced; repairs, alterations, and refitments of vessels; shortage of mercantile tonnage in 1916; the standardization programme; the Clyde record of mercantile output; the total production of the Clyde during the war; problems involved in war-time production; labour and materials; extensions and improved facilities; shipbuilding capacity at the end of the war; post-war production; output since 1918.

The importance of the Clyde before the war as a centre of shipbuilding, both mercantile and naval, indicated the chief direction in which the industrial activities of the district should be used when war broke out. The 1913 output of the Clyde yards, which indeed constituted a record (last approached in 1907), was made up of additions to the mercantile marine of 353 vessels, of 692,600 tons and 649,240 indicated horse-power; and to the Navy of 64,195 tons and 462,200 i.h.p.[1] The aggregate output for that year was equal to that of the whole of Germany, and greater than that of any other single British shipbuilding centre. In the Clyde Valley was concentrated 90 per cent. of the shipbuilding and marine-engineering activity of Scotland, and in 1911 these industries gave employment to 54,195 wage-earners in Lanark, Renfrew, and Dumbartonshire.[2]

The work in the Clyde Valley was carried on by a large number of firms, most of them completely independent of each other, varying considerably in size, and differing in this area more than in any other in the types of vessel they produced. Most firms specialized on some particular type, such as the cargo steamer of intermediate size, the oil-tanker or the warship;

[1] *Glasgow Herald Supplement*, 1914, p. 26.
[2] *Census Report, Scotland*, 1911.

but some turned out a variety of types. Some did shipbuilding only, others marine-engineering only, but in many cases single firms undertook both sides of the work. Again, while most firms restricted themselves to new construction, some did repair work, and a few did both. Three yards, those of Messrs. John Brown & Co. at Clydebank, Messrs. Beardmore & Co. at Dalmuir, and the Fairfield Co. at Govan, were almost wholly engaged on naval work, while at Messrs. Wm. Denny & Bros., Messrs. Yarrow & Co., and Scott's Shipbuilding Co., a certain proportion of naval was turned out in addition to mercantile tonnage.

Industrially, therefore, the district was well suited to the special needs of war-time. Geographically it was no less so. Its situation on the west gave it a natural immunity (added to artificially on the outbreak of war) from the many dangers which faced the east under the new conditions, and the restrictions required in the east coast dock-yards were unnecessary in those of the Clyde Valley. These combined advantages were immediately recognized, and the whole shipbuilding activity of the area was soon directed into the channels deemed most urgent for the time being.

What were the most urgent needs, however, was a question on which, in the nature of the case, there was some uncertainty. On the whole two periods can be distinguished. During the first, the demands for naval construction were pressed more and more, mercantile work was largely ignored, and yards were changed over and fitted to contribute to the naval programme. The second period began with the intensification of the submarine warfare, and the recognition that the mercantile arm was no less necessary to victory than the naval. In this period, beginning in 1916, the original policy was reversed, and plans were laid for an increased mercantile output, not only to maintain the necessary supplies of foodstuffs and raw material in war-time, but also with a view to the commercial position of the country in the period after the war. In neither case, of course, was the necessity both of naval and mercantile work forgotten but there was a distinct difference of emphasis.

The first period began with the outbreak of war. In midsummer, 1914, the Clyde was threatened with a depression in shipbuilding, which, however, was not yet acute. The intensity of production, involving the working of night shifts, which had characterized 1913, was no longer necessary, but there were still many vessels on the stocks, employment was fairly steady, and actual dismissals in the yards were few. The first effect of the war was to stop the completion of vessels ordered by countries which were now our enemies; and private owners followed with the request that work on vessels being constructed for them should be suspended. The immediate effect was unemployment; and the fear of its extension led the Government to request shipbuilding firms as far as possible to refrain from dismissing men. The fear soon proved groundless. As early as August 1914, ships began to be requisitioned by the Lords Commissioners of the Admiralty under Royal Proclamation for the transport of troops, and other war purposes. Admiralty needs soon became too great to be met by the ordinary Admiralty dockyards, and the mercantile builders were pressed into the service of the Navy. Shipyard labour showed a remarkable eagerness to enlist.[1] Not only on the Clyde, but all over the country, it was soon obvious that the problem was not one of keeping the workers employed, but of finding sufficient labour and material for the required output of tonnage.

The feature of this first period was the concerted effort to meet naval needs. The three chief naval producing firms on the Clyde became Government Dockyards from the first. Yarrow's of Scotstoun and Scott's of Greenock followed in 1915, and the passing of the Munitions of War Act in 1915 brought under Government control all the shipyards and most of the engineering establishments; and these were directed to increasing the naval output. On the Clyde the effects of the effort were soon perceptible. The indicated horse-power of naval vessels produced rose from 462,200 in 1913 to 653,287

[1] By October 1914, 12 per cent. of the workers in the large shipbuilding establishments in Scotland, and 16·7 per cent in the smaller firms, were known to have joined the forces. *State of Employment in U.K.*, October 1914 (Cd. 7703), p. 38.

in 1914, and the advance continued in 1915, when the i.h.p. reached 1,023,627. For the whole war period, the statistics, so far as they are available, are given in the following table :

NAVAL OUTPUT OF THE CLYDE [1]

Year	*Vessels*	*Tons*	*I.H.P.*
1913 . . .	17	64,195	462,200
War Period			
1914 . . .	32	83,074	653,287
1915 . . .	167	92,155	1,023,627
1916, 1917, 1918 . . .	288	641,755	4,285,516
Total 1914–18 .	487	816,984	5,962,430

The details of the types of vessels included in this total are shown in the following list :

NAVAL WORK ON THE CLYDE DURING THE WAR YEARS [2]
(New construction only)

Type of vessel	*Number*	*Tonnage*	*I.H.P.*
Armoured ships . . .	7	142,886	366,500
Battle cruisers . . .	2	58,000	201,300
Light cruisers . . .	11	45,906	563,430
Destroyers	159	186,899	4,127,900
Submarines	33	34,662	103,360
Mine-sweepers . . .	61	47,751	102,685
Sloops	71	89,244	169,800
Patrols	20	12,300	85,000
Gun-boats	24	7,270	28,300
Monitors	4	25,722	12,420
' Q ' vessels	8	11,521	22,400
' P.Q.' vessels . . .	2	1,276	8,500
Armed merchant cruisers .	1	19,350	14,287
Other vessels	84	134,197	156,548
Total	487	816,428	5,962,430

[1] Compiled from returns in the *Glasgow Herald Supplement*, 1914–18.

[2] Compiled from returns of Clyde shipbuilding firms in the *Glasgow Herald Supplement*, 1918.

This new naval construction was attained, at least in the period up to 1916, at the expense of mercantile tonnage, which fell from 692,601 tons in 1913 to 460,258 in 1914, and to 215,060 in 1915. In 1916 it was still lower. Separate figures of naval and mercantile output are not available for the last three years of the war; but the average mercantile output turned out in these three years shows an advance on 1915, a result to be expected from the deliberate attempt to stimulate that branch of shipbuilding.

A remarkable feature of the record is the variety in the type of naval vessels produced. The list of ships constructed includes practically every type required by the Navy. Almost every yard contributed to the output of destroyers or mine-sweepers, and there were few yards which were not engaged on some work of a kind to which before the war they had been quite unaccustomed. The production of the single firm of Fairfield includes 2 battle cruisers, 3 light cruisers, 24 destroyers, 9 submarines, 1 armed merchant cruiser, 3 mine-sweepers, 1 salvage vessel and one Royal Fleet auxiliary.

Notable among the smaller naval vessels produced on the Clyde are the large and small 'China gun-boats', the latter constructed in the yards of Messrs. Yarrow at Scotstoun, and dismantled, shipped abroad and reassembled for fighting on inland waters. For mine-sweeping, light-draught paddle-steamers were requisitioned from the Clyde; and an improved type of mine-sweeper which gave much satisfaction was built and fitted with engines chiefly on the Clyde.

The work of repairing vessels does not normally attract the same amount of general attention as the construction of new tonnage; but its importance in recent times is evidenced by the fact that it has accounted for as large a wages bill as new work; and during the war period questions of economy in time, labour, and materials made it more than ever important to repair where possible rather than to undertake new construction. Before the war, the work was widely distributed in the yards around the coast, and was performed generally by firms which specialized on this work, and did no actual building. In the war years the necessity for speed and safety led to the concentration of the

work in particular centres, especially the Tyne in England and the Firth of Forth in Scotland. The Clyde also did its share, though the position of the river, eminently suitable for new construction, was not the most convenient for the repair of vessels damaged at sea. The work done, however, was considerable. It included not only the repair of damages to ships, but their reconditioning, alteration for new purposes (as in the case of paddle-steamers altered to mine-sweepers), and their refitting with machinery. In the nature of the case it is impossible to give any accurate measure of the amount of work which was thus accomplished. In the first place, the mere enumeration of the vessels repaired gives little indication of the work involved; for damage necessitating repairs may be anything from a small injury made good with a few days' work, to a rent in the sides of a vessel, requiring weeks of labour. In the second place, a statement of the value of the work performed is not much more illuminating, because of the irregularly increasing costs of material and labour required for repairs. The changes in prices of steel plates, angles, &c., have already been stated,[1] and where there had been no restriction of price the advances were sometimes even greater, as in the following cases:

	1914	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Red oxide paint per cwt. . .	10 0	12 0	14 0	20 0	30 0	34 0	34 0
11″ by 2½″ white wood deals, per lin. foot . .	3¾	5¼	10½	1 3	1 4	1 4½	1 5

Though an accurate idea of its implications is thus unobtainable from a mere statement of the vessels so dealt with, some indication, necessarily vague, is afforded by the following list of vessels which passed through some of the Clyde yards and engineering shops and were repaired under Admiralty direction. This is supplemented by a more detailed description in the Appendix.[2]

[1] *Supra*, pp. 66, 69, 70.

[2] pp. 201–207.

RECORD OF WORK PERFORMED ON THE UPPER REACHES OF THE CLYDE,[a] NOVEMBER 1914 TO MARCH 1921

Refits, Alterations, and Repairs of Damages

Type of vessels	*No. of refits*	*Type of vessels*	*No. of refits*
Destroyers	412	Submarines	28
Flotilla leaders	33	Mercantile auxiliaries	285
Sloops	77	Tugs	21
Mine-sweeping gunboats	35	Yachts	8
Cruisers	59	Trawlers and drifters	9
Battleships	4	Miscellaneous	25

Total number of refits: 996.

Classes and Numbers of Vessels in which Machinery was Refitted, Repaired, and Reconditioned

Class of vessels	*No. of vessels refitted and repaired*	*No. of vessels reconditioned*
Armed merchant cruisers	161	7
Cruisers	56	—
Gunboats	26	—
Flotilla leaders	32	—
T.B.D.'s	352	—
Sloops	84	—
Submarines	35	—
Oilers	15	—
Sweepers	50	—
Trawlers	282	40
Drifters	243	12
Whalers	21	—
Yachts	71	—
Motor launches	84	1
Puffers	8	—
Motor yachts	2	—
Motor drifters	2	—
Tugs	48	—
Boarding vessels	1	—
Mooring barges	15	—
Boom vessels	5	—
U.S. Government ships	6	—
Total	1,599	60[b]

[a] i.e. from Clydebank upwards.

[b] For the details in this and the preceding table we are indebted to the Dockyard Department of the Admiralty.

The period of definite expansion in the mercantile output began in the winter of 1916–17, when the increase in submarine warfare directed against British shipping as well as against that of neutrals engaged in commerce with this country revealed the danger of further neglect. The enemy's war on British shipping, first by means of cruisers and later by the first submarine campaign, opening in February 1915, had resulted by November 1916 in the destruction of $2\frac{1}{4}$ million gross tons.[1] During the same period the new tonnage constructed had not been sufficient to make up the loss, but had fallen from 1,722,154 tons in 1914 to 649,336 tons in 1915 and 582,305 tons in 1916. New construction had thus failed to the extent of about a million tons to keep pace with destruction. The opening of the new submarine campaign in February 1917 intensified the seriousness of the position. In the eight months between then and the end of September more tonnage was destroyed (namely $2\frac{1}{2}$ million tons) than in the whole of the previous period. Ships over 1,000 tons net suffered most. Moreover, the enemy attacked the neutral shipping on which this country so largely depended, with the result that the proportion of foreign vessels entered with cargoes in the foreign trade at ports in the United Kingdom dropped from 33 per cent. of the total entries in 1916, to 17 per cent. in the later months of 1917;[2] while at the same time the total British and foreign entries rapidly declined. The safe position of Glasgow and the Clyde, attracting inward tonnage from other ports, prevented, in the former case, the same drop in vessels entered with cargoes as was experienced in the United Kingdom as a whole. But, as elsewhere, the Clyde mercantile output had receded, and mercantile vessels in course of construction had been left unfinished or reconstructed for war purposes.

The situation was first seriously tackled when the Ministry

[1] Gray, *War-time Control of Industry*, p. 164; and *Reports of Departmental Committee of Board of Trade on Shipping and Shipbuilding Industries after the War*, p. 101.

[2] In part this change may have been due to the Government purchases of foreign ships, and to the fact that certain firms importing non-essentials, such as tobacco, were allowed to buy foreign ships on condition of importing so much food.

of Shipping was established in December 1916, with Sir J. (now Lord) Maclay as Controller. Three methods were employed. Work on mercantile ships was speeded up, tonnage was purchased from other countries, and a new programme of standardized production was inaugurated. The first two methods were more or less in the nature of stop-gaps. The standard programme, worked out by the Controller and a Shipbuilding Advisory Committee (the members of which later joined the Admiralty Shipbuilding Council to co-ordinate the demands for naval and mercantile building), was a more ambitious attempt. The general advantage of standardization, namely increase of output and reduction of costs, had already been recognized before the war, and had led to the formation of the British Engineering Standards Committee. In shipbuilding too a degree of standardization had been attempted, not only in the hulls of vessels, but in marine engines. But so far as this country was concerned,[1] it had been confined to particular works; there had been no co-operation between steel-works, engineering establishments and shipyards; and the insistence of private owners on their own special designs had prevented much development of the idea even within works. During the war these limitations did not apply; and the programme of the Shipping Controller had in view a definite organization of selected steel-works, engine-shops and shipyards, which acting in co-operation should produce machinery and hulls which could be assembled in the yards. The object was the acceleration of the output of general trading vessels, the only type indeed in which standardization could be effected to any extent. The scheme met at first with considerable criticism on the part of shipowners, who opposed to the standardization programme a scheme of ' repeat ' vessels, which they claimed would attain the same ends without some of the disadvantages attendant on standardization. In particular it was held, ' standard ' vessels built to a few simple designs for hulls and machinery would be suitable only for the most general trading and incapable of competing effectively with

[1] In Denmark and U.S.A. standardization had been carried further than here.

vessels built before or after the war, for special kinds of traffic or on special routes. The ' repeat ' scheme, under which former specialized vessels would be repeated by the yards which had originally built them, would avoid this result, while it would effect equally great economies and secure equal rapidity of production.

The latter part of this claim was probably ill-founded. Over the United Kingdom, as a whole, the output of 1918 was more than double that of 1916—a rate of production under the standardized programme greater than would have been possible under the alternative method. The former part of the claim had more justification. While the stimulation of mercantile construction had its effect, standardization was introduced too late to show its best results before the date of the Armistice, and it was only in the output of 1919 that the concentration of the Clyde yards on standardized cargo boats for the first time made itself evident. The following analysis of the Clyde output of 1919 brings out the point :

THE CLYDE OUTPUT, 1919

Type	*No. of vessels*	*Tonnage*
Cargo steamers	90	378,512
War vessels	26	91,676
Oil tankers	10	55,491
Auxiliary naval	50	34,599
Passenger vessels	7	28,142
Motor ships	4	27,197
Barges, lighters, &c.	64	11,749
Tugs	12	6,022
Fishing vessels	24	5,569
Concrete ships	4	2,816
Dredgers	5	2,577
Launches and boats	121	984
Stern-wheel steamers	5	820
Total	422	646,154

By this time, however, the war having ended, the demand was for the specialized merchant vessel of the pre-war type ; and with the cessation of Government control, these cargo

steamers were transferred to private ownership, and many of them were altered to meet the ideas of their owners. Meantime, so long as the war lasted, naval construction naturally got the preference over commercial, and repairs had priority to both. The record of the Clyde mercantile output during the whole period of the war is shown in the following table :

CLYDE MERCANTILE OUTPUT FOR 1913 AND THE WAR PERIOD [1]

Year	*Vessels*	*Tons*	*I.H.P.*
1913 . . .	353	692,601	649,240
1914 . . .	307	460,258	496,120
1915 . . .	126	215,060	180,503
1916, 1917, 1918 . . .	977	881,559	1,065,859
Total 1914–18 .	1,410	1,556,877	1,742,482

The complete war-time output of the Clyde shipyards (both naval and commercial construction) follows, and the 1913 total is given for comparison :

THE CLYDE SHIPBUILDING OUTPUT, NAVAL AND MERCANTILE, FOR 1913 AND THE WAR PERIOD [2]

Year	*Vessels*	*Tons*	*I.H.P.*
1913 . . .	370	756,976	1,111,440
1914 . . .	339	543,332	1,149,407
1915 . . .	293	307,215	1,204,130
1916 . . .	393	506,922	1,862,410
1917 . . .	432	461,589	1,588,370
1918 . . .	440	555,803	1,900,595
Total 1914–18 .	1,897	2,374,861	7,704,912

In respect of tonnage, 1913 still remained the record year, and the best war year, 1918, fell 200,000 tons short. But equal

[1] Compiled from returns in the *Glasgow Herald Supplement*, 1918.

[2] *Glasgow Herald Supplement*, 1918, p. 28.

tonnage represents more actual work and a bigger wages bill in naval than in mercantile construction, and the change-over during the war years from the latter to the former makes i.h.p. a better test of performance than tonnage. Judged by this standard, 1913 was surpassed by each of the war years, and while there is no means of making an accurate comparison, there is little doubt that, as respects actual work done, the war period eclipsed any other equal period in the history of the Clyde, in spite of the many difficulties which had to be surmounted.[1]

Among these difficulties, that of maintaining a sufficient supply of satisfied and willing labour was the most serious. Enlistment among shipyard workers began early and rose to fairly high proportions; by October 1914 there were known to have joined the forces 12·9 per cent. of the workers in the larger shipbuilding firms in Scotland and 13·9 per cent. in the larger engineering establishments. It was not possible in shipbuilding, to the same extent as in some other industries, to make up the shortage by calling on female labour, because so much of the work is skilled or heavy. Before the war the number of women employed in shipbuilding on the Clyde was negligible. By July 1916 the number introduced into shipbuilding, general engineering and miscellaneous metal trades (exclusive of munitions) was estimated at 1,800 for Glasgow and district;[2] and even by the end of the war, the total number of females employed in marine engineering and shipbuilding over the whole of the United Kingdom was only 31,000 or 7 per cent. of the total number of employees in these industries.[3] But while the inflow of women was never sufficient numerically to make up for the loss of men, nor of a quality industrially to replace the skilled men who had withdrawn, they made dilution possible

[1] Some particulars of speedy work are to be noted. In Brown's Clydebank yard, the armoured ship *Repulse* (26,500 tons and 115,000 i.h.p.) was built in less than nineteen months. In Scott's, Greenock, the armoured monitor *Sir John Moore* (5,906 tons and 2,500 i.h.p.) was commenced 13 January 1915, launched 31st May, and ready for trials on 30th June. *Glasgow Herald Supplement*, 1918, pp. 29, 30.

[2] *Labour, Finance and the War*, ed. Kirkaldy, 1916, p. 101.

[3] *British Labour, 1914–18*, ed. Kirkaldy, 1921, p. 18.

as well as a greater utilization of the existing skill, and they therefore contributed distinctly to the solution of the problem. Among the work done by women in shipyards, as noted by an observer [1] in 1916, was the following: attending plate-rolling and joggling machines; back-handing angle irons, flanging, fitting, upholstering, and polishing; drillers' and caukers' assistants; platers' helpers; rivet heaters; holders-on; crane driving; catch girls; firing plate furnace; general labouring (gathering scrap and cleaning up vessels in construction).

Such female labour as was enlisted in the industry, however, did not enter on any extensive scale till 1916. In the meantime, in the closing months of 1914, relations between Trade Unions and employers were harmonious. Voluntary agreements were made by which restrictions on labour were withdrawn, and men were allowed to work overtime to any extent and to shift from yard to yard in accordance with the pressure of naval work. Firms also decided that yards on mercantile work would lend men to naval firms as need arose. But this harmony was not long-lived. With the inauguration of the Government programme of dilution and the discouragement of recruiting among shipyard workers, unrest began and throughout the following year it developed on a more serious scale on the Clyde than elsewhere.[2] Dilution and demarcation questions were the chief subjects of dispute, but the rise in the cost of living (including the raising of house rents, which began earlier on the Clyde than elsewhere) [3] was an additional cause of unrest, and while there were few actual stoppages, the strained relations, not only between the workers on the one hand and the firms and the Government on the other, but also between the rank and file and the Union leaders, retarded output. At this critical juncture both employers and statesmen made allegations regarding excessive drinking and bad time-keeping on the part of the Clyde workers, and certain sections of labour became openly rebellious. In 1916 several shipyard workers were deported. By then, both workers and masters had learned

[1] H. E. R. Highton, in *Labour, Finance and the War*, p. 140.

[2] *Infra*, pp. 143 ff.

[3] *Infra*, p. 169.

something of the necessity of forbearance, and on the surface at least work proceeded more smoothly thereafter.

Meantime, male labour had been recruited to the industry from a number of sources. Men came from peace-time industries and from outlying districts. But it was chiefly through a redistribution of the labour of the district as between peace and war occupations that the necessary supplies were obtained for shipbuilding. By 1917 more men were employed in the yards on the Clyde than at any previous time.

The scarcity of materials was hardly less serious than the shortage of labour. The general nature of the problem of maintaining supplies of steel, the most important material in shipbuilding, has already been dealt with,[1] but its direct relation to the shipbuilding problem may be noted. The pre-war disparity in price between the German and the Scottish ship-plates and sections[2] delivered on the Clyde had led Clyde shipbuilders to go more and more to Germany for their plates. The cutting off of this source of supply with the outbreak of war caused scarcity and soaring prices ; and the huge demands being made for steel for munitions intensified the problem of the shipbuilder. The passing of the steel-works under Government control in 1915 did nothing to relieve the situation as far as the mercantile builder was concerned, for the pre-occupation of the Government was with the shell output, and many works in the Clyde district erected for plate-rolling were at this time converted for the purpose of rolling bars and billets for shells. The naval builder was in a somewhat better position ; for one thing he got priority, and for another, the steel requirements for a given value of naval work are less than for the equivalent of mercantile. But by 1916 even the demands of the Admiralty, which came next in order of priority to those of the Ministry of Munitions, were not being supplied. Meantime the various schemes for increasing the steel output had been put into operation. By 1917 shell requirements were well on the way to being met, and from the middle of that year shipbuilding began to get preference over munitions and many mills reverted to the rolling

[1] *Supra*, p. 59. [2] See p. 59.

of plates. Thus by the end of 1917, in spite of the programme of mercantile output with its greater steel consumption, it could be said that ' there are evidences now of the shipbuilders' requirements of steel being fully satisfied '.[1] The previous shortage of British steel, however, had brought about a dependence on America, from which country we imported an increasing quantity of steel plates, &c.

While steel is the most important item for shipbuilding, it is only one of a large number of materials on which the industry depends. Timber is probably the next in importance, but partly manufactured and wholly finished articles are required in large numbers and in great variety. These during the war period were all difficult to procure, high in price and irregularly delivered. Timber in particular caused difficulty, as it is almost wholly imported; and this scarcity led to some developments which are likely to be permanent. For cabin fittings, for instance, and other parts in which finer woods are required, home-grown ash, beech and pines were used; concrete was effectively employed as a substitute for wood in keel-blocks; and in other directions experiments were made with new wood-substitutes, with varying success.[2] The shortage of timber mainly affected mercantile building, since little is used in naval construction.

By the end of the war the shipbuilding industry of the Clyde had a greatly increased productive capacity. Technically, certain advances had been made. Ships had been transferred in large numbers from their original uses to more strenuous employments; general cargo vessels had been converted into carriers of oil in bulk; and river craft had had to be fitted and strengthened for work on the seas; and the work of reconstructing vessels for such new purposes yielded much valuable experience. Standardization had resulted in simplification in many departments, particularly in template work; and the

[1] *Glasgow Herald Supplement*, 1917, p. 44.

[2] See *Transactions of the Institution of Engineers and Shipbuilders in Scotland*, April 1918, p. 16, an article by Mr. James Craig on ' Some Effects of the War on Merchant Shipbuilding '.

necessary speeding up in construction had led to the introduction, on a greatly extended scale, of pneumatic tools for riveting, caulking, &c., and of electrical tools for drilling and other purposes. The increase in building facilities on the river itself is not of a kind which can be reduced to figures or indicated by any statement of the increased extension of building slips. In part it is visible to the eye in the shape of giant cranes which tower above the fog, suggestive of an illustration to Mr. Wells's *War in the Air*. But for the greater part the development consists of improvements and the re-allocation of space within the yards, making for speedier work and increased output. Fortunately many of the changes and improvements which were necessitated by the demand for naval construction, in which most firms took part, were of a kind available for post-war commercial work also. The net effect, therefore, was an improved capacity which promised well for the future.

The promise has not yet materialized. On the contrary, after an encouraging advance in 1919 and 1920, the year 1921 resulted in a total production on the Clyde of only 511,185 tons, which was the smallest peace-time production since 1910. It is true that the lee-way in the British mercantile marine, caused by the destruction of ships and the reduction in output during the war period, was rapidly made up, so that by a year after the Armistice, the position was about as strong as in 1913. But Great Britain was short of first-class liners; the British tonnage had shrunk in proportion to the world tonnage, and the need to rehabilitate the economic condition of the many countries injured by the war seemed to point to an enormous expansion in the carrying trade which would call on all the energies of our shipbuilders. In view of this situation, the causes of the failure to rise to the occasion for more than a short period must be briefly indicated. The chance for the industry came immediately after the Armistice when the world's need was greatest. The failure did not lie with the shipbuilding firms, which began immediately to change over to peace conditions, and to prepare for commercial work. But slow demobilization, and the failure of the Admiralty to release shipwrights

from the Government yards retarded the resumption of normal activity. Nor was it possible, as in the case of some other industries, to take advantage of the release of large numbers of women from munitions ; in shipbuilding the nature of the work prevented it, and in marine engineering, while it would have been possible to utilize women, the firms preferred to wait for the release of skilled engineers from the Army. Labour troubles complicated the situation in 1919. Disputes and strikes were frequent within the industry itself, and the railway strike of 1919 had its effect.

In the second place the end of hostilities did not solve the steel problem. By the end of 1918, in spite of the closing down of munitions works, the demand for steel was greater than the works could meet. Demobilization of steel-workers went on slowly and the works had an inadequate supply of labour. The strike of bricklayers in 1919 retarded output. And while steel sections could be fairly rapidly turned out, steel plates were handicapped by the fact that many firms had to change back from the rolling of bars and billets to the rolling of plates. Moreover, the change-over from naval to mercantile production in the yards meant a greater proportionate demand for steel in order to keep the yards as busy as before. This shortage of British steel was accompanied by a decline in imports from America, a fact welcome enough to the steel-makers, but adding to the difficulties of shipyard output.

In the third place the eagerness to purchase, which had characterized the first months after the war, rapidly disappeared. Within a year after the war, the shortage in the British mercantile marine had been in great measure made up [1] and the emptiness of the world's pockets meant lack of employment for the ships. Freights declined, and shipowners showed a tendency to cancel orders. Increasing costs in the British yards sent buyers to other countries, the coal strike of 1921 put

[1] ' The end of the Napoleonic wars left our mercantile marine stronger than it had been in 1803, or at any previous date,' and ' it was the strenuous and unremitting activities of our shipyards which saved the situation.' W. R. Scott, *Economic Problems of Peace after War*, First Series, pp. 46 and 48.

a stop to production, and shipbuilding came practically to a standstill.

The promise of 1918–19, therefore, was short-lived. The following table summarizes the position to date :

THE CLYDE SHIPBUILDING OUTPUT, PRE-WAR AND POST-WAR

Year	*Vessels*	*Tons*	*I.H.P.*
1907 . . .	—	619,919	—
1908 . . .	—	355,586	—
1909 . . .	—	403,187	—
1910 . . .	—	392,392	—
1911 . . .	—	630,583	—
1912 . . .	—	640,529	—
1913 . . .	370	756,976	1,111,440
1919 . . .	422	646,154	1,479,771
1920 . . .	330	672,438	620,615
1921 . . .	249	511,185	478,760

CHAPTER V

THE OUTPUT OF MUNITIONS

Problems involved in the change-over to munitions production ; inexperience of the Clyde in such work ; the introduction of women ; women's work ; dilution by males ; use of automatic machinery ; the Glasgow Shell Scheme ; the shell output of Glasgow and the West of Scotland ; records of firms ; production of guns and parts ; trench warfare supplies ; tanks ; aeroplanes ; total production of munitions in Scotland ; the return to peace-time production.

The problem of increasing the supply of munitions and the general manner of its solution are sufficiently well known, and the brief reference which follows is intended merely as a background to the activities of the Clyde district. Throughout the country, the production of munitions in the enormous quantities which soon became necessary involved the solution of two main groups of problems, the organization of the material resources of the nation and the organization of the supply of labour. In the case of the former, it soon became apparent that the existing armament firms were unable to produce anything like the quantity required, and that their activities would have to be supplemented by those of ordinary engineering firms. These, however, were inexperienced in the special work which was required, and the lack of the necessary tools, machinery, &c., the supply of which could not be rapidly increased, threatened to prevent the desired acceleration of output. To meet the difficulty, the plan adopted in the first instance was the introduction of the system of sub-contracting, under which the large armament firms who received the orders gave out the simpler parts of the work to be done by outside firms, retaining to themselves the more difficult and delicate work and the assembling of parts. When this failed to meet the situation, the Government established the Ministry of Munitions and

directed production from the centre, under the powers of the Defence of the Realm Act and the Munitions of War Act.

On the side of labour, there was not only the difficulty of an insufficient supply of experienced workers, but the critical problem of preventing alienation and suspicion when the situation seemed to demand the abolition of certain trade practices and other interferences with Trade Union customs and usages. The Committee on Production appointed to inquire into methods of increasing output in engineering and shipbuilding issued a series of reports which formed the basis of the Treasury Agreement of March 1915, under the terms of which organized labour agreed to work.

The general decisions reached on these two main problems were contained in the Munitions of War Act, 1915, which, amended in subsequent years, and supplemented by Circulars, Orders, and Regulations, laid down the conditions under which munitions were manufactured during the war. The administration was in the hands of the Ministry of Munitions (set up in June 1915), with its elaborate system of departments and branches, each directing a particular part of the supply. The country was divided into twelve munitions areas, of which Scotland had two, and a Director of Munitions was appointed for Scotland, first in the person of Mr. William Weir (now Lord Weir) and later of Mr. (now Sir) Frederick Lobnitz.

In the case of Glasgow and the Clyde Valley, not only were these difficulties as great as elsewhere, but there was the added fact that its fame as a shipbuilding centre had brought the Admiralty into the field early in the war, with the result that by 1915, when the need for more and more shell came to be acutely felt, the greater part of the available manufacturing facilities which had been diverted to war production were already occupied on Admiralty work, and no supply of munitions was being turned out for the War Office, except by Messrs. Beardmore's and a few sub-contractors of English firms. While, moreover, it is true that there existed in the district excellent facilities for the manufacture of bombs, grenades, and other cast-iron parts, as well as numerous engineering and machine-making

industries, employing on the Clyde in 1911 some 95,000 men and women [1] with considerable experience in modern engineering processes, the pre-war work of the engineering establishments was not of such a kind as to enable them to turn over rapidly and easily to the new production. If we except the firm of Messrs. William Beardmore & Co., the experience of the Scottish firms in munitions work was slight. In the Clyde district, according to the Census of 1911, the number of persons employed in the manufacture of arms was only about 200. Nor was the manufacture of small precision parts, experience in which might have been turned to good account, an established industry, except in the single case of the Singer Manufacturing Company.

Thus from the point of view of the Ministry of Munitions the problem as regards the West of Scotland was, with a short supply of labour, to establish what was virtually a new industry at a time when most firms were already engaged on important work in other directions. From the point of the firms themselves, the difficulty was one of organization, the shell departments which they came to set up being in some cases the smallest part of their many commitments. The situation as a whole, therefore, demanded from the Government and the employers the most careful organization as well as considerable ingenuity in adapting the existing plant and labour supplies to the new demands; and on the part of labour, submission to many interferences with established customs.

The complete and rapid turn round from ordinary production to the manufacture of munitions was accomplished with less difficulty by the small than by the large establishments, and within a remarkably short time most of the small shops in the West of Scotland, which were not already committed to other war production, were doing something on munitions. Even garages and bicycle-repairing shops participated in the work and contributed their quota of shell components. In the case of the larger establishments the change over was a slower process; and, had they had to rely on coal as their power, the procuring

[1] *Census Report, Scotland*, 1911; numbers for Lanark, Renfrew, Dumbarton, and Paisley.

of the necessary boilers and other plant would have caused much delay. Resort was had, however, to the electrical engineering firms, which, in the Glasgow area, were soon inundated with orders for electrical machinery, motors, and generating plant; and the revolution which might otherwise have occupied months was accomplished in weeks. Within the city of Glasgow, the power was obtained almost exclusively from the Glasgow Corporation Electric Power Stations, and the increasing demands which continued to be made during the war show the extent to which this source of power was used. In 1915 the number of units generated was 104 millions; in 1916, 132 millions, and in 1917, 147 millions; and in the latter year 86 per cent. of the total was used for power purposes. Outside of the city, in the surrounding districts, the supply was largely obtained from the Clyde Valley Electric Supply Co., which, owing to the increasing calls on its resources, had to add to the number of its power stations during the period.

Meanwhile the problem of finding the necessary additional supplies of labour was proving troublesome. Throughout the country generally, the problem was tackled in two ways. In the first place, the attempt was made to add to the number of workers by attracting labour from other less necessary industries or by inducing workers, chiefly women, who had not formerly been engaged in wage-earning pursuits, to come forward and give their services. This method, if successful, would add to the total labour supplies. The second method attempted was to make better use of the existing labour, by conserving the skilled workers for such tasks as required their special skill, and bringing in inexperienced labour to perform those parts of the skilled man's normal work which were less exacting. This was the method of dilution, which was defined as the substitution of women for men, or of unskilled men for more skilled with the object of ' up-grading ' the latter, and so squeezing out at the top the skilled men, who could be utilized as supervisors, or as the nucleus of night-shifts. The method of addition involved at the moment no serious problems of organization, though the demobilization of the additional workers at the end of the war

would require careful handling. The method of dilution brought difficult industrial problems in its immediate train, and proved in the sequel the chief cause of industrial unrest in many manufacturing centres. Both methods necessitated resort to female labour on a large scale.

This was especially the case on the Clyde, where the preoccupation of establishments on Admiralty work, contrary to expectation, became greater rather than less as the months advanced, and where, therefore, few men were available for the manufacture of shells for the War Office. In some other metal and engineering districts women were already employed, before the war, in considerable numbers, and the war conditions did not cause any extraordinary change in the proportions of men and women in these industries. In the Clyde Valley this was not so. Apart from the single case of sewing-machine manufacture, carried on by the Singer Manufacturing Co., few engineering establishments made any great call on the services of women, as can be seen from the following table, which shows the position as at 1911 : [1]

MALE AND FEMALE LABOUR EMPLOYED IN THE CLYDE DISTRICT IN VARIOUS METAL OCCUPATIONS

(Figures for Lanark, Renfrew, Dumbarton, and Stirling)

Occupation	*Numbers employed*	
	Male	*Female*
Iron and steel manufacture	25,664	43
Manufacture of other metals	1,251	22
Engineering and machine making	93,400	2,062
Electrical apparatus	4,409	55
Tools	1,282	69
Types, blocks, and dyes	199	20
Arms	185	2
Miscellaneous metal trades	8,836	1,143
Ships and boats	43,951	263
Vehicles	6,265	79
Total	185,442	3,758

[1] *Census Report, Scotland*, 1911.

Of the women so employed, the greatest number in any one industry was in sewing-machine manufacture, which employed over 2,000.

The employment of women in the general metal industries, therefore, so far as the Clyde district was concerned, was more or less a new venture. It involved moreover, in many instances, the application of the dilution principle ; and the general opposition with which that principle was met on the part of the Clyde workers retarded for some time the augmentation of the labour supply.[1] The Clyde Dilution Commission appointed in January 1916 spent many months in negotiations with employers and employed, and in attempts to get dilution agreements accepted by the workers in many of the metal industries ; and it was not till the second half of the year that the progress of dilution showed much acceleration. From then onwards the progress was rapid, and the numbers of women recruited for munitions increased daily. By June 1916 it was estimated[2] that 18,500 women were employed in the metal trades of the Clyde district, of whom 12,000 were engaged in shell-making and shell-filling. (The remainder included 4,700 employed on sewing-machine manufacture for war purposes, and 1,800 on shipbuilding, general engineering and miscellaneous metal trades.) By the end of the war 16,000 women were employed in Scotland on shell-making alone.[3] The total number employed on munitions outside of the regular armament firms, in the last three years of the war, is shown[4] in the table on p. 98.

At the three dates instanced in the above table, women in the West of Scotland formed 47 per cent., 53 per cent., and 56 per cent. of the total number of munition workers. In the metal industries of the same area before the war, women had formed only 1·9 per cent. of the total number of workers. Up to the middle of 1916, the additional female labour was in the industrial sense additional rather than substitutive labour inasmuch as the women employed on shells were doing work which had not

[1] *Infra*, p. 143.
[2] *Labour, Finance and the War*, 1919, p. 101.
[3] *Report on War Activities in Scotland, Munitions Archives.*
[4] *Ibid.*

previously been done in the Clyde district. Technically, therefore, their work did not involve dilution. Nevertheless, apart from the sewing-machine workers, the women were doing work which, had it been done in the district previously, would have been done by men; and with a view to post-war conditions, their presence gave rise to the same kind of problem as if they had been actually diluting male labour. Moreover, from the middle of 1916, with the progress of the work of the Dilution Commissioners,[1] the substitution of women for men proceeded apace, and by August 1919 the greater proportion of the women introduced into metals were engaged on general engineering work which did involve dilution.

LABOUR EMPLOYED IN MUNITIONS IN SCOTLAND

(Excluding regular armament firms)

	October 1916			*October 1917*			*October 1918*		
	Men	*Women*	*Total*	*Men*	*Women*	*Total*	*Men*	*Women*	*Total*
Glasgow and West of Scotland.	20,883	18,825	39,708	21,500	24,523	46,023	22,119	28,087	50,206
North and East of Scotland.	4,289	1,721	6,010	4,858	3,077	7,935	5,458	3,425	8,883
Total .	25,172	20,546	45,718	26,358	27,600	54,958	27,577	31.512	59,089

This female labour came from many sources. Geographically it would seem that up till 1916 the greater number of the women came from the immediate vicinity, though a limited investigation made in 1916 showed that one factory in Glasgow already employed 200 fisher-women from the outer Hebrides.[2] In the later years the influx from a distance increased and the Clyde Valley drew on the more or less distant rural districts. Industrially there was a considerable amount of transference of female labour from normal peace-time occupations to munitions, especially from the textile industries, which in the West of

[1] See Chapter VIII, on Labour, pp. 146 ff.

[2] *Labour, Finance and the War*, p. 102. Report by J. E. and H. E. R. Highton.

Scotland are largely women's industries. On the other hand, many of the women were the wives or relatives of soldiers, and a considerable number of these had not previously been engaged in wage-earning occupations.

The women thus employed in munitions in the West of Scotland were engaged on work on shells of all calibres, from the 2-pdr. anti-craft shell upwards. At first the maximum limit was the 8″ shell, but later all the necessary work even on the 15″ shell was said to be successfully performed by women.[1] Their work included every process after the rough forging. Among these processes were the following: 'Rough turning, rough finish boring and mill threading on the body of the shell; cutting, tapering, boring and facing on nose, and finishing, turning and forming the outside of the complete shell, cutting the base for weight, recessing for base-plate, and turning the copper band. On fuzes their work included capstan turning, drilling, milling, boring, and screwing, stamping, soldering, washing and assembling. Shell-filling involved filling cartridges with cordite and N.C.T., assembling H.F. shells, and doing labouring work both within and without the danger zone.'[2] Much of this work demanded not only heavy manual labour, but also some skill and a considerable amount of care and concentration. For the work on shells the period of training required was short. Much of the work was unskilled labouring; and of the remainder the greater part had been rendered comparatively simple by the introduction of automatic and semi-automatic machinery, which converted work which had formerly demanded the judgment and dexterity of the skilled man into a series of more or less repetitive operations; and to learn to tend these machines was the work of a few weeks. In general engineering, on the other hand, much of the work which the women undertook was of a non-repetitive character, and a longer training was required. The Royal Technical College of Glasgow offered facilities for the training of women in some of the more important engineering operations. In shell work

[1] *Report on War Activities in Scotland, Munitions Archives.*
[2] *Labour, Finance and the War*, pp. 139, 140.

the women generally worked in squads, numbering up to twenty, and were supervised by skilled engineers who supplied the cutting tools necessary and set up the machines. The supervisors again worked under the direction of foremen, and a woman superintendent was in charge of the discipline of the women in the shop.

The success of women throughout the country on the work of munitions has been generally conceded. In Glasgow and the West of Scotland, according to contemporary reports, they gave no less satisfaction.[1] Within the limits of their physical powers, and within the conditions imposed by their short training, their work compared favourably with men's. It should be noted, however, that their most successful work was repetitive, and there were few cases in which women showed much aptitude for an all-round training. There did exist in several works in Glasgow 'Flying Squads' in which each woman had learned to perform every operation on the shell, and was prepared to fill gaps caused by the absences of other workers,[2] and while it was found difficult to get women to train for the Flying Squads, as they disliked being put on different jobs,[3] yet the method seems to have been adopted earlier in Glasgow than elsewhere. Probably the combination of good education with the habit of hard physical work, which was found to lead to the best results in the training for munitions work,[4] accounted for the relatively good adaptability of the Scottish women. In quantity of output they were unrestrained by Trade Union habit and usage, and being temporary workers, they were not influenced by the subconscious harbouring of energy, which is the natural protective action of the male worker, with a life-time of industrial work before him. The result is indicated in the authoritative statement [5] that 'if women workers had produced shell, as shell in

[1] But contemporary opinion should be corrected by reference to post-war fact. There was little inclination among employers to retain the services of women, when the temporary need had passed.

[2] *Labour, Finance and the War*, p. 109.

[3] *Report Com. Women in Industry*, Cmd. 167, App., p. 27.

[4] *Ibid.* Evidence of Director of Training of Munition-workers, p. 5.

[5] *War Activities in Scotland, Munition Archives*, Glasgow Area Records, Parcel 9, 8350/3, p. 6.

smaller quantities were produced with skilled labour in 1913, the output would have been only one-third of the quantity actually obtained'. Methods of remuneration affected rate of output. In general the women worked under an individual piece-rate system. But other systems were introduced with varying results. In the National Filling Factory at Georgetown a collective premium bonus system, introduced into one department in February 1917, and gradually extended to the whole works (in which women were almost exclusively employed), was found to have good results in increasing output and reducing costs. In the manufacture of igniters for 60-pdr. cartridges, the output per worker for 48 hours prior to the introduction of the bonus was 115; at the end of six weeks under the new system it reached 229 per week. In the case of 4·5″ shell, the result was as follows:

	Output per week	*Cost per unit*
April (before bonus) . . .	42·65	8·26*d.*
Sept. (three months after bonus) .	90·96	6·53*d.*

In the experience of the Ministry of Munitions, the best results by way of output were obtained where the system of collective piece-wages was in operation, as in the National Projectile Factory, Cardonald.[1]

Male munition workers were naturally more difficult to find, and throughout the whole period the scarcity of skilled workers, particularly mill-wrights, tool-setters, and skilled supervisors, was felt. General metal workers were pressed into the service of munitions, and with the contraction of the non-metal industries, much unskilled labour was set free. Students, professional men, and men unfit for military service came forward in considerable numbers, and after the early trouble connected with dilution had been overcome, male labour became progressively available. At the time of the Armistice, over 22,000 male munition workers were employed in Glasgow and the West of Scotland.

Utilization of female labour and of unskilled male labour on this extensive scale would have been impossible but for the

[1] *War Activities in Scotland, Munition Archives*, Glasgow Area Records, Parcel 9, 8350/3, p. 6.

simplification of processes made possible through the use of new kinds of machinery. Machine tool manufacture had been an important branch of Glasgow engineering work before the war, and many firms, each specializing more or less in their own product, had turned out most types of machine tool used in the engineering establishments of the district. But with the outbreak of war, these firms were themselves in difficulties for lack of labour; the sudden demand for immense quantities of machines overtaxed the resources of the firms, and the adoption of standardized methods as the only way of fulfilling the tremendous programme of shell production, necessitated the use of automatic and semi-automatic machines and lathes, such as only the specialized makers of the United States were in a position to supply. The result was a scarcity which could not rapidly be made good. In the case of gun-making and gun-components the lack of plant was very serious, and it was only by the initiative and enterprise of firms which carried on this work by converting old machines, and without the introduction of a single machine tool, that a good output was maintained. A similar shortage of machine tools for the production of trench warfare materials was experienced. In time, by the importation of American machines, the situation was met, and by 1917 and 1918 the engineering industry of the Clyde had been virtually revolutionized by the introduction throughout of automatic machinery, and the adoption of mass production.

Thus by 1916 the problems of labour and machinery were on the way to solution. In the meantime the shortage of materials for munitions had also been seriously tackled. Steel in particular had been the object of much consideration, and, as already indicated, its export had been restricted, its application to various uses brought under control, and its production speeded up. Great programmes for the extension of steel works, and for the increase of the productive capacity of the country had been commenced, and it was apparent that for the purposes of munitions, at least, the needed supply would be forthcoming.[1]

[1] *War Activities in Scotland, Munitions Archives.*

These various efforts, directed to the increase of labour, plant, machinery and materials, were co-ordinated under the Glasgow Shell Scheme, which was instituted as early as 1915, and which worked so successfully that it resulted in the production of three times the amount originally expected.[1] In addition to the National Projectile Factories included under the scheme, arrangements were made by which firms entered into contracts with the Ministry of Munitions for the supply of shell. Such firms were required to submit to the Director of Munitions in Scotland schemes for the output of so many shell per week, and these schemes being approved, became the programme of production of the firms. The contracts were of two kinds, ordinary or assisted. Under the assisted contract, firms agreed to deliver a specified number of shell of a given calibre in accordance with a schedule, undertaking to purchase exclusively from the Ministry of Munitions all forgings, copper-bands, base plate stampings, and fuze sockets necessary, at specified prices free on rail at the works.[2] The contractors, at the expense of the Ministry, made all necessary alterations and additions to buildings for manufacturing and storing shell, and fixed and installed proper machinery, all of which remained the property of the Ministry. The cost of the buildings, alterations, and installations was met by the Ministry up to an agreed maximum; but the cost of upkeep was borne in the first instance by the contractor, and was included in the cost of the shell. This cost was ascertained periodically and the price determined under schedules to the contract (see tables on p. 104).

The number of assisted contracts in Glasgow was twenty, involving a capital expenditure on the part of the Ministry of approximately £2,000,000 (excluding National Projectile Factories), and the number of workers employed was 50,000.[3]

[1] *War Activities in Scotland, Munitions Archives.*

[2] According to contract 30/10/16 No. 94/Glasgow/54, the prices were, forgings, £3 15*s.*; Copper bands, 9*s.* 4*d.*; base plate stampings, 2*s.* 8*d.*; fuze sockets, 2*s.* 9*d.* *Munitions Archives.*

[3] *War Activities in Scotland, Munitions Archives.*

SCHEDULE (EXAMPLE)

PART I

If the cost of production is less than	*but not less than*	*Amount or method of ascertaining bonus*
£ *s.* *d.*	£ *s.* *d.*	
7 15 0	7 10 0	Difference between cost of production and £7 15*s.* 0*d.*
7 11 0	6 17 6	4*s.* per shell.
6 17 6	—	4*s.* per shell and in addition one-fourth of difference between cost and £6 17*s.* 6*d.*

SECOND SCHEDULE (EXAMPLE)

PART II

INCREASED AMOUNTS FOR REGULATING MAXIMUM PRICE AND BONUS FOR FIRST 3,000 SHELL

Prices in above part of schedule	*Increased to*
£ *s.* *d.*	£ *s.* *d.*
7 15 0	8 5 0
7 11 0	8 1 0
6 17 6	7 7 6

The general picture of the Clyde Valley at this time is therefore that of a congested industrial area, whose activities were employed in the production of coal, and of iron and steel in their various stages. The shipyards of the district absorbed the greater part of these iron and steel products, but careful organization made it possible to utilize to great effect the remainder of the engineering skill, and the result was a very substantial contribution to the national output of all kinds of munitions required for warfare on land. The main facts of that output follow on pp. 105 to 109.[1]

The items included in the term munitions in its more restricted meaning are shells and their components, guns and gun parts, the numerous materials required for trench warfare, aeroplanes, and tanks.

The number of shell produced in Scotland as a whole, from the date of the formation of the Ministry of Munitions to the date of the Armistice, was 12 millions (of which 5 millions were

[1] The facts which follow are quoted, with permission, from the *Report on War Activities in Scotland,* in the Archives of the Ministry of Munitions.

from 18 pdrs. to 4·5″, and 7 millions from 60 pdrs. to 15″). To this total the north and east of Scotland made a considerable contribution, as they did in the case of other munitions. But of course the greatest facilities were available in Glasgow and the West of Scotland, and the major part of the Scottish Munitions output is to be attributed to that area. In the present instance the output of shell in the West of Scotland alone (excluding the regular armament firms) amounted to over 8½ million shell, of the following kinds :

SHELL OUTPUT OF GLASGOW AND THE WEST OF SCOTLAND

(Excluding the regular armament firms)

2 pdr.	167,628	
18 pdr. H.E.	888,138	
3″ H.E.	19,352	
4·5″ Shrapnel	77,000	(partly machined)
4·5″ H.E.	1,416,403	
4·5″ Lyddite	3,520	
60 pdr. Shrapnel	610,113	
60 pdr. H.E.	1,195,178	
60 pdr. C.I. Chemical	149	
6″ H.E.	2,344,167	
6″ C.I. Chemical	341,064	
6″ H.E. converted into Chemical	32,675	
8″ H.E.	1,401,464	
9·2″ H.E.	64,078	
12″ H.E.	7,030	
15″ H.E.	13,280	
75 mm.	19,753	
210 and 160 m. Italian	23,895	
	8,644,887	

Throughout Scotland the rate of weekly output of shell continued to improve from 1916 onwards, as is shown in the following average figures :

Rate of weekly output of shell in Scotland

During 1916	54,000 per week
„ 1917	125,000 „
„ 1918 (till Armistice)	129,000 „

The rate of weekly output per person employed (including staff) was :

Size of shell	*Weekly output per person*
15″	One shell
8″	Four shells
6″	Seven shells
60 pdr.	Nine shells
106 fuze	30 fuzes

The following table gives the number of forgings produced in the period :

(1) *Shell forgings*	*No.*	(2) *Adapter forgings*	*No.*
18 pdr.	44,464	8″	255,200
4·5″	488,147	12″	3,359
60 pdr.	2,013,813	13·5″	1,625
6″	2,264,205		
8″	790,071	(3) *Nose forgings*	*No.*
9·2″	25,470	4·5″	132,400
10·25″	15,381	60 pdr.	22,000
14″	626	6″	197,400

Shell components of all kinds, amounting altogether to some forty-five millions for the West of Scotland, were produced ; but many of these went into completed shells turned out in this area, and the extent to which they were additional is not definitely ascertainable.

A scarcity of copper, experienced in 1915, continued in 1916, in spite of the enormously increased output in America in that year, and gave rise to difficulty in the production of copper shell bands. To get over the difficulty, a unit for the rolling of copper plate was formed in Glasgow. By 1918 it was turning out 200 tons of rolled copper plate per week, a volume of production sufficient to meet local war needs. In the last three years of the war the output of copper bands in Scotland was :

PRODUCTION OF COPPER BANDS IN SCOTLAND

Size	*1916*	*1917*	*1918*
9·2″	10,500	33,750	—
8″	71,400	550,000	443,500
6″	28,300	430,000	531,600
4·5″	13,000	128,000	—
18 pdr.	—	472,000	4,425,800
Total	123,200	1,613,750	5,400,900

Not less enormous was the output during the period of guns and gun parts. The production of these throughout the country was organized under a series of programmes, the first of which, providing for 5,000 guns, chiefly of light weight, was put forward

in the early months, the contracts being placed with armament firms. By June 1915 the need for heavy artillery was seen, and a large programme, including 1,618 4·5″, 560 6″, 372 8″ and 48 12″ howitzers and a large number of 60 pdrs., was authorized, and armament firms were given powers to extend their works. During this year extensions to the value of £700,000 were carried out at Messrs. Beardmore's in Glasgow.[1] Other programmes for guns and howitzers followed rapidly in July and September of 1915. In 1916 the armament firms received orders for many heavies and long-range guns, and between January and December 1917 a scheme for between 700 and 800 4″ guns for arming merchant ships against submarines was carried out by four armament firms.[2] In all of this work the armament firms of Messrs. William Beardmore & Co., Glasgow, had a share, and the total output of that firm during the war was very great, including thousands of guns and gun-carriages, besides large quantities of gun-forgings, stampings, bullet-proof plates and components for other firms. Both in the production of new guns and components, and in the repair of guns damaged in the field, firms normally engaged in miscellaneous engineering work came to the aid of the regular armament firms, and in spite of lack of experience, shortage of labour, dilution difficulties, scarcity of necessary materials such as high-class steel plates, forgings, &c., and an insufficient supply of machine tools, which retarded output in the early stages, they were able to contribute substantially to the various programmes. Altogether, outside of the regular armament firms, 860 contracts for firing platforms, components for guns, limbers, wheels, &c., were placed in Scotland, and the work, particularly of the smaller firms, was of a high order.

The production of supplies for trench warfare, organized by the Trench Warfare Supplies Department, which was set up in Glasgow in July 1915, necessitated dilution and the introduction of female labour on a large scale. The list of contracts placed with West of Scotland firms up to 31st July 1916, includes the following items, all of which were dispatched :

[1] Dewar, *The Great Munitions Feat*, p. 123. [2] *Ibid.*

Sulphuric acid	325 cwt.
Ethyliodo-acetate mixture	16,335 gall.
Steel sheets for helmets	311,500
2″ T.H. stem boxes	22,000
Gas cylinders	71,000
Stokes bombs	68,300
2″ T.H. bomb heads	73,700
No. 19 percussion grenades	71,000
M.S.K. bombs	55,000
T.W. oval grenades	120,400
Mills grenades	950,000

For the production of tanks two armament firms and one sugar machinery firm received contracts in 1917. Before this all contracts had been placed in the Midlands ; but the facilities existing in Scotland for the production of the necessary steel and armour plate, as well as of smaller components, led to the decision to produce the complete article in the Glasgow district. The first contracts were for Mark V machines, but the programme was extended later to include Medium B and Mark VIII Tanks. By 1918 a new armour-plate industry had been established in Glasgow, and 90 per cent. of the armour plate required for all tanks being produced in Great Britain was being provided by Scotland. By the time of the Armistice facilities existed for the production of 500 tanks complete per week in the Clyde district, and production had actually begun when the cessation of hostilities put an end to this activity.

Scottish firms, only two of which had had any previous experience, turned out during the war 4,390 aeroplanes, as follows :

1915	237 machines	1917	1,234 machines
1916	556 „	1918	2,363 „

Eleven firms and 110 sub-contractors making components were engaged on the work. Twelve types of machines were produced and the largest output in one month was attained in October 1918, with an output of 292 machines. Clyde firms also contributed to the output of airships. R 34 was built by Messrs. Beardmore & Co.

The records of some single firms and units in the production of various kinds of munitions were remarkable. Thus the Singer

Manufacturing Co., engaged before the war in sewing-machine manufacture, turned with great success not only to the production of shell, but to aeroplanes, tank parts, bombs, and grenades; and piled up, for the last three years of the war, an output [1] which included about 750,000 shells of various calibres for the Ministry of Munitions (in addition to shell for the Admiralty); over 2,600,000 fuses; about 155½ million fuse parts; 5,700,000. rifle parts, and about 2 million hand grenades, bombs, gun parts, &c. The output of the National Projectile Factory at Georgetown amounted to

Shells filled	19,000,000
Cartridges filled	27,000,000
Other components finished	33,000,000

and the total value of the finished ammunition handed over by the factory to the Army Ordnance Department was £66,000,000 Twelve thousand workers (almost exclusively women) were employed in this factory.

It is impossible to make any complete summary of the Scottish munitions output, but the following table gives in round numbers the total production of certain kinds of munitions in Scotland (outside of the regular armament firms) from the establishment of the Ministry of Munitions to the date of the Armistice:

Shells: 18 pdr. to 4·5″	5,000,000
,, 60 pdr. to 15″	7,000,000
Total shells produced	12,000,000
(Of which were machined on the east of Scotland)	4,000,000
Weight of shells produced	400,000 tons
Copper shell bands	7,000,000
Rolled copper plate	9,000 tons
Fuses	4,000,000
Shell components (10 millions from east coast)	55,000,000
Large Admiralty mines	15,000
Trench warfare supplies (15 per cent. on east coast)	70,000 tons
9·45 trench howitzers on carriage	500 sets
Shell-filling (weekly output=7,000 tons)	19,000,000

The production of such quantities of war materials indicates that the problems of conversion to war-time production had been

[1] For detail see Appendix XII, p. 208.

fairly successfully solved in the West of Scotland. It suggests, moreover, that the engineering industries were likely to be left greatly increased in their productive capacity and almost completely revolutionized in their methods and processes after the war had finished. Standardization, mass production, and repetitive processes which had been the features of war-time engineering, and which had been made possible by the extensive introduction of automatic machines and special machine tools, might have been expected to continue after the war.

But two things happened to prevent the complete fulfilment of this expectation. In the first place, the promise made to the Trade Unions during the war, that dilution, being merely a war-time measure, would not be allowed to prejudice the position of the Trade Unions after the war had ceased, was implemented by the Restoration of Pre-war Practices Act, 1919, the terms of which, contrary to general prophecy, were carried out with little opposition on the part of the employers.[1] Pre-war practices were restored, dilution ceased, and women and unskilled men returned to their pre-war occupations in the majority of cases ; although more women are now employed in the engineering industries of the West of Scotland than was the case in 1913, and although some of the men taken into munitions during the war remained to work particular types of machines. But the result was that, even if employers had wanted it, the continuance of mass production by repetitive processes on more or less automatic machines would have been impossible.

But, in the second place, such a desire does not seem to have been by any means general. In part this was due to the fact that the new plant installed during the munitions period had in many cases worn out and that the uncertainty of the industrial future prevented a development on mass production lines. In part also, the necessity of restoring pre-war practices and the consequent necessity of reversion to older methods was foreseen. Again the actual situation, an immediate demand for great quantities of ordinary engineering products, made

[1] See p. 155.

practical the desire of employers to reinstate their former skilled men as far as possible. Hence there was no such spectacular development in the industries as might have been expected.

At the same time the experiences and the developments during the war period were not without their results. In the first place, many West of Scotland firms had added considerably to their premises for the purpose of manufacturing munitions. When the need ceased, these premises were available for other purposes, and the rapid expansion of demands for engineering products in 1919 caused them to be utilized for peace-time production.

Motor-car manufacture was undertaken by several firms which had not formerly adventured in that direction, the output of agricultural machinery, stimulated by the agricultural legislation, was increased, and promised well for the future, and the production of machinery and machine tools was taken up again with renewed vigour.

Secondly, standardization did remain. Its advantages had become more widely apparent than ever before, and while it was not applied immediately on any extensive scale in the production of ordinary peace-time products, its development is a matter of time and adaptation. Trade depression has retarded experiment, but with its revival, the advance of methods of standardization in engineering is assured. Moreover, the experience of the war period had its indirect effects. Mass production had necessitated more careful factory designing, closer inspection of products, more accurate costing systems, and better shop organization than in pre-war times. These persist.

In general, therefore, while there has been no revolutionary upheaval in the engineering industries, the war has left them with a greatly increased productive capacity and a greater readiness to consider new methods, which are bound to have their effect.

CHAPTER VI

OTHER INDUSTRIES

The engineering group of industries : locomotive building, iron and steel structural work, boiler making, electrical engineering, agricultural machinery ; chemicals ; textiles ; tobacco.

While it is true to say that practically the whole of the industrial activity of the Clyde Valley was diverted to the service of the war on sea or land, the contribution was not equally direct in every case, and it remains to indicate briefly in this chapter the position of some of those industries which were not wholly drawn into the manufacture of munitions or the building of ships.

In the Engineering group, as already indicated, there were few firms which had not been called upon to add to the output of warlike material, in the shape of shells, guns and gun components, parts of ships, aeroplanes or tanks. Where their activities were not wholly employed in these directions, the establishments were frequently engaged on the manufacture of contributory products, and the amount of productive capacity which could be devoted to ordinary peace-time output was left considerably curtailed. This was a matter of more consequence in some cases than in others ; in particular, it was felt that where pre-war production had been chiefly for export, some leeway would remain to be made up when hostilities should cease. Even in such cases, however, there was sometimes an element of compensation in the experience gained from the solution of war-time problems, and in the discoveries of new methods and processes, in which the difficulties of the time resulted.

One of the most important and progressive branches of general engineering in the West of Scotland before the war was the production of locomotives and general railway rolling stock. The number of workers employed in the industry in Scotland at

the end of July 1914 was 25,000, a number greater by 500 than in the previous year, and by 5,000 than in 1910. The majority of these workers were employed in the West of Scotland. The steady progress of the industry which is thus indicated, promised to continue in 1914, and orders from India and the Argentine and other distant markets, both British and foreign, were numerous.

The outbreak of war disturbed the industry, especially in its export side, and led in time to a great diversion of its activities. The usual difficulties presented themselves. On the one hand, both labour and materials were difficult to obtain. Many men enlisted; and while their places were to some extent filled, in the first instance by men from depressed industries (a source that was soon exhausted), and later by women (the majority of whom were employed not on actual locomotive work, but on the shell work to which many of the establishments turned), the net result at the date of the Armistice was a fall in the numbers employed as compared with 1914. The scarcity of materials was largely attributable to the fact that for some time locomotive construction was not fully scheduled as war work, and the firms therefore did not receive priority of supplies. On the other hand, export was inevitably curtailed, and the home demand for new construction and for repairs slackened off.

Statistics of output and employment in the industry generally are not available for the war period. But the detailed information as to the activities of the largest British locomotive company may be taken as indicative of the conditions in the industry as a whole.

The North British Locomotive Company at the beginning of August 1914 employed 8,347 men out of a total of over 25,000 (including those in railway workshops) employed in the industry in Scotland. The company owned three large works, The Atlas Works, Queen's Park, and Hyde Park; all of which before the war were almost wholly engaged in the construction and repair of locomotives. At the end of the war (during which some extensions took place) the productive capacity of the works was 800 main-line locomotives per annum.

During the war years part of the activity of the company was diverted to the production of definite war material. Two new buildings which were in the course of erection at the outbreak of the war, and were designed for special departments of their locomotive workshops, were utilized for munitions: one, known as the 'Mons' Factory, being allocated to the production of shells; the other, the 'Marne' Factory, to the production of shell forgings. In the course of the war the 'Mons' Factory turned out 864,551 shells, of which 146,776 were 8″ H.E., 387,113 were 18 pdrs., 81,548 6″ gun shells, and 249,114 6″ howitzer shells. The forgings for the 8″ and 6″ shells, amounting to 477,438 in all, were produced in the 'Marne' Factory, but the 18 pdr. shells were turned from the bar. In addition to shells, the 'Marne' Factory was used for the production of sea-mines, of which it produced 6,000 of the welded type in addition to many riveted cases. These works also turned out British pill-boxes and machine-gun casemates. All the work on the sea-mines, and the bulk of the work on shells in the 'Mons' Factory, was performed by women, of whom 1,381 were so employed in October 1918.

The production of war material was not confined to the shell factories. In the main locomotive engine works of the company, activities were diverted from the normal work to the construction of aeroplanes (of the B.E. 2C type), which were built from finished parts supplied by various makers; trench howitzer carriages and spare parts; torpedo tubes (double and triple); tanks of the Medium B and Mark VIII types; 18 pdr. Q.F. gun carriages, and many other kinds of war material. Some of this work involved the construction at the works of special types of machines, the delivery of which from other works would have necessitated too great delay. Machine tools and lathes were also supplied by the company to other munition works.

But while the company was thus engaged on abnormal production, the most important part of its output still consisted in locomotives, of which it produced during the period 1914–19 a total of 1,412. Of these, 695 were produced for use in the war

area, about 380 going to France, and 300 being built for the Ministry of Munitions for overseas service. The remaining 717 locomotives delivered during the war period typify the normal trade of the works. Some were built for home use ; many were exported to India, China, Australia, South America, and Spain.

At the outbreak of the war, as already indicated, the number of employees of the company was 8,347. In the course of the war 3,120 workers were lost through enlistment. These were replaced by women to the number of 1,781 and by men from other industries to the number of about 500. The total number of workers employed at the Armistice, male and female, was 7,519. Of the women, 1,381 were employed in the shell factories, which utilized also the services of men, both for forging, in the 'Marne' Factory, and as tool-setters and foremen in the 'Mons' Factory. Women were also utilized as diluted labour in a great variety of occupations in the locomotive engine works.

This one locomotive company, therefore, which employed at the outbreak of war about one-third of the total number of locomotive workers in Scotland, produced during the war period in addition to large quantities of other war material :

Locomotives	1,412
Shells : 8″	146,776
,, 18 pdr.	387,113
,, 6″ gun	81,548
,, 6″ howitzer . . .	249,114

In iron and steel structural work, Scotland occupied an important place in the years before the war. According to the returns of the Census of Production,[1] the value of the output of the industry was in 1917 just over £8,000,000, or about 20 per cent. of the total for the United Kingdom ; and the bulk of this work was localized in the West of Scotland. The products of the industry, bridges, iron and steel building materials, &c., found their destination not only in this country but in many distant parts of the world, and contributed to the development of India, China, and South Africa. Naturally the ordinary export fell off during the war. The normal home

[1] *Census of Production, Final Report* (Cd. 6320), 1912, p. 190.

demand also was curtailed, owing in the first instance to the inevitable retardation of ordinary developments, and later to Government restrictions on building. The activities of the industry, however, did not cease but were diverted, for both directly and indirectly the energies of the structural engineers were essential to the conduct of the war. Even in the early months the Government demand for hutments, aeroplane sheds, and other erections, was sufficient to absorb much of the available productive capacity; and in the enlargement of docks, and the erection of new engineering shops and the extension of existing ones, required for the increased output of shells and ships, the remaining capacity was largely utilized. During the rest of the war period there were three main directions in which the structural firms added to the supplies of war equipment. With the recognition during 1915 of the enormous shell output which would be required if the war were to be successfully ended, came the building of national projectile factories and the rapid enlargement of many of those in private ownership. Secondly, in 1916 and 1917, when the solution of the problem of munitions supply was seen to lie farther back in the stages of production, a programme of extensions of steel factories was inaugurated which called for the activities of the structural engineers. Lastly, when the standard ship programme got under way in 1917, many of the structural firms co-operated with the shipyards, and turned out standard sections for cargo steamers.

Throughout the whole period the industry was hampered in its output through lack of steel. This was partly the natural consequence of the pre-occupation of the steel works on the production of shell steel, and the conversion of many mills which had formerly supplied the industry with joists, &c., to the rolling of billets for shell. Partly it was due to the allocation of the existing supplies of steel to their most important purposes and the consequent low place in the scale of priority occupied by structural work. Again, the enormous demand of the Admiralty for steel plates meant a shortage for structural work. A substitute was for some purposes found in timber, but with the passing months the supplies of timber also fell away.

Discard shell steel, which was tried, proved unsatisfactory for important structural purposes. The opening of the Bessemer Steel plant at Colville's Glengarnock works in 1917 furnished a material which proved suitable, and this along with the steel supplied under priority had to be made sufficient for the purposes of the industry.

The Clyde boiler-making industry occupied a deservedly high place in the pre-war years. In 1917 [1] the value of the products of the industry amounted to over £2,000,000, more than 50 per cent. of the total output of the United Kingdom. The work on the Clyde was partly done by special boiler-making firms, partly by marine-engineering establishments. The bulk of the boilers went into ships built on the Clyde, or into land engines or power plant in various parts of the country; but there was also an important export trade both with the colonies and with foreign countries. Practically every type of boiler was produced in the Clyde workshops, but the superiority of the water-tube boilers for many purposes as compared with the ordinary Scottish boiler and the Lancashire boiler had brought the former specially into prominence in the years just prior to the war. The whole industry was being to some extent threatened by the developments in internal combustion engines, as well as by the increased use of electricity for motive purposes; but the Clyde suffered perhaps less than most districts on this account through the great expansion in shipbuilding and engineering which was taking place concurrently. On the other hand the use of oil as fuel which had commenced, for naval purposes principally, before the war, and which, owing to the scarcity and high cost of coal, was applied during the war period to liners and cargo steamers as well as to land engines, necessitated modifications in the build of boilers, and great advances in that connexion were made in the Clyde boiler works. In auxiliary industries progress was considerable. The cutting off of Germany, whence, before the war, came many of the solid-drawn weldless steel tubes used in the Clyde boilers,[2] led

[1] *Census of Production, Final Report* (Cd. 6320), 1912, p. 190.
[2] *Statist*, xciv, p. 991.

to the successful development of the manufacture of boiler tubes in the area; and the use of oil-fuel developed the production of oil-burners. Like all other metal industries, boiler-making suffered for lack of material; and the specialized boiler-works not attached to shipyards, lost much labour, which was attracted by the high wages on boiler-making for naval work offered by the shipbuilders. High freights and Government restrictions cut off the export market, but the way to Italy and France continued open, and many Clyde boilers went to those countries during the war. While figures for the output of the industry in recent times are not available, it is safe to say that the Clyde maintained its comparative position at the end of the war.

The special contribution of the electrical engineering trades to the necessities of war-time, apart from their actual output of munitions, gun parts, &c., lay in their provision of electrical motors and generating plant which were required if the rapid turn-over of the ordinary engineering shops to munition work was to be effected. This demand was not a merely temporary one, restricted to the early period, but grew with the increasing need for munitions and the extension and enlargement of munition works. The progressive application of electricity in many directions, such as in steel furnaces, in the propulsion of ships, and in the welding processes in engineering trades made a demand which to some extent compensated for the cutting off of the export trade; and throughout the country the numerous military camps required electric lighting which called on the work of the electrical engineers. The provision of a water supply to these camps, as well to the Admiralty dockyards and to National Factories, also utilized the services of the manufacturers of cast-iron pipes, whose normal buyers, the local councils, had for the sake of economy contracted their expenditure, postponing developments in municipal undertakings till the post-war period. The makers of agriculture machinery, again, found their exports diminishing; but they were soon called upon to provide labour-saving machinery and implements to compensate for the lack of labour on the farms. In this, however, they did not have

the field entirely to themselves, as American makers, having lost their continental markets, turned their attention to this country. The inclusion of increased food production in the Government war-time programme led to an increased breaking up of land and a demand for ploughs, harrows, &c., which at various times outran the supply even though augmented by imports from America. There was some advance in the use of tractors for ploughing, but the success of the British makers in this direction was not marked.

It is a matter of general recognition that modern warfare is chiefly the business of the engineer and the chemist, and in the Great War the chemist rapidly climbed into prominence with the development of new methods of warfare. Hence the chemical industries, which form an important group in the West of Scotland, were in a large measure diverted from commercial to military purposes in the period under review. But industrial and military chemistry are not distantly related, since products formerly used to promote life and well-being were with little modification turned to purposes of destruction; and for that reason the diversion of these industries under the new circumstances involved relatively few problems of economic and industrial organization. Consequently these industries did not suffer even the brief preliminary period of disturbance which was general in the early months of the war.[1] Explosive works came directly under the control of the Government (ultimately under the Ministry of Munitions), and were directly engaged in the manufacture of munitions. Firms dealing in products farther back in the stages of production, while not so directly meeting the War Office demands, were also controlled, and their products used for the same ultimate purpose.

For the whole chemical industry the war was a time of expansion and increased production. But this applies less to

[1] *Report of Board of Trade on the State of Employment in the U.K. in October 1914* (Cd. 7703), 1914, p. 38. More persons were employed in the chemical industries of Scotland in October than in July 1914. Most other industries had suffered a contraction in employment.

the fine chemicals, in which advance was slow in spite of the high hopes entertained. In heavy chemicals the progress was rapid and continuous. On this side, Britain was supreme before the war, and the threatened German challenge to Britain's supremacy was at any rate for the time being cut short in 1914. With the loss of German supplies, and the great increase in the world's demand for chemicals, the opportunity came for the British makers; and in spite of the shortage of labour, and the enormous home demand for war purposes, it is clear that the British industry even increased its hold on foreign markets during the war period. At the same time, special stimulus was given to the trades—both heavy and light—by Government assistance. The output of sulphuric acid was directly aided by the Ministry of Munitions, and financial help was given for the furtherance of scientific research. Co-operation between the firms themselves and between the industrial and the scientific sides of chemistry developed, and by the end of the war the industry was in a position to take an increasing part in supplying the needs of foreign markets. In these advances the Scottish industries shared.

The manufacture of sulphate of ammonia was increasing for some years prior to the war, and of the total production some 75 per cent. left the country as exports. During the war the increase did not continue; but the industry was nevertheless able to maintain its pre-war level. In 1916 434,000 tons were produced as compared with 432,000 tons in 1913, and this in spite of a shortage of labour and the feared scarcity of sulphuric acid. In the first year of the war, exports showed little decline, being 313,877 tons in 1914 as against 324,704 in 1913, a fact largely due to increased demands from Holland, whose supply from Germany was cut off. But America and Japan were taking less, and with the imposition of Government restrictions, exports fell to 250,000 in 1916. So far, however, as maintenance of employment was concerned, this mattered little, for the war had increased demand in other directions, first in connexion with the manufacture of munitions, and second in connexion with agriculture. In the latter case, the need for intensive cultivation

which was kept prominently before the farmers by the Board of Agriculture necessitated the use of fertilizers, and since less nitrate of soda was available, the agricultural demand for sulphate of ammonia was stimulated. In 1917 there was formed the British Sulphate of Ammonia Federation, dealing in 97 per cent. of the total output.

Sulphate of ammonia was formerly an important part of the Scottish mineral oil trade, being responsible for a value of £590,000 out of a total output of the Scottish Oil Shale Works of £2,014,000.[1] The other products of the Shale Oil Works (which are confined to Scotland) include for the year 1907, Petroleum of various kinds, £793,000; Paraffin Wax and Candles, £601,000; Lubricating greases, £13,000; and other products, £17,000. During the war period the advance in the production of these products was steady, although the exports fell off considerably.[2]

EXPORTS FOR 11 MONTHS ENDED NOVEMBER

	1913	*1918*	*1919*	*1920*
	Tons	*Tons*	*Tons*	*Tons*
Paraffin wax .	15,200	1,100	8,500	11,500
Candles . .	11,700	1,900	9,500	11,700

Nevertheless, the end of the war saw the Scottish Companies in some difficulty, alleged to be due to increasing costs of production arising from dearer chemicals, increased wages, and a shorter working week; and the five companies accepted an offer of the Anglo-Persian Oil Company in 1919, and sold their ordinary shares to a new company, the Scottish Oils, Ltd., which became the central selling agency, with an office in Glasgow.

In the pre-war year the United Kingdom consumed 1,732,000 tons of sugar of all kinds, including 1,523,600 tons of refined sugar. Of the latter, 958,600 tons were imported and the

[1] *First Census of Production, Final Report* (Cd. 6320), 1912, p. 50.
[2] *Glasgow Herald Supplement*, 1920, p. 42.

balance refined in the three centres, Liverpool, London, and Greenock on the Clyde. According to the Census of Production, the sugar refined in Scotland in 1907 was equal to one-quarter of that of the United Kingdom, amounting to 2,797,000 cwt. out of a total of 11,300,000 cwt.;[1] and the number of persons employed was 1,182, out of a total of 6,501. Raw sugar imported at Greenock amounted in 1913 to 4,319,000 cwt., the bulk of which was beet from Germany.[2] For the whole of the United Kingdom the proportion of beet to other sugar imports was high, as the following table shows :[3]

SUGAR IMPORTS INTO U.K., 1913

Variety	*Imports (cwt.)*
Refined	18,450,897
Unrefined Beet	13,542,112
,, Cane and other sorts	7,392,181
	39,385,190

Of the total quantity of sugar consumed in the United Kingdom 80 per cent. was beet sugar, and of this 68 per cent. came from Germany and Austria.[4] The cutting off of these sources of supply, and the fear of a shortage all round, led to the formation of the Government Commission on Sugar Supplies, which became the sole importer, buying up immediately the whole of the surplus stock of Cuban sugar as well as supplies from Mauritius, Java, and South America. It also controlled the refineries, supplying them with raw sugar from the stocks so acquired, controlling the price of their products, and restricting their profits. The need of this control was great. By 1914 imports of beet had fallen from 13½ million cwt. to considerably under 5 millions. At the end of August 1914 the stores in the bonded warehouses were less than one-half of what they had been a year previously, and were not sufficient for one month's consumption.[5] In 1915 and 1916 the imports of beet had

[1] *Census of Production, Final Report* (Cd. 6320), 1912, pp. 521–2.

[2] *Trade of U.K. with Foreign Countries and British Possessions*, 1917, vol. ii, p. 139.

[3] *Stat. Abs. of U.K.* (Cmd. 1246), 1921, p. 135.

[4] J. W. Robertson Scott, ' Opportunities of the War,' *Nineteenth Century and After*, October 1914.

[5] *Increase of Prices of Commodities since the beginning of the War*, Cd. 8483, p. 20.

entirely disappeared, and the country had to depend on the constantly declining quantities of refined sugar imported and on the supplies of cane sugar which fortunately increased fairly rapidly.

Before the war, Greenock had dealt with something like 4,600,000 to 4,800,000 cwt. of sugar annually. In spite of the elimination of beet, the output was maintained during the war, a fact which is reflected in the imports of unrefined sugar.[1]

IMPORTS OF UNREFINED SUGAR INTO GREENOCK

(Cwt. in thousands)

1913	*1914*	*1915*	*1916*	*1917*	*1918*
4,319	3,832	3,150	4,396	4,818	4,977

Meantime the United Kingdom consumption of sugar under rationing fell away to 1,111,000 tons in 1918. Nevertheless, production continued, and the Scottish refineries maintained their relative importance.

MELTINGS OF RAW SUGAR[2]

Nine months ended Sept.	*London, Liverpool, Greenock*	*Greenock*	*Greenock*
	Tons	*Tons*	*Percentage*
1917 . .	642,229	166,942	26
1918 . .	707,046	173,117	24·4
1919 . .	773,719	190,979	24·6

The textile trades of the West of Scotland before the war were varied in character; but since few of them turned out products which could be directly used for war purposes, the outbreak of hostilities involved a considerable change-over in the nature and organization of the industry. In the cotton trade proper was included the production of art muslins, fancy and decorative goods, and lace curtains, employing in 1914 some 5,000 workers in the West of Scotland and yielding an output of

[1] *Annual Statement, Trade of U.K.*, 1917 and 1918.

[2] *Statist*, xciv, p. 996.

the value of about one million sterling. The mixed trade comprised the manufacture of fancy cotton dress goods, fine cotton shirtings, and ginghams. In addition there was the Paisley thread industry employing 10,000 workers; and there was also a considerable output of carpets and fancy flannels. In 1913 the exports from Glasgow consisted of [1]

Cotton piece goods	287,963,300 yards
Woollen and worsted piece goods .	3,608,500 ,,

Exports went chiefly to Canada, S. America, and India, as well as to the Continent.

The beginning of the war brought a difficult time for textiles. For one thing, the chief source of the yarn for the fancy flannel trade, namely Belgium (Verviers), was immediately cut off, and the trade had to depend during the whole period on the yarns of Yorkshire and Lancashire. The supplies forthcoming from these sources became more irregular as time passed. Even when the supplies of raw wool were abundant in the first year of the war the pressure on the spinners made deliveries uncertain; and later, with the curtailment of supplies, the tremendous demands for Army stores, and the consequent increase of Government restrictions, the position became rapidly worse. Early in 1916 the War Office Contracts Department, under the Defence of the Realm Act, took control of production and acquired the product of factories at 'conversion costs', claiming 70 to 80 per cent. of the output of yarns. In May 1916 the Government purchased the entire home clip of wool and later the Australian clip, and thereafter the industry came more and more under control. In 1917 the Wool Control Board, representative of the Government and of manufacturers and workers in the industry, was set up in response to an outcry against bureaucracy. But policy was not thereby changed and the control of output and distribution remained as great as before. The result of these changes was a great increase in prices, and woollen yarns which could be bought at 3*s.* a lb. in 1914 were in 1919 23*s.* 6*d.*

[1] *Annual Statement of Trade of U.K.* (Cd. 9136), 1918, vol. ii, p. 136.

No such restrictions were imposed on the cotton industry, which remained free till 1917 and was only brought under control through the shortage of raw cotton due to tonnage scarcity. The shortage was serious. By 1916 Glasgow's imports of raw cotton were down to 4,438 centals (of 100 lb.). Government intervention took the form first of a prohibition of speculative dealings, and second, of the Raw Cotton Order of June 1917, which prohibited the purchase of raw cotton except under licence. The establishment of the Cotton Control Board consisting of employers, merchants, Trade Unionists, and representatives of the Board of Trade followed, and the first work of the Board was to permit unrestricted purchases abroad while retaining the limitation of purchases in this country. Control was next extended to the work of production, and in August 1917 the Cotton (Restriction of Output) Order limited the percentage of spindles to be run on work other than Government contracts to 60 per cent., subject to permission to exceed the limit on payment of a levy for excess spindles, the levy to be used for the payment of unemployment benefit to the workers adversely affected by the restriction. In 1917 Glasgow's imports of raw cotton rose to 173,000 centals, and in 1918 to 572,000.

Meantime the home demand for the products of the industry was gradually affected. The general unemployment in the early stages of the war caused enforced economy in dress and in the purchase of decorative goods such as curtains and lace. On the other hand, as unemployment ceased and the large population in the West of Scotland became more and more engaged in the highly paid war-time industries, the increased earnings of the people began to be spent more lavishly, and the home demand for the products of the textiles improved. While, therefore, 1914 was a bad year in all departments of the cotton industry, particularly in fancy goods and carpets, the 1915 home demand was considerably better; and in flannels of course the demand was abnormal. In the later years the difficulty was not the lack of home demand, but the impossibility of supplying it owing to the shortage of materials and the pre-occupation of the industry in other directions.

The war had a varied influence on the export trade. In the first place the Continental market was lost, and while the Border trades (from which Germany had been a large buyer) were most seriously affected, the West of Scotland trade did not escape. But the fact that French mills were in German hands diverted a considerable demand to this country, and by 1915 the demands from our Allies for flannels and woollens were becoming very great. This pressure continued, but the lack of tonnage and of shipping facilities to the French ports curtailed the possible trade. In non-European countries, if we except America, the general result of the war conditions and of the high prices and high freights which followed, was to divert a good deal of trade from the West of Scotland high-quality goods to the cheaper Lancashire manufactures or to the products of America. This was so in the Canadian market, and in that of South America, into which the U.S.A. made inroads. America herself, on the other hand, prospering under war conditions, increased her demands for the textile products of the West of Scotland. In the European market Scandinavia was the best buyer, and the French demand continued good until restrictions were placed on her imports.

So far, therefore, as the normal trade was concerned, while on the whole there was plenty of demand, restrictions and lack of transport facilities prevented advantage being taken of the situation. Partly for that reason, and partly on account of the control of Government, the textile factories of the district turned more and more to the manufacture of goods for war purposes. In some cases the change over was fairly easy. Fancy flannel mills and carpet mills, in which the machinery was suitable, commenced almost immediately without undue friction to produce army blankets and flannel shirtings, the demand for which continued to be enormous. In other cases the change-over was by no means simple; but sooner or later even mills making coloured cotton goods turned to the war products.

For meeting the larger home and allied demand for civilian goods as well as the special needs of the army, the chief difficulty

was to procure sufficient labour. Even in 1914 the demand for labour in the flannel trade was in excess of the supply, and with the passing months the scarcity became more marked. The male workers in the industry joined the Army in large numbers; and the female labour was attracted into munitions by the higher wages to be received there; and in the West of Scotland this industry indeed formed one of the chief sources of labour for dilution purposes in the engineering trades. By 1915 the shortage had resulted in the fact that few mills were able to utilize more than two-thirds of their productive capacity.

The following table shows the course of exports during the war years, and carries on the story into the first post-war year:

EXPORTS OF TEXTILES FROM GLASGOW, INCLUDING BOWLING[1]
(In thousands)

	1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
Cotton piece goods	287,963	231,136	151,591	213,053	216,157	156,707	164,203
Woollen goods .	3,608	3,413	2,326	4,221	4,729	1,654	2,222

It is evident that the year following the war was one in which the industry regained some of its foreign orders. But in 1920 came a complete collapse, emphasized by the failure of the home demand as well as that of the European and other markets.

There is not much available information on which to base an account of the tobacco trade of the West of Scotland during the war period. Imports of unmanufactured tobacco into Glasgow show remarkable variations, representative figures being $4\frac{1}{2}$ million lb. in 1913, about 19 million lb. in 1915, one million lb. in 1917, and $21\frac{1}{3}$ million lb. in 1919. But these figures reflect, not the needs of the manufacturing industry, but the varying policy of the Government departments with regard to imports and licences. From confidential data supplied from an authoritative source, however, it is possible to state that the manufacture of tobacco in the West of Scotland was maintained, and that in spite of the pre-occupations of the district in engineer-

[1] *Annual Statement, Trade of U.K.*, 1917 and 1919.

ing, ship-building, and munitions, the tobacco manufacturers had in 1917 and 1918 a greater volume of output than in 1914, and that the first post-war year showed an advance of about 50 per cent. on the best year of the war period.

The most noteworthy fact which appears from a review of the various industrial activities of the Clyde area during the war period is that, in spite of the reduction of the normal labour available for the production of peace-time products, through the enlistment of some, and the employment of others on work of a purely war-time character, the output of the ordinary products was nevertheless so well maintained. The explanation lies partly in the success of dilution, which enabled an abnormal production of war products to be maintained even with a reduced supply of skilled labour; and partly in the fact that such a large additional element of labour was recruited from the wives and female relatives of the men who had enlisted. This latter fact also supplies the explanation of the remarkable lack of disturbance in industry when the war ended and the demobilized men returned to take up their usual occupations. What happened, in the Glasgow area at least, was that a large proportion of the women quietly resumed their domestic occupations and the men went back into the jobs which had been ' kept warm ' for them by their women-folks.

CHAPTER VII

THE TRADE OF THE CLYDE

The harbour of Glasgow; imports and exports, 1913 and 1919; increase in importance of the Clyde trade during the war; coastwise trade; effects of the submarine campaigns; nationality of vessels using the port; trade with British possessions and with foreign countries; maintenance of food supplies and of raw materials during the war; statistics of chief imports and exports during the period.

THE harbour of Glasgow was before the war the gate through which the bulk of the products of the West of Scotland passed out to the world. It had in recent years been improved to meet the growing needs of the overseas trade, and it was the intention of the Clyde Trust, which had jurisdiction over eighteen miles of river from Glasgow to the firth, to develop the harbour by additions at Barrhead and Renfrew, extending to 400 acres. Parliamentary sanction had been gained for the greater part of this scheme, which was justified by the progressive expansion of trade in preceding years, but which was checked by the outbreak of war.

The course of the trade of the Clyde was seriously disturbed by the conditions accompanying the war—the modification of the West of Scotland industries, the interference with shipping, and the restrictions imposed by the Government on commerce. Temporarily the disturbance affected both the volume and the character of the trade; but while the volume of trade has not yet regained anything like its pre-war dimensions, it would appear that the permanent effect on its character has been slight.

In the year ended 30th June 1913, the tonnage of goods passing through the port of Glasgow (both foreign and coastwise) amounted to 10,418,324 tons, of which 4,040,945 tons were imports and 6,377,379 exports.[1] By 1919 the total had sunk to 6,941,997 tons, made up of 3,606,351 tons of imports and

[1] *Clyde Navigation, Annual Statistics*, 1913, p. 44.

3,335,646 of exports.[1] The net shrinkage as compared with 1913 was thus 33 per cent., the shrinkage in imports being about 11 per cent., and in exports 48 per cent. The actual figures over the whole course of years are given in the following table :

TRADE OF GLASGOW [2]

Year ended 30th June	*Tonnage of goods*
1913	10,418,324
1914	10,067,502
1915	9,579,961
1916	9,710,969
1917	8,433,437
1918	7,973,613
1919	6,941,997
1920	7,028,020
1921	5,821,839

During the same period the trade of the United Kingdom of course underwent a similar reduction, and a comparison of values indicates that the war left Glasgow with a greater proportion of the country's trade than it had before the war, and that during the war years themselves, export and import trade went on more steadily than was the case in many other ports. Taking overseas trade alone, the total value of Glasgow's exports and imports in 1913 was about 54¾ millions, or 3·9 per cent. of the total trade of the United Kingdom (exports being 2·4 per cent., and imports 5·7 per cent.). By 1919 Glasgow was doing 4·2 per cent. of the total (exports = 3·9 per cent. ; imports = 4·7 per cent.). The course of changes over the period was as shown in the tables on page 131.[3]

Thus by 1919, while the volume of trade passing through Glasgow had shrunk, it constituted a greater proportion of the total trade of the country than in 1913. The relative increase, however, was confined to imports ; exports were proportionately smaller than in the former year.

[1] *Clyde Navigation, Annual Statistics*, 1919, p. 44. [2] *Ibid.*, 1913–21.

[3] *Annual Statement Trade of U.K. with British Possessions and Foreign Countries*, 1917 (Cmd. 1093) and 1919 (Cmd. 9136).

VALUE OF IMPORTS OF THE U.K. AND OF GLASGOW, INCLUDING BOWLING

(In thousand pounds)

	1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
Glasgow .	18,485	16,870	26,568	33,804	40,343	70,420	64,190
U.K. .	768,385	696,635	851,893	948,506	1,064,145	1,316,151	1,626,156
Glasgow's percentage	2·4	2·4	3·1	3·5	3·7	5·3	3·9

VALUE OF TOTAL EXPORTS OF U.K. AND OF GLASGOW [1]

(In thousand pounds)

	1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
Glasgow . .	36,271	31,850	30,341	42,075	36,711	26,117	46,059
U.K. . .	534,820	526,196	482,931	603,846	596,757	532,364	963,385
Glasgow's percentage . .	5·7	6	6·2	6·1	6·1	4·9	4·7

In addition to an overseas trade, Glasgow was also engaged in the coastwise trade (including cross-channel trade to Ireland) though to a less extent than many other ports. In 1913, out of a total trade of 10,418,824 tons, the coastwise trade accounted for 2,829,222 tons or 27 per cent.[2] During the war [3] it declined in volume to 1,942,618 tons (in 1919), a figure, however, which represented a comparative rise in importance. The net result was thus a decline which appeared chiefly in foreign exports, and which was accompanied by an increase in the comparative importance of the coastwise trade. The table at the top of page 132 summarizes these facts.

Considering the many circumstances which combined at the time to make overseas trade difficult, the results are not surprising. Among the causes which need be only briefly indicated were the congestion at the ports, which became a

[1] Including produce and manufactures of the U.K., of British possessions, and of foreign countries.

[2] *Clyde Navigation, Annual Statistics*, 1914, p. 44.

[3] *Ibid.*, 1919, p. 44.

OVERSEAS AND COASTWISE TRADE OF GLASGOW

Year ended	*Foreign*	*Coastwise*	*Total*
30th June 1913	*Tons*	*Tons*	*Tons*
Imports	2,807,872	1,233,073	4,040,945
Exports	4,781,230	1,596,149	6,377,379
Total 1913 . .	7,589,102	2,829,222	10,418,324
30th June 1919			
Imports	2,841,294	765,057	3,606,351
Exports	2,158,085	1,177,561	3,335,646
Total 1919 . .	4,999,379	1,942,618	6,941,997

serious matter, involving at times delays of as much as five or six weeks before a boat could be discharged ; the high price of coal for bunkers ; and the reduction of the British mercantile marine through enemy action and through requisition for war purposes. The submarine campaign, it is true, was directed in the first half of the war, mainly against British shipping, leaving that of neutrals unmolested. But neutral vessels could not overtake the work involved in British foreign trade, which in normal times depended to so great an extent on vessels sailing under the British flag. In the case of Glasgow, for instance, 89 per cent. both of the vessels arriving and of those departing with cargoes in 1913 were British, as is seen in the following figures :

NUMBER AND TONNAGE OF VESSELS ARRIVING AND DEPARTING WITH CARGOES AT GLASGOW IN 1913 ; DISTINGUISHING NATIONALITY OF VESSELS[1]

	British		*Foreign*		*British percentage*
	Vessels	*Tons*	*Vessels*	*Tons*	
Arrivals .	1,033	2,409,373	255	290,483	89
Departures .	1,562	3,713,502	402	426,703	89

[1] *Annual Statement of Navigation and Shipping of the U.K.*, Cmd. 1913. Official statistics give, in the case of particular ports, only the vessels arrived and departed, and not the vessels entered and cleared. But the former afford a rough indication of the place of British vessels in the trade of the port.

The first submarine campaign resulted in a decline in total arrivals and departures, accompanied by relatively increasing contribution by neutrals to the carriage of goods to and from British ports. But the second campaign, beginning in February 1917, and directed against all vessels trading with us, affected neutrals also, with the ultimate result that in 1918 arrivals and departures at Glasgow stood as follows :

NUMBER AND TONNAGE OF VESSELS ARRIVING AND DEPARTING WITH CARGOES AT GLASGOW IN 1918; DISTINGUISHING NATIONALITY OF VESSELS[1]

	British		*Foreign*		*Total*		*British percentage*
	Vessels	*Tons*	*Vessels*	*Tons*	*Vessels*	*Tons*	
Arrivals .	578	1,605,077	150	187,830	728	1,792,907	79
Departures	455	1,137,530	247	235,858	702	1,373,388	65

To these causes, which affected the foreign trade of the country as a whole, we must add in the case of the West of Scotland the great change which took place in the objects to which the industrial activities were directed. Here, more than elsewhere, was the whole energy turned to the one end of meeting war needs. The special character of the industries of the Clyde lent itself to this modification : and the works producing coal, iron, steel, ships, and engineering products were made to subserve the one essential purpose. The whole district was therefore producing during the period almost exclusively for home and war consumption, and its surplus for export was small.

Yet, during the period, the trade of the West of Scotland increased relatively to that of the whole country, a fact to be assigned to its geographical position, which naturally affected shipping and freights, and helped to determine the export policy of the Government. To avoid the dangers of the long voyage round the north of Scotland, cargoes which in normal times would have gone to Aberdeen, Dundee and Leith, were discharged at Glasgow. Jute, for instance, came to Glasgow

[1] *Annual Statement Navigation and Shipping, U.K.* (Cmd. 953), 1920, p. 169.

instead of Dundee, and was transhipped to other ports. Thus there grew up during these years a temporary transit trade, which had not been a feature of the pre-war activity of this part of the country. In particular, coal was frequently sent through from the Fife and Lothian mines to be shipped from Glasgow, instead of being sent from the east coast ports.

In the second place, the fact that Glasgow's trade was to a considerable extent a trade within the empire meant that it suffered less dislocation than did ports dealing chiefly with foreign countries. Even as regards Europe her connexion had been more with countries which became our allies than with those which became either our enemies or neutrals. Hence, as the following figures show, the alteration in the distribution of her trade was much less than might have been anticipated :

PROPORTIONS OF TRADE BETWEEN GLASGOW AND THE BRITISH POSSESSIONS ON THE ONE HAND, AND FOREIGN COUNTRIES ON THE OTHER[1]

	1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
	per cent.				*per cent.*	*per cent.*	*per cent.*
Trade with British possessions . . .	38	Not published			29	29	35
Trade with foreign countries . . .	62	Not published			71	71	65

The coastwise trade of Glasgow during the war years owes its relative rise in importance largely to the intimate connexion that exists between such trade and the internal transport facilities of a country. The disorganization of the railways, the lack of locomotives and of wagons, and the consequent congestion and delay, diverted to the coastwise shippers much traffic which in normal times would have gone across country. To this must be added the dislocation of ordinary shipping, and the advantage, in the uncertainty of the time, of discharging in bulk, and transhipping by coastwise steamers as opportunity arose, as in the case of jute already mentioned.

[1] Calculated from returns in *Annual Statements of Navigation and Shipping, U.K.*, 1913, 1917, 1918, 1919.

To a district like the West of Scotland, with its immense and closely packed industrial population, the maintenance of the necessary food supplies was the outstanding need. How well the necessity was met is seen in an analysis of the figures. The imports of corn and grain into Glasgow, which amounted to 12,500,000 cwt. in 1913, never fell during the period below 10 million cwt., and in 1916 and 1917 rose to over 13 million. Imports of butter, cheese, eggs, meats, tea and even sugar, all showed enormous advances in 1919 as compared with 1913; and in most cases the advance was continuous after 1914. Nor was this merely a question of finding the necessary shipping for an automatic supply. In many cases the normal sources of supply were cut off, and new markets had to be found from which to draw the goods. The actual extent of this dislocation cannot be illustrated in the case of a single port like Glasgow, but an indication is given in the following figures for the United Kingdom as a whole : [1]

	Quantities imported		*Dislocation of sources of supply*	
	1914	*1915*	*Increase from certain countries*	*Decrease from certain countries*
	cwt.	*cwt.*	*cwt.*	*cwt.*
Wheat .	99,513,540	98,778,833	22,225,718	22,960,425
Beef, frozen .	3,569,208	5,036,318	1,903,850	436,740
Bacon .	5,061,045	6,219,053	1,622,141	464,133

Of almost equal importance to food was the maintenance of the supplies of raw materials for essential industries. These, however, were marked by greater fluctuations. Iron ore was maintained throughout at just over one million tons : pig-iron and puddled bars, of which Glasgow imported just over 1,600 tons in 1913, had risen to 10,000 in 1915, and at 1919 stood at nearly 25,000 tons. Other metals fluctuated greatly. Steel ingots, blooms, billets, &c., rose to their highest figure of 66,000 tons in 1915, after which date the greater capacity of the

[1] Quoted in *Glasgow Herald Supplement*, 1915, p. 34.

British works, combined with the reservation by the United States of a greater proportion of their supplies for their own use, brought down the Scottish import figure. Imports of leather increased greatly in 1915 and again in 1917. The fluctuations in raw cotton, which were enormous (varying from 4,400 centals in 1916 to 173,000 centals in 1917), were largely the result of Government policy. Wood and timber followed, with interruptions, a downward path. The outstanding case of increased imports, and one which is likely to be of permanent importance, is oil, the imports of petroleum having risen from just under 4 million gallons in 1913 to 83 millions in 1919. The increase is chiefly noticeable after 1916. During the war the Admiralty established an oil-wharf at Old Kilpatrick, whence an oil-pipe was led across the country to Rosyth. Since the war the advisability of establishing public oil-wharves at Bowling and Old Kilpatrick has been discussed, and in view of the increasing utilization of oil as fuel the advantages of such a development are obvious.

With few exceptions, therefore, the imports both of food and of the raw materials of industries essential to a country in time of war were maintained or increased during the period. Woollen and worsted yarn declined from $2\frac{1}{2}$ million lb. in 1913 to zero in 1918. But the chief reductions were in articles of less immediate utility the importation of which was under Government ban. In exports the general trend was downwards, and in some cases, such as coal, cotton manufactures, and iron and steel manufactures, the decline was of serious consequence. In the cases of cotton and iron and steel manufactures a slight recovery was evident in the first post-war year, but coal exports continued to dwindle, reaching in 1919 the low level of 683,697 tons as compared with nearly 2 million tons in 1913. In 1920 and 1921 coal exports sank still lower, and in the year ended the 30th June 1921 about 85,000 tons of coal were imported into Glasgow.[1]

The statistical history of some of the most important imports and exports of Glasgow is shown in the following tables :

[1] *Clyde Navigation, Annual Statistics,* 1921, p. 53.

IMPORTS

(In thousands)

	1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*
Wheat . . cwt.	4,814	3,791	3,766	4,708	6,121	4,163	4,370	—
Barley . . ,,	1,080	864	654	1,807	972	699	1,540	—
Oats . . ,,	740	533	100	193	504	480	276	—
Bacon . . ,,	211	159	237	261	318	949	581	—
Beef . . ,,	110	89	51	47	177	99	147	—
Eggs great hundreds	7	382	588	865	357	73	732	—
Lard . . cwt.	44	47	58	52	39	192	130	—
Steel ingots, &c. tons	30	16	66	11	3	1	15	—
Iron ore . . ,,	1,122	1,103	1,150	1,108	1,120	1,346	873	—
Petroleum . . gall.	3,968	3,307	5,709	6,865	16,262	76,343	83,350	—

EXPORTS U.K. PRODUCE AND MANUFACTURES[1]

(In thousands)

	1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
Coal . . tons	1,989	1,999	2,417	1,974	1,350	1,127	684
Cotton piece goods yds.	287,963	231,136	151,591	213,053	216,157	156,707	164,203
Iron and steel manufactures thereof . tons	578	423	453	480	.257	111	242
Machinery . tons	120	117	76	73	66	35	30
Woollen and worsted piece goods yds.	3,608	3,413	2,326	4,221	4,729	1,654	2,202

[1] *Annual Statement Trade of U.K., &c.*, 1918, pp. 134–6, and 1920, pp. 134–6.

CHAPTER VIII

LABOUR

Significance of the Clyde labour movements; pre-war Industrial Unionism; the Engineers' strike, 1915; the Labour withdrawal Committee; attitude to the Munitions Act, 1915; The Clyde Workers' Committee; the dilution campaign on the Clyde; Shop Stewards and Works Committees; the movement towards industrial democracy in the Engineering industries; the Parkhead strike, 1916; progress of dilution; records of departures from trade practices; unrest in 1917; wages; hours; later development of the Clyde Workers' Committee; Trade Union development.

The labour developments specially distinctive of the Clyde during the war period were of more than local or temporary interest. In more than one instance movements initiated in the district extended to other parts of the country and affected the line of development of British labour politics. Nor were they simply the ephemeral accompaniments of the unique war-time conditions. These conditions only served as the occasion for giving embodiment to ideas which had been in the air before the war, but which, as ideas, had attracted only the more advanced personalities in labour. Now, embodied in living organizations, they appealed to the rank and file, while at the same time they constituted a challenge to the Trade Unions, powerful enough to leave its mark on post-war Trade Unionism. Of these organizations the one which most directly opposed the established order, both of industry and of the associations of labour, and which was most prominently concerned with war-time labour problems, was the Clyde Workers' Committee. The development of this body was intimately connected with the progress of dilution on the Clyde, and its history throws an indirect light on the labour conditions of that district during the period.

To understand the beginnings of the movement it is necessary to go as far back as 1905, when James Connolly

started on the Clyde a society similar to the American Socialist Labour Party, the object of which was to bring about the organization of labour on the basis of industries rather than of crafts. The interest of the industrial unionists was not simply in the internal government of the Unions; it went beyond that and looked to the inauguration of an era of 'real social democracy' in which 'representatives elected from the various departments of industry will meet and form the industrial administration or national government of the country'.[1] The movement thus aimed at revolution by methods akin in some respects to those of Syndicalism; but while in this country Syndicalism had proved a flash in the pan, industrial unionism lived on in the Clyde and elsewhere, attracting adherents, and gaining some ground.

The opportunity for its emergence as an active organization came with the engineers' strike on the Clyde at the beginning of 1915.[2] For obvious reasons, it was in the engineering and shipbuilding industries that the most difficult and interesting labour problems arose in the Clyde area. The great demand for munitions and for naval vessels caused a shortage of labour which called for the sacrifice of Trade Union rules and usages which are numerous in those industries. But the 1915 dispute did not arise out of war conditions; dilution had not yet been adopted officially, and the Treasury Conference was yet to be held. The strike indeed was purely of pre-war origin. It arose out of a demand made under a resolution of the District Committee of the A.S.E. in June 1914 for an advance of 2*d.* per hour to take place in January 1915, when the three-year agreement of 8½*d.* an hour was due to terminate. By an agreement of 1914, shop disputes in engineering could not issue in a stoppage of work before they had been considered first by a local conference, and secondly, after fourteen days' notice, by a central conference. Through some delay, for which the men blamed the employers (and the employers the men), the January Conference

[1] *Socialism made Easy*, by James Connolly, p. 16.

[2] For a contemporary account of the strike see J. H. Jones, article on 'Labour Unrest and the War' in the *Political Quarterly*, August 1915.

was missed ; and the District Committee instructed its members, failing a satisfactory offer, to cease work on the 20th January.[1] At a hurriedly called special conference on the 19th (adjourned to the 22nd) the employers offered a halfpenny advance, which the men refused, and the whole matter stood referred to the February Conference.

So far, the men's conduct of the case had been in accordance with agreement. At this point a new element arose which came to count for much in the Clyde movements of subsequent years. A Committee of Shop Stewards at one of the factories held a meeting attended by some 5,000 employees, and passed a resolution in favour of ceasing overtime until the employers agreed to a special conference to consider the case. Against the orders both of the District Committee and the National Executive of the A.S.E. overtime ceased in fifteen shops.

The Shop Stewards who had thus challenged the authority of the Union's leaders were themselves at this time Union officials appointed by the District Committee of the A.S.E. (under Rule 3, par. 5)[2] to perform certain definite minor duties, such as examining the contribution cards of members of the Union. From this time forward they began to have more influence, and to be elected not by the District Committee but by the rank and file of the workers in the departments of the Engineering Works, being within the ordinary union but not of it, and threatening its disruption and the revolution of its government.

The split which had thus appeared widened with the progress of negotiations. When an offer of ¾*d.* advance was made at the February Conference, the Executive recommended acceptance and arranged for a ballot on the question to be held a month later. The extreme sections of the rank and file, irritated by the attitude as well as by the tardy action of the Executive, came into open revolt. On the 16th February the men in one factory ceased work, and by the end of the month over 5,000 men were out. At this juncture the Shop Stewards' Committee

[1] Strikes were not yet illegal.

[2] For the text of the paragraph see Appendix XV, p. 210.

which had handled the earlier stages of the dispute was enlarged by the inclusion of Shop Stewards from all the shops involved; the enlarged body became the ' Central Withdrawal of Labour Committee ', continued to press for the 2*d.* advance, and demanded that in negotiations with the employers it and not the A.S.E. should be responsible. When at a later stage (the ballot having resulted in 8,927 votes to 829 against acceptance of the $\frac{3}{4}d.$) the Executive recommended resumption of work on the 1st March, in conformity to the demand made by Sir George Askwith, the Withdrawal of Labour Committee urged that work should not be resumed till the 4th, and that then it should be accompanied by the application of ' Ca' canny '. As a matter of fact, resumption was general by March 3rd, overtime was restarted, and the ' Ca' canny ' policy was not adopted.

In the sequel, when the A.S.E. balloted its members on the question whether they would leave the matter to the newly appointed Committee on Production, functioning as an Arbitration Court, the rank and file returned to their allegiance to the Trade Union leaders, and the vote, though a small one, was decisively in favour of arbitration. On the 23rd March the Arbitration Court awarded 1*d.* an hour or 4*s.* a week on time rates and 10 per cent. on piece-rates, the advance to be regarded ' as due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war '.

There were several important features in this dispute. In the first place, the officials of the A.S.E. all along worked for moderation, to the extent that its attitude was considered ' pusillanimous ' by the rank and file. That attitude, secondly, gave its opportunity to the industrial unionism of Connolly, with its ideal of government from below, and the adherents of that theory, many of whom were numbered among the Shop Stewards, pressed their advantage, carrying with them, not perhaps as regards their views on the ultimate order of society, but at any rate as regards their policy in the existing dispute, a considerable body of the rank and file. In the third place, the award issued by the Committee on Production (the first affecting the large body of engineers in the Clyde area) refused

what the men considered a long overdue advance, and the decision left a legacy of suspicion and ill-will which had its later effects.

The temper of labour was not improved by the public allegations made by employers and members of the Government regarding bad time-keeping and excessive drinking on the part of Clyde ship-workers, culminating in the issue on the 1st May of an official white paper [1] setting forth the alleged facts of the case. According to this paper the Clyde workers, and particularly the riveters, were the worst offenders in the country in the matter of time-keeping. Figures, taken out for forty-eight representative firms, fifteen of which were on the Clyde, were given to show that the ' normal ' week being 53 or 54 hours, the actual time worked was as follows :

(*a*) Only 24 per cent. of the men were working more than the normal week.

(*b*) Of the remainder, 40 per cent. worked between 40 and 53 hours, and 36 per cent. worked less than 40 hours.

(*c*) 493 men out of every 1,000 were working less than 45 hours a week.

In a comparison of districts the following facts were given relative to iron-moulders :

	Clyde *per cent.*	*N.E. coast* *per cent.*
More than normal week . .	27·6	19·7
40 to 53 hours	39·4	40·5
Less than 40 hours . . .	33	39·8

In the case of the Clyde workers, and particularly those in Clydebank and Scotstoun, the chief cause alleged for the irregularity and the consequent loss of output was excessive drinking.

There was probably some basis in fact for the allegations contained in the document; but its publication as a Government paper, on the basis of evidence which was somewhat one-sided, was probably ill-advised. A more thorough inquiry

[1] H.C. 220/1915. *Report and Statistics of Bad Time-keeping in Shipbuilding, Munitions and Transport Areas.*

would have taken into account the previous work of the men in the yards, their voluntary relinquishment of trade practices, their overtime and their Sunday work; and would have considered the effects on output of overwork and fatigue, and the effects of the rigorous Scottish climate on the regularity of outside workers such as riveters. A more impartial document would also have inquired whether employers themselves were not responsible, through lack of organization, for some of the lost time. On the question of excessive drinking, moreover, the evidence contained in the document itself was not unanimous, that part of it which may be considered as coming from the least biased source (the Factory Inspector of the Clyde District) being to the effect that ' there does not appear to be any noticeable increase of drinking since the war began. The quantity consumed is about normal.' It is significant, too, that the Armaments Committee established about this time on the Clyde to give effect to the Treasury Agreement, did not consider drinking to be an important cause of irregularity; and that the Commission on Industrial Unrest in 1917 pointed out that not a single witness in Scotland had suggested that the restriction of drinking hours (which followed the publication of this white paper) was a factor in the unrest. For these reasons the issue of the document may be considered unfortunate.

It was under this unhappy combination of circumstances that the dilution campaign was launched on the Clyde. The Munitions of War Act, passed in 1915, embodied the terms of the Treasury Agreement and provided for dilution accompanied by the abolition of strikes, the control of the movement of labour by the use of leaving certificates, and the control of wages. From this time forward occupations formerly reserved for skilled men were to be opened to the unskilled and to women, and the output of munitions and other war material was expected to improve rapidly.

But the scheme met with opposition on the Clyde, and as the year passed the opposition grew in volume. One of the first signs of the coming storm was seen in the sequel to a circular issued by the Ministry of Munitions in August 1915,

recommending the employment of women in non-repetitive work on lathes and on tool-making. Several firms notified their intention of carrying out the terms of this circular, and in one of these (Lang's of Johnstone) the attempt was frustrated by the men, who pointed out that the Executive of the A.S.E. opposed the change, and that in any case the local committee itself would not permit it. In this case the Ministry of Munitions withdrew the obnoxious circular. A second case was that of the strike at Fairfield over the dismissal of two shipwrights, the cause of the strike being, on the men's account, that the firm maintained the right to indicate on the clearance certificates the reason for the men's dismissal. The Munitions Tribunal fined seventeen of the strikers £10 each, and three, refusing to pay, were sent to prison. The result was a threat of a general strike on the Clyde, and the Government Commissioners, sent to investigate the circumstances, found that the Unions refused to take any part in the inquiry until the men were released. Ultimately the difficulty was got over by the Unions paying the fines of the imprisoned men.

These straws show how the wind was blowing, and when Mr. Lloyd George, as Minister of Munitions, visited Glasgow and attempted to address the Engineering Shop Stewards on Christmas Day, the attempt was a complete failure. When a few days later he met a representative body of Shop Stewards, Mr. David Kirkwood, introducing him to the meeting, said: 'I can assure him that every word he says will be carefully weighed. We regard him with suspicion, because every action with which his name is associated has the taint of slavery about it.' It was at this meeting, which naturally proved a noisy and abortive one, that the demand was first emphatically made, that if dilution were to be introduced, it should be carried out under the control of the workers. As a partial concession to this demand, the Clyde Dilution Commission was appointed in January 1916, and in pressing the claims of dilution, the Commission was careful to consult the Unions as well as the employers. On the part of the majority of the workers, it would seem that the opposition was not to dilution as such. The report

of the investigators, Mr. (now Sir) Lynden Macassey and Lord Balfour of Burleigh,[1] pointed out that 'in general complaints were not against the Munitions Act 1915, but against its operation in particular workshops'. Even Mr. Kirkwood, in the interview between Mr. Lloyd George and the shop-stewards, is reported as saying that 'they as Socialists welcomed dilution of labour, which they regarded as the natural development in industrial conditions'.[2] And the boilermakers' proposals[3] for dilution of labour in the shipyards begin, 'The purpose of the Munitions Act is to expedite the output of ships and munitions without prejudice to Trade Union rules, privileges or customs at the end of the war. This we accept and endorse, and we are willing to co-operate.' These views are typical; and the output of munitions and ships during the war is itself sufficient proof that, in spite of particular grievances, the appeal of the Government was responded to by the men.

But while this was the attitude of the majority of the Clyde workers, there was at the same time a considerable minority which objected to the Munitions Act on principle and determined to make it unworkable. The Labour Withdrawal Committee, which, as already indicated, grew out of the Engineers' strike of 1915, continued in existence after the immediate occasion of its formation had passed. The terms of the Munitions Act provided a *raison d'être* for an unofficial body of this kind, untrammelled by restrictions on its activities such as those to which the official Trade Unions were subjected. The Munitions Act, therefore, had not long 'started on its enslaving career'[4] when this Committee called a meeting of shop-stewards and others interested, which decided that the Act had to be fought; and the 'Clyde Workers' Committee' was formed 'for the purpose of concentrating the whole force of the Clyde area against it, whenever an opportunity presented itself'.[5] The Committee by the issue of manifestoes

[1] Cd. 8136, 1915. *Clyde Munition Workers.*

[2] *Forward*, Glasgow, 5th February 1916.

[3] Issued 1st May 1916.

[4] *The Worker* (organ of the Clyde Workers' Committee), 29th January 1916.

[5] *Ibid.*

rapidly attracted adherents not only from the engineering trades in which it had originated, but from many others, including, according to a manifesto issued in 1916,[1] the following: 'A.S.E., tool-makers, boilermakers, blacksmiths, turners, tinsmiths, sheet-iron workers, electrical trades, joiners, gas and general workers, school teachers, and coopers.' 'The support given to the Munitions Act by the officials (of the Trade Unions)', says the manifesto, 'was an act of treachery to the working class. Those of us who refused to be sold have organized the above Committee, representative of all the trades in the Clyde area, determined to retain what liberties we have, and to take the first opportunity to force the repeal of all the pernicious legislation that has recently been imposed upon us.'[2]

Meantime, in January 1916, the special Commissioners appointed to promote dilution on the Clyde, Mr. Lynden Macassey, K.C., Sir Thomas Munro, and Mr. Isaac Mitchell, got to work, calling the attention of employers to the need for dilution, and asking them to make suggestions for dilution in order (*a*) to increase production, or (*b*) (if prospective work was not sufficient to justify an extension of works) to release skilled workmen for employment in Government work in other controlled establishments, by replacing them with semi-skilled or unskilled labour, male or female. These suggestions were considered by the Commissioners, who then drew up schemes which the firms had to put in force. A typical dilution scheme contains the following provisions:

PROVISIONS APPLYING TO DILUTION SCHEME IN ALL DEPARTMENTS

1. The scheme shall come into force on . . . 1916.

2. The scheme is subject to the safeguards provided by Schedule II of the Munitions of War Act, 1915.

3. A shop-committee of the workers affected is to be formed to confer with the management on any point rising from the practical operation of this Dilution Scheme which it has not been possible to settle between the individual worker and the foreman. If an understanding

[1] Clyde Workers' Committee, '*To all Clyde workers.*'
[2] *Ibid.*

is not thus arrived at, the matter will, without stoppage, be referred to arbitration.

4. A record of all past and present changes in practice in departments affected by the scheme shall be handed to the convener of the shop-stewards of the A.S.E., and by him remitted to the district office of that society to be retained for future reference.' [1]

So far as concerned the dilution of labour in shipbuilding and ship-repairing yards and marine-engine shops mainly engaged on Admiralty work, joint arrangements were made by the Commissioners and the Admiralty. The Commissioners conducted preliminary negotiations with the Trade Unions and the men affected, prepared a specific scheme of dilution (consulting the Admiralty Overseer in each instance and receiving from the Admiralty such skilled and technical assistance as was necessary), and submitted the scheme for the approval of the Admiralty. When approved, the Commissioners took steps to put it into operation and dealt with objections and obstructions. The Commissioners agreed not to transfer any man, without the Admiralty's consent, from any yard or shop mainly engaged in Admiralty work, to any other establishment.

The Shop Committee of Workers referred to in the above provisions for a dilution scheme was the men's answer to the proposals of the Government. Conceding the principle of dilution, they demanded to control its conditions. This demand took many forms. The boilermakers, in their proposals in connexion with dilution of labour in the shipyards, detailed the particular provisions which they considered necessary, and asked for a general instrument of control in the form of meetings to be held locally with the representatives of the Government for the purpose of discussing dilution in accordance with the needs and practice of each district. The Clyde Workers' Committee, again, demanded that shop-stewards have full liberty to visit different parts of the shop in the interests of the men. In most cases the control took the form of a dilution committee to watch progress and to regulate the conditions of dilution. These dilution com-

[1] *Glasgow Area Records, Munitions Archives.* The details of a typical scheme, in operation in a large engineering establishment on the Clyde, are given in Appendix XVII, p. 213.

mittees (called by various names, Industrial Committees, Works Committees, &c.) were constituted in different ways. In some cases they were directly representative of all the trades and departments in a works or ship-building yard ; [1] in others they were elected by the existing shop-stewards of the various unions within the works, as a sub-committee of the Shop Stewards' Committee.[2] In still other cases the 'rank and file' in the workshops, impatient of the action of the official Trade Unions, elected their own shop-stewards, retaining the old name for quite a new organization, in which distinction of craft [3] was no longer an important feature. These new organizations, under whatever name, and however formed, had as their original duty the controlling of dilution. As dilution affected most of the Trade Union customs and usages, including demarcation, relation of skilled and unskilled, apprenticeship, &c., the existence of the new bodies necessarily involved the breaking down of barriers between crafts, and the consideration of shop conditions from a common standpoint.

The circumstances of the war had thus brought into being in many of the engineering establishments throughout the district new labour organizations, freed from the narrow craft outlook, directly representative of the workers in the shops, and ready, therefore, to listen to the appeal of the Clyde Workers' Committee. That body, on account of the general dissatisfaction of the workers with the attitude of the regular Trade Unions, was having its ranks recruited from many sides, by men who may have had little knowledge of its ultimate aims, but who found in it a ready instrument to meet what they considered the menace of the suppression of liberty, against which the

[1] As at Dalmuir shipyard.

[2] Messrs. Barr & Stroud. In March 1916, according to a correspondent, 'it was found necessary to create a dilution committee, and the united shop-stewards, representing all the organized elements in the shop, decided that the best men in the shop-steward committee, irrespective of what union they belong to, be elected to the dilution committee. . . . Thus we have our industrial committee as a sub-committee of the shop-stewards' committee.'

[3] 'The one outstanding feature', says the above correspondent, 'of our shop organization through the joint committee, is the great extent to which inter-craft jealousy is eliminated.'

Trade Unions had evolved no definite policy. It became, therefore, the meeting-point of numerous disaffected elements. Nevertheless, its own policy was definite enough. While it was never numerically strong, it is worth while, in view of its later influence, to try to place it in relation to other labour movements which have arisen in recent years.

The movement on the Clyde was purely industrial. Although its adherents included internationalists and pacifists, the movement itself was not political. Its fundamental position was opposition to capitalism, whose power 'bent the whole life of the community, political, educational, religious, and social, to its own ends'. Capitalism therefore must be abolished, and to that end the first step was the education of the worker in 'working-class economics'. Hence increasing numbers on the Clyde turned to Marx, because they found in him convincing proof of their belief in the evil of capitalism and the reality of the class-war. But their study of Marx did not lead them to Collectivism as a solution of the economic problem. Collectivism would reimpose in a new form the centralized economic power which had already suppressed the freedom of the proletariat. The solution lay in putting the control of industry in the hands of the actual workers in the industry, and to that end there was necessary a reorganization of labour on lines distinctly opposed to those of Trade Unionism in two important respects. First, craft unionism, which fostered inter-occupational jealousies and disunion, must be replaced by an organization by industries, in which common interests would lead to the union of the whole of labour against capitalism. Secondly, the direction of policy must lie with the rank and file. These ideas were definitely formulated in the constitution of the Clyde Workers' Committee,[1] the objects of which were 'to obtain an ever-increasing control over workshop conditions, to regulate the terms upon which the workers shall be employed, and to organize the workers upon a class basis and to maintain the class struggle, until the overthrow of the wages system, the freedom of the workers, and the establishment of industrial

[1] See Appendix XIV, p. 210.

democracy have been obtained'. Its structure was dictated by these objects. The unit of organization was the Workshop Committee, composed of shop-stewards or delegates elected by the workers in the shops. From each such Committee two conveners (one being a woman where women were employed) would be elected, and these would be the delegates to the Clyde Workers' Committee. Ultimately, such Workers' Committees would exist in every district in the country, and from each, delegates would be elected to a National Workers' Committee. But no committee would have executive power, all questions of policy being referred back to the rank and file.

So far the solution is akin to Syndicalism, and in the ultimate hope of the establishment of industrial democracy the two movements were at one. But the internationalism of Continental Syndicalism did not appeal, during the war period at any rate, to the Clyde worker; and, what is much more fundamental, the intuitionalism which characterizes the Syndicalist movement was impossible to the ratiocinative Scot. The Syndicalist has no clear-cut programme, but trusts to the inspiration of the moment to show him the next step. Nothing, on the other hand, is more characteristic of the Clyde movements, even in this revolutionary period, than the care with which the proposals for the reorganization of industry are elaborated. To the Syndicalist, the general strike is the fulfilment; to the Clyde revolutionary, the general strike, so far as it was in the programme at all, was merely the beginning.

It is not difficult to understand how at such a time, the fairly general demand for 'control of dilution *in* the workshops', which was the basis of the dilution committees, should pass into a demand for 'control *of* the workshops', and consequently, how numbers of the new shop-stewards should be drawn into the Clyde Workers' Committee. And thus we have the curious spectacle of two sets of organizations within the same industries, the newer being the result of a growing lack of faith in the older; and the still more curious fact that, in most cases, members of the newer organization remained members of the older. Since in structure and in ideals the two were opposed, there was

obviously little hope of permanence in such a state of affairs ; and what would happen when the peculiar conditions of war-time were removed remained to be seen.

The later history of the movement may be briefly indicated at this point. Early in 1916 three members of the Clyde Workers' Committee were imprisoned for the publication of a seditious article in the *Worker* (the organ of the C.W.C.) on the 29th January 1916. Shortly after, the opposition of the body to the Munitions Act came to a head in connexion with the strike at the Parkhead Forge of Messrs. William Beardmore & Co. The strike arose through the introduction of a dilution scheme in certain departments of the Parkhead Works on the 28th January 1916. The grievances of the men, as stated in a manifesto issued by them in the course of the strike,[1] were three : first, that in spite of an agreement that all men employed must be Trade Unionists, certain non-union workers, chiefly soldiers, were introduced ; secondly, that in the 15″ shell shop over 100 men were set to work at lathes turning these shells, and at horizontal boring machines boring these shells, at a rate of 6*d.* per hour, which was under the standard rate ; and thirdly, that the Convener of the shop-stewards had been prohibited by the management from visiting the Howitzer Shop, into which female labour had been introduced, in order to ascertain the conditions under which they were working, as he claimed to have a right to do. In the sequel the first two points were allowed to drop, and the dispute turned on the standing of the Convener of the shop-stewards. The strike, which involved a large number of workers, lasted from the 17th March till the 4th April, and resulted in the deportation of ten shop-stewards from the Clyde area.

Open activity in opposition to the Munitions Act ceased from that date in the Clyde district. But the deportation of the workers, who were sent into other parts of the country, was in itself a direct cause of the spread of the Shop Committee idea in other districts, and Works Committees on the Glasgow model sprang up in various centres. On the Clyde, however, the move-

[1] See Appendix XIX, p. 215.

ment became less militant during 1916 and 1917, although propaganda continued to be carried on, and funds were raised in aid of the prisoners and deportees and their dependants [1] by a Provisional Committee.

In 1917 the Whitley Committee published its first and its supplementary report, embodying the proposals which have since become familiar. The reports were the occasion for a period of renewed activity. The Provisional Committee of the Clyde Workers' Committee issued a manifesto [2] urging workers to refuse assent to the Whitley proposals, but to support the 'Workshop Committees (not on Whitley Report lines)' which 'are now being formed, composed only of workers and working *only* in their interest in every workshop where the employees are alive to their own well-being'. The manifesto also outlined the scheme for linking up such committees over the whole country. 'From each Shop Committee', it says, 'at least two delegates will be sent to a District Committee, representative of all workers in the area, from the District Committee Delegates will attend a National Industrial Council representing all the District Committees in Scotland. This National Council will in turn be linked up with the English National Council, representative of all the English Districts.' Such a national organization was actually formed and up till 1922 there existed a Scottish Workers' Committee, with head-quarters in Glasgow; [3] and in April 1921 a National Workers' Committee was formed at Sheffield. The press organ of both was *The Worker*, published in Glasgow. The present strength of these organizations is not definitely ascertainable, but the whole movement has lost the importance it had during the war period. Its source of weakness lay in the fact that it attracted its adherents by its attitude to a temporary set of conditions, failing to convert more than a minority of them to the general principle for which it stood. With the passing of these temporary conditions,

[1] For the Maintenance and Defence Fund there was collected between March 1916 and August 1917 nearly £1,900.

[2] See Appendix XVIII, p. 214.

[3] This Committee has now ceased to exist—June 1923.

membership lapsed, and the allegiance of the workers to the regular Trade Union was renewed.

Meantime, after the suppression of the Clyde Workers' Committee early in 1916, dilution proceeded apace on the Clyde, particularly after the agreement had been negotiated, on the 14th of June, between the Clyde Dilution Commission and the boilermakers and iron and steel shipbuilders, providing for dilution in their trades in the shipyards. The general progress is indicated by the fact that whereas between January and April 1916, the Dilution Commissioners had to hold a thousand conferences on the Clyde, in two summer months only forty were necessary, and thereafter employers were able to introduce dilution schemes by agreement without calling on the Commissioners.[1] By August, schemes were being approved in large numbers, and by the end of that month dilution had been established in 150 of the largest of the 300 controlled engineering and shipyard establishments on the Clyde, and large numbers of women were employed in general engineering work.[2]

The progress of dilution was not, of course, unattended by considerable dissatisfaction on the part of the skilled workers affected. Apart from the out-and-out opposition to the Munitions Act as such, criticism was directed against particular features of the Act, or against particular consequences of it which were experienced in the district. Most of the grievances were based on a comparison of the restrictions to which the worker was subjected with the supposed greater freedom of the employer. In particular, the Clearance Certificates were a cause of much discontent, inasmuch as they put undue power over the worker into the hands of the employer.[3] The Tribunal system was also believed to lend itself to undesirable results.[4] Both of these matters were the subject of later amendment. Delay in the settlement of disputes was another source of trouble; and on

[1] Dewar, *The Great Munitions Feat*, p. 264.

[2] The actual number is doubtful. Semi-officially it was given as 14,000; but there is reason to think this estimate excessive, unless it is meant to include women on shell-work as well as in general engineering.

[3] *Clyde Munitions Workers*, Cd. 8136, 1915.

[4] *Ibid.*

a point of general principle, dissatisfaction arose through control being centred in London, and through the lack of co-ordination between the many departments dealing with the different aspects of the labour question.[1] The last-named, however, was a less serious cause of unrest on the Clyde than elsewhere, since the Clyde Dilution Commission itself acted as a means of co-ordination.

But these difficulties were more or less common to the whole country. Concerning the Clyde, particular mention may be made of the question of the restoration of pre-war Trade Union practices, and of the problem of wages. In spite of the guarantees offered by the Government, both in agreements of the 18th and 25th March, and in the Munitions Act itself, the suspicion that the sacrifice of their defences would be used to weaken the post-war position of Trade Unions was never wholly allayed. The guarantees were themselves definite and emphatic enough. No departure from trade practices was to be allowed except in connexion with work for war purposes, and even then the departure was to be for the period of the war only, and pre-war usages were to be restored when the special circumstances had passed. A record of every such departure was to be kept by the employer and the Ministry of Labour, and a copy sent to the Union concerned. Where a new type of machine was introduced the class of workman to be employed after the war would be determined by pre-war practice. Finally, the Government undertook to use its influence to restore pre-war practices at the conclusion of hostilities.

It soon became apparent, however, that many changes which, in the opinion of the workers, constituted departures from pre-war practices were not being recorded. In a district like the Clyde, where so many firms were engaged during the war on work which was entirely new to them, it frequently happened that changes took place which were not held to be in the technical sense ' departures ' inasmuch as there had been no pre-war practice in that class of work in that establishment. Anticipating that difficulty, and to ensure that complete

[1] *Glasgow Area Munitions Records, Munitions Archives.*

records were kept, the Ministry of Munitions in September 1916 initiated a local system of records, and sent a circular to all controlled establishments pointing out the necessity of recording all changes; and at the same time instructed the Chief Investigation Officers that records were to be simply statements of fact, without prejudice to the question of restoration. Under the Restoration of Pre-war Practices Act, 1919, Section 1 (1), firms were obliged to restore the practices which had been departed from by 15th October 1919, and in case of failure, the Trade Union could, under Section 2 (2) (3), prosecute the firm before the Local Munitions Tribunal, with appeal in the case of Scotland to a Judge of the Court of Session appointed by the Lord President. In the sequel, for the whole country over 30,000 records of departures were compiled, of which only twenty-five led to attempts at prosecution; and in only five of these cases were decisions given in favour of the Trade Union. For the whole of Scotland the number of records was 10,000, and for the Clyde district alone 6,000.[1]

The need for speeding up the output of munitions led to the greater utilization throughout the country of methods of payment which were intended to bring about a closer relation between wages and output. Piece-work systems were introduced among classes of labour in which time-work had previously been the rule; and premium bonus systems, not by any means common before the war, came into operation in many engineering establishments and in shipyards. The pre-war attitude to payment by results had differed in different unions. In some, a definite relation of wages to value of output had been recognized, as in the iron and steel industries, in which wages were fixed by sliding scale and varied according to the ascertained prices of products. In other cases, such as the Associated Ironmoulders of Scotland, while there was no attempt to abolish piece-work systems already introduced, there was decided objection to any extension of the system. The attitude of the A.S.E. had changed from time to time. Definitely opposed to piece-work till 1897, it had then been

[1] The records are preserved at the offices of the Ministry of Labour.

compelled to give way, and under agreements of 1901 and 1907 had accepted the principle of payment by piece. The 1907 agreement, however, had been rescinded in 1914. In the shipbuilding industry the custom varied with occupations. Boilermakers worked on elaborate piece-lists; so did the drillers. Shipwrights, on the other hand, as well as most of the wood-workers, worked on time. There was thus no uniform policy before the war; but under the Treasury Agreement the signatories had agreed to payment by results for the period of the war.

Various experiments were tried with the object of stimulating output. The most frequent system was straight individual piece-payment. Collective piece systems had been tried before the war, especially where men worked in squads, and the attitude to such methods had never been defined by the Trade Unions. Such systems were now applied in several cases, especially in shell making, to the whole of the workers in a shop. This was held to be the most successful of all systems in increasing the output of shells.[1] In the case of the premium bonus system also, both the individual and collective forms were in use. The ultimate object of both is the same, namely, to provide an incentive to the worker to increase his production. A time-rate per hour being fixed, and a given number of hours allotted to the performance of the job, it is to the workers' advantage to finish his job in the fewest hours possible, as he receives in addition to his time wage a percentage for each hour saved. The degree of inducement, however, varies with the different forms of the system. The greatest possible inducement would be offered in a system under which the worker received the full-time wage for each hour saved. While such an offer would not in general be of advantage to the employer, an approximation to it was reached in the case of one Glasgow establishment, where the men received for each hour saved the full hourly rate less a deduction of $2\frac{1}{2}d.$ in the shilling for clerical expenses. In the National Filling Factory at Georgetown, an experiment in collective premium bonus, applied to 300 women in one department in February 1917,

[1] *War Activities in Scotland, Munitions Archives.*

was so successful that it was ultimately extended to the whole factory. For every operation a standard output was fixed, calculated on the average output in the past, and for every unit by which a group of workers exceeded the standard, they received as a group an additional sum, payable at the end of the week along with their time wage. The result was increased wages to the women, an increased output, and a lower cost of production.[1]

Opposition to these systems of payment by results was fairly general among workers who had been accustomed to a time wage.[2] In part it was due to the general fear of unemployment through increased production, and to the fear of rate-cutting, combined with the belief that no Government guarantee, however well-intentioned, could prevent the subtle influence of these systems resulting in reduced earnings in the post-war period. In part it was due to the preaching of the ' wage-slavery ' ideas of the advanced sections of labour.

Nevertheless the revolutionary Trade Unionists were not wholly opposed to piece-payment, so long as the system was collective and not individual, and so long as it was sufficiently safe-guarded. A form of the system was advocated by some members of the Clyde Workers' Committee for application throughout the engineering and shipbuilding industries.[3]

In a draft memorandum on these industries Mr. William Gallacher, a member of the Clyde Workers' Committee, proposed that the Shop Committee be invested with complete responsibility for production in the shop, and that they should be the sole medium for contract between employer and workpeople, and have full bargaining powers in the matter of time allowance where premium bonus systems obtained and of rates under a piece-work system. This would eliminate individual contracting, which was the objectionable feature of piece-work. In a more fully developed memorandum [4] the authors propose to

[1] *Supra*, p. 101.

[2] *Commission on Industrial Unrest, Scotland*, Cd. 8669, 1917, p. 7.

[3] See Appendix XVI, pp. 211, 212.

[4] *Towards Industrial Democracy*, by Messrs. Paton and Gallacher. Published by the Paisley Trades and Labour Council, 1917.

utilize this control to revolutionize the relations between the firm and the workers, according to the plan indicated in the following paragraph: 'Only the apathy or disloyalty of the workers themselves can prevent the Works Committee having in a very short time the experience and the authority to enable them to undertake in one large contract, or in two or three large contracts at most, the entire business of production throughout the establishment. The contract price, or wages—for it is still wages—will be remitted by the firm to the Works Committee in a lump sum, and distributed to the workers by their own representatives or their officials, and by whatever system or scale of remuneration they may choose to adopt. A specially enlightened Trade Union would no doubt elect to pool the earnings of its members and pay to each a regular salary, weekly, monthly, or quarterly, exacting, of course, from the recipient a fixed minimum record of work for the period.'

The system here advocated is collective piece payment. It differed from such systems already in operation, however, in the important particular, that it would place the distribution of the wages in the control of the Works Committee instead of the firm's office. It differed also in principle. Actual collective piece systems were a device for increasing output: the proposed system was a device for putting the control of the shop into the hands of the Works Committee.

The usual method during the war, however, was not collective but individual piece payment. And the chief opposition came as a result of the introduction of women and their payment on a basis which, it is true, was insisted on by the Trade Unions themselves, but which led to unforeseen results. The general wages conditions under which the Trade Unions had agreed to dilution were contained first in the Treasury Agreement, which laid it down that the employment of women should not adversely affect the rates customarily paid for the job. This was interpreted in Circular 12 issued in October 1915 (obligatory at first only in National Factories, but later in all munitions works to which the Ministry of Munitions applied the order). The difficulties in the interpretation of this circular, which led

to endless trouble, and which constituted one of the chief sources of unrest on the Clyde, were indicated in the elaborate nature of the Consolidated Order issued in May 1918. Under these various regulations, women having reached proficiency on their machines were paid the men's standard rate. Meantime the skilled male workers had in many cases been promoted from the machines to be supervisors on a time rate, and they now saw the women, unrestrained by any ideas of restricting output, earning much larger sums than they themselves could do. It was this result which led, after the abolition of the leaving certificates, to the 12½ per cent. bonus to time-workers and the cumulative difficulties which all over the country followed in its wake.

If the dread of unemployment was a potent cause of opposition to piece-wages, it was no less powerful as an advocate of reduced hours of work. In 1917 the Glasgow District Committee of the Amalgamated Society of Engineers appointed a Sub-Committee on Reconstruction, which reported, *inter alia*, in favour of a five-day week of 40 hours (later altered to 30 hours). In 1918 a Sub-Committee on Reconstruction appointed by the six District Committees of the A.S.E. in the north-west area, supported the 40-hour resolution. Similar resolutions were adopted by the Scottish Trade Union Congress and by a special conference of all the Trade Union Organizations called by the Parliamentary Committee of the Congress and the Scottish Advisory Council of the Labour party. These official bodies were supported by an unofficial 'Ways and Means Committee', a body appointed by a Scottish Conference of Shop Stewards and Workshop delegates, which put its weight in favour of a 30-hour week. While the war lasted these resolutions were little more than pious expressions of opinion. What raised the question in a practical form was the spectre of unemployment raised by the sudden slowing down of munitions after the armistice and the fear of the flooding of the labour market through demobilization, however skilfully it might be carried out. Already in the beginning of 1919 the 54-hour week in engineering and ship-building had been replaced by a 47-hour week on the Clyde.

But that reduction had led to unexpected difficulties. It disorganized domestic arrangements by changing the breakfast hour; it caused too long a stretch between meals, and it led to a stiffening of discipline on the part of employers, some of whom immediately instituted 'checking-in' at departments instead of at the works gate, abolished the usual five minutes' grace, and refused admission to work after the morning starting time. Agitation against the 47-hour week and in favour of further reduction grew. A conference, in which the official District Committee of the A.S.E. and other official bodies sat along with the unofficial 'Ways and Means Committee', decided to demand the 40-hour week, and a stoppage of work ensued which lasted from the 25th January to the 11th February 1919.

There were two important features of this so-called strike. In the first place, it marked the turning-point in the history of the unofficial movement on the Clyde. For a time it looked as if the 'revolutionary' element were to carry the day, for not only was the strike largely engineered by the Clyde Workers' Committee, but the members of the District Committee of the A.S.E. supported the unofficial element against the orders of their own Executive. But the Executive took a strong line, suspending the Chairman and Secretary and the Glasgow District Committee from holding any office in the Society for two years. This action sobered the union, and although the officials were shortly afterwards reinstated, from then onward the influence of the C.W.C. became less. In the second place, it marked the changed conditions of the engineering trades which the Armistice had brought about. The industry being no longer 'essential' in the supreme sense of war-time, it was recognized that the employers were in a stronger position to resist the men's demands than in past years, and the attempt was made to bring about a favourable decision by securing the practical sympathy of other workers in a local general strike. The attempt failed, as the transport workers dropped out after the first few days. Thus the first serious struggle after the Armistice revealed the inherent weakness of the unofficial movement and the strength of the estab-

lished Trade Union. To the loss of strategic strength due to the passing of war conditions is to be added the disunion which was caused by the rapid movement to the extreme left of certain members of the advanced party. Yet some results remained. Directly, as already indicated, the Clyde movement had its effects in other districts. Indirectly it affected Trade Unionism as a whole; for it gave prominence to the ideals of the control of industry by the workers, and to that end stimulated the progress of amalgamation among unions which characterized the first years after the war.

CHAPTER IX

SOCIAL CONDITIONS

Population 1911, and as estimated during the war years; housing conditions in Glasgow and district; rents; cost of living; savings of the people; employment; pauperism; public health; education.

The river Clyde flows through the three counties of Lanark, Renfrew, and Dumbarton on its way to the sea. These three counties cover an area of 1,339 square miles; and a large portion of the area is practically continuous as regards population, and homogeneous in industrial character. A portion of the county of Stirling, which strikes south towards Glasgow, is also identified with the industrial life of the Clyde Valley. Many features of the social life of the people, being based on the industrial conditions, are common to the whole of this wide district.

The three counties which form the Valley of the Clyde contained in 1911 a population of nearly 2 millions, of whom about 785,000 lived in the city of Glasgow. In 1912 the city boundaries were extended to include several adjacent districts, and in the whole of the area which is now greater Glasgow there were in 1911 over a million people or more than one-half (53 per cent.) of the population of the three counties and more than one-fifth (21 per cent.) of that of the whole of Scotland. The actual population of Glasgow as well as its proportion of the Scottish total was estimated to have increased by 1914.

POPULATION

	1911 [1]	*1914* [2]	*Increase or decrease*
Greater Glasgow . . .	1,008,487	1,055,930	+47,443
Renfrew, Dumbarton, Lanark .	1,901,417	1,947,400	+45,983
Scotland	4,760,904	4,728,500	−32,404

[1] *Census Report*, Scotland, 1911.

[2] *Report of Registrar General for Scotland*, 1914.

Prior to the war the population of the whole of Scotland showed an increase at each of the census dates, but one whose rate had declined during the last inter-censal period, 1901–11. The movements of the existing population were, moreover, towards the industrial centres and at the expense of the rural districts. Thus, between 1901 and 1911, if we except the county of Aberdeen, the only counties which showed any marked increase in population were the industrial areas of the east and west, notably Lanark, Renfrew, Dumbarton, and Stirling in the west and Fife and the Lothians in the east. In the case of most other counties there was an actual decline, which was particularly noticeable in Argyll, Inverness, Orkney and Shetland.[1] There was thus before the war a normal migration into the Clyde Valley.

For the movements in population during the war period we have to depend on the estimates contained in the reports of the Registrar General.[2] Normally it is possible to correct such inter-censal estimates by reference to the reports of the next Census. In the present case the 1921 figures afford no basis on which to judge the estimates for the intervening years on account first of the temporary nature of the population movements which took place during the war, and second of the post-war redistribution, the extent of which we have no definite means of deciding. On general principles, however, we should expect that the double process of enlistment of men, and movement both of men and women into munition centres would strengthen the normal tendency to rural depopulation.

The estimates of the Registrar General bear out that expectation. The counties of Argyll, Inverness, Ross and Cromarty, and Sutherland show reductions between 1911 and 1918. The population of the counties of the Clyde Valley, on the other hand, was estimated to have expanded during that period as is shown in the following table; and the expansion is seen, from the figures of the recent Census, to have continued up to 1921 except in the case of Lanark.

[1] *Census Report*, Scotland, 1911, p. 2.
[2] *Reports of Registrar General for Scotland*, 1914–19.

POPULATION OF THE CLYDE VALLEY

	1911 (Census)	*1914 (Estimated)*	*1918 (Estimated)*	*1921 (Census)*
Dumbarton .	136,233	141,000	147,400	150,868
Renfrew . .	279,066	283,800	296,100	298,887
Lanark . .	1,486,118	1,522,600	1,609,100	1,539,307
Clyde Valley .	1,901,417	1,947,400	2,052,600	1,989,062

In the city of Glasgow itself the war-time movements of population are not at all certain. The Registrar's estimates show a progressive increase from 1,055,930 in 1914 to 1,112,704 in 1918,[1] the details of which are here shown :

	1911 (Census)	*1914 (Estimated)*	*1915 (Estimated)*	*1916 (Estimated)*	*1917 (Estimated)*	*1918 (Estimated)*	*1921 (Census)*
Glasgow	1,008,487	1,055,930	1,047,577	1,095,171	1,105,529	1,112,704	1,034,069

The mere fact that the 1921 figure is below that of the whole of the war period, is not in itself sufficient to throw doubt on the estimates. But a sample inquiry made into selected groups of Census enumeration areas (32 in all, representative of between 5 and 6 per cent. of the population of Glasgow) made in May and June 1916, showed an actual fall in population in those areas from 57,297 in 1911 to 55,288 in the middle of 1916.[2] This result is probably more representative of the actual facts. It is true that the munitions works and shipyards soon came to employ increasing numbers of workers ; but many of these lay outside the city boundaries, and much of the additional labour in them came from other industries in the immediate district. What influx there was from greater distances came on the whole after 1916.

On the other hand, the fact that the number of unoccupied houses within the city had shown a rapid decline up to 1916

[1] The estimates are to the middle of each year.
[2] *Report of the Medical Officer of Glasgow*, 1914–19, p. 2.

leads us to infer an increasing population. But the inquiry referred to revealed, among other relevant facts, that in the selected areas the number of wives in residence between 20 and 35 years of age exceeded the number of husbands by 1,792; which suggests that the diminished number of unoccupied houses was the result of the formation of new households, rather than of a positive increase in the population.

Such a result was not unwelcome. The characteristic type of working-class dwelling in the West of Scotland is the tenement with its multiplicity of 'closes', i.e. flats or single rooms used as separate dwellings and opening off a common stair; and it results, in some of the congested areas of Glasgow, in the massing of as many as 700 persons to the acre.[1] The individual houses are small. In Glasgow in 1911, nearly two-thirds of the population lived in houses of one or two rooms.

GLASGOW: PROPORTION OF POPULATION IN HOUSES OF VARYING SIZE[2]

One room	*Two rooms*	*Three rooms*	*Four rooms*	*Five rooms and over*
per cent.	*per cent.*	*per cent.*	*per cent.*	*per cent.*
13·8	48·7	21·2	7·2	9·1

In some of the surrounding districts the conditions were worse. In the first table on p. 166 Coatbridge and Wishaw show the least desirable conditions, with more than three-quarters of their population living in houses of two rooms or of one.

The contrast of the Scottish towns with the urban districts in England and Wales, as shown in the last line of the table, needs no emphasizing.

As a result of these conditions there was a remarkable amount of overcrowding within houses. If we take the English standard under which a house is considered overcrowded if it has more than two persons to a room, 55·7 per cent. of the population of Glasgow were in 1911 living in a state of overcrowding; and if we take the more lenient Scottish standard of

[1] *Housing in Scotland*, Ministry of Reconstruction, 1918, p. 3.

[2] *Census Report*, Glasgow, 1911.

over three to a room, the figure is still 27·9 per cent. In the whole county of Lanark (including Glasgow) the conditions were even less desirable.

PROPORTION OF POPULATION LIVING IN HOUSES OF VARIOUS SIZES [1]

Burghs	*One room*	*Two rooms*	*Three rooms*	*Four rooms*	*Five rooms or over*
	per cent.	*per cent.*	*per cent.*	*per cent.*	*per cent.*
Airdrie . . .	19·3	51·5	14·4	5·2	9·6
Biggar . . .	6·7	28·5	17·6	13·7	35·5
Coatbridge . .	22·4	54·2	13·6	4·0	5·8
Hamilton . .	18·7	49·5	16·5	5·7	9·6
Lanark . . .	10·7	33·5	19·2	10·4	26·2
Motherwell . .	16·8	53·7	20·3	4·3	4·9
Wishaw . .	23·0	53·1	13·7	4·6	5·6
All urban districts in England and Wales[a]	1·7	6·8	13·2	24·3	54·0

[a] *Census Reports*, 1911. Summary Tables (Cd. 7929), 1915, p. 329.

PERCENTAGE OF POPULATION LIVING

	More than two per room	*More than three per room*	*More than four per room*
	per cent.	*per cent.*	*per cent.*
County of Lanark [a] .	58·8	32·2	14·0
City of Glasgow [b] .	55·7	27·9	10·7

[a] *Census Report*, Lanark, 1911. [b] *Census Report*, Glasgow, 1911.

The fluctuations in the building industry resulted in alternate periods of scarcity and of plenty in housing accommodation, a fact which is reflected in the varying numbers of empty houses at different periods. In the city of Glasgow houses were scarce early in the century, but a boom in building increased their number till in 1910 they reached the maximum point, when 10·95 per cent. of the houses were unlet. From then onwards depression in building resulted in a reduction of unlet houses, and at the outbreak of war the number of vacant houses was 5·69 per

[1] *Census Report*, Lanark, 1911.

cent., a figure which represented as nearly as possible the normal equilibrium of demand for, and supply of housing accommodation.[1]

The following table shows the fluctuations in Glasgow : [2]

GLASGOW

Date	*No. of empty houses*	*Percentage of empty houses*
1900 (Whitsunday) .	4,828	2·93
1905 ,, .	13,495	7·69
1910 . . .	19,715	10·95
1911 . . .	19,375	10·74
1912 . . .	18,623	10·33
1913 . . .	18,341	7·93
1914 . . .	13,178	5·69

In addition to emphasizing the natural scarcity of houses, the war prevented the recovery of the building trade; and the high cost of building, the scarcity of building labour, and the later Government restrictions brought about almost a complete cessation in the erection of houses. The following table, for example, shows the number of linings granted by the Glasgow Dean of Guild Court in respect of houses in the years 1914–19 : [3]

APARTMENTS

Year ending Aug. 31	*One room*	*Two rooms*	*Three rooms*	*Four rooms*	*Five rooms*	*Six rooms*	*Total*
1914 . .	15	108	116	25	46	63	373
1915 . .	63	156	120	32	35	48	454
1916 . .	1	—	2	—	12	1	16
1917 . .	—	—	—	—	—	—	—
1918 . .	—	64	28	—	—	—	92

By 1915 the number of unlet houses in Glasgow was down to 8,998, or 3·88 per cent. of the total, and conditions became

[1] See *Report*, Cd. 8111, p. 3.

[2] Prepared by Mr. Alex. Walker, City Assessor, for the Com. on Rentals, 1915. See Evidence, Cd. 8154, Appendix, p. 94.

[3] *Report of Medical Officer of Glasgow*, 1914–19, p. 129.

rapidly worse during the war period. Nor was the scarcity confined to only a few of the industrial districts of the city, but appears in practically every ward, residential as well as industrial and commercial. At the same time the cost of materials and labour prevented the normal expenditure on repairs; and the Local Authorities ceased to exercise their powers of closing houses unfit for habitation. Thus there went on a progressive deterioration in the standard of accommodation.

The problem was even more acute in the surrounding districts, which soon became filled to overflowing with workers on munitions and shipbuilding. In these districts, as in Glasgow, the available houses had already been decreasing before the war, but the new conditions emphasized the scarcity. The following table shows the condition of matters in some of the neighbouring burghs: [1]

PERCENTAGE OF UNOCCUPIED HOUSES

	1911	*May 1914*	*May 1915*
Glasgow (as prior to the 1912 extension)	11·3	6·7	4·7
Partick	10·1	1·1	0·9
Govan	10·5	3·6	1·8
Greenock	3·7	0·4	0·2
Renfrew	6·7	1	0·3
Paisley	7·6	4·3	1·8
Barrhead	4·8	0·8	1·3
Rutherglen	6·4	2·2	0·9
Clydebank	15·5	0·4	—

On account of this scarcity of housing, many men and women unable to find living accommodation in the vicinity of their work had to travel long distances daily. In 1915, 16,000 workers at Clydebank (chiefly occupied at the Dalmuir Shipyards) and about 5,000 workers from the boiler-works and machine tool works at Renfrew travelled from and returned to Glasgow every day.[2] The effect of this daily travelling, on top of the

[1] *Committee on Rentals in Scotland.* Evidence, Appendix, p 94.
[2] *Ibid.* Evidence, p. 68.

long working hours, was undoubtedly to increase the fatigue of the workers and to add to the conditions which tended to industrial unrest, of which, there is no question, the lack of housing was one of the most important causes.[1]

The scarcity of houses brought about a rise in rents, which increased the feeling of dismay at the rising cost of living, and led to much dissatisfaction. The whole question was, in 1915, made a subject of investigation by a Committee appointed by the Secretary for Scotland. Evidence before the Committee gave the results of a sample investigation into 370 out of the total of 198,405 'small houses' in Glasgow (defined by the House Letting and Rating Scotland Act, 1911, as houses of £21 rent and under). The investigation showed that up to May 1916, the change in rents as compared with pre-war years would be as follows : [2]

In 147 cases	. . .	.	No increase.
„ 15 „	. . .	.	A decrease.
„ 123 „	=33·3 per cent.	.	An increase of less than 5 per cent.
„ 56 „	=15·1 „	.	An increase of 5 per cent. and less than 10 per cent.
„ 29 „	= 7·8 „	.	An increase of 10 per cent. and over.

The average increase over the 370 cases was 5·675 per cent. The argument of the owners and factors, that a 10 per cent. increase would be necessary to compensate for increased expenses due as to 5 per cent. to increased cost of repairs, and as to 5 per cent. to increase of interest on bonds, was not substantiated by the Committee as regards the cost of repairs. The matter was more serious, it was agreed, as regards increased interest on bonds. On the whole, it was obvious that in a not very large percentage of the cases, owners had taken advantage of the existing scarcity to raise their rents unduly. During the remainder of the war period, rents were restricted under the increase of Rent and Mortgage Interest (War Restriction) Act, 1915 and the amending Acts, the result of which was to

[1] Cf. *Commission on Industrial Unrest, Scot.*, Cd. 2669, p. 4.
[2] Cd. 8111, p. 15.

limit increases to the amount necessary to cover increased rates and water charges.

Rent was only one element in the cost of living, which as a whole was rising rapidly. But while the Clyde Valley experienced the rise which was general in all urban centres, the concentration of the working population on the relatively highly paid war industries prevented any general suffering. Various factors indeed go to show that the population of the area was, during the actual war years, more capable of maintaining a fair standard of comfort than in the pre-war period. Relatively there was the absence of unemployment. Even in the early weeks of the war, when the Border textile industries were almost at a standstill through the loss of continental markets, and the Fife miners were suffering severely through the curtailment of the export trade, there was no such serious and widespread unemployment in the west; and after the first few months, the general experience was one of scarcity of labour in practically every industry. To deal with the National Relief Fund instituted at the beginning of the war a Scottish Advisory Committee was set up. This Committee with its local Committees dealt with distress due to enlistment, before the War Office machinery was working smoothly; but the existence of the Soldiers' and Sailors' Families Association, and the increasing efficiency of the War Office organization, rendered this part of the Committee's work unnecessary. Thereafter, its main work lay in dealing with distress due to the dislocation of trade and industry. A Scottish Committee on Women's Employment was established, and the Fund gave grants for the maintenance of workrooms and for training schemes for women. But with the growth of the munitions industry the work of this Committee also became less urgent.

Another indication which points in the same direction is the reduction in pauperism in the Glasgow parish during the period. The number of paupers in receipt of indoor relief fell from 4,112 at November 1913 to 1,849 in 1918[1]; and the number on the outdoor rolls (including dependants) from 7,695 to 6,124. Nor

[1] *Parish of Glasgow, Statistical Reports*, 1914–19.

was this reduction simply the result of any application of severer tests; for the number of applications for relief shows a similar decline from 11,081 in the second half of 1914 to 5,453 in the same period of 1918. The distressing class of 'ins and outs', men and women who get a day's work occasionally, and fall back on the parish in the intervals, was reduced from 1,295 in the second half of 1914 to 298 in the corresponding period of 1918. Money was more plentiful, and employment was available for all. A similar trend is seen in the applications of women for parish relief on account of the desertion of their husbands. In the first half of 1913 there were 771 such applications; in the first half of 1918 only 268. The men had found their way into the Army, and their wives were drawing allowances for themselves and their children, or were working at munitions. The above facts are summarized in the following table:

PAUPERISM STATISTICS, GLASGOW, FOR THE SIX MONTHS ENDING NOVEMBER 15

	1913	*1914*	*1915*	*1916*	*1918*
Applications during the six months . . .	10,662	11,081	8,094	6,972	5,453
On indoor roll at 15 Nov. .	4,112	3,672	2,496	2,203	1,849
On outdoor roll at 15 Nov. .	7,695	8,127	7,790	7,718	6,124
Ins and outs, six months .	1,221	1,295	847	679	298
Desertion, six months .	785	757	442	370	280

After the war the receipt of pensions prevented a rapid recrudescence of pauperism; but the numerous hasty war-marriages resulted in a speedy increase in the applications of women for relief on account of the desertion of their husbands.

A further indirect indication of the temporary prosperity of the people is afforded by the reports of the Education Authority of Glasgow on the Medical Inspection of School Children, in which it appears that during the war years the children suffering from underfeeding and insufficient clothing were fewer in number

than in normal years. The facts as given in the reports are these : [1]

UNDERFED AND ILL-CLAD CHILDREN

	1913–14	*1914–15*	*1915–16*	*1916–17*	*1917–18*	*1918–19*
Underfed . .	14	20	18	3	4	1
Ill-clad . .	168	207	128	60	71	98
Both . . .	27	37	4	5	13	10
	209	264	150	68	88	109

The rate of infantile mortality is calculated at the number of infants under one year old who die in a given year per thousand born in that year. The rates for Glasgow during the war period were as follows : [2]

INFANTILE MORTALITY IN GLASGOW

1913	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*
129	137	143	111	129	113	114

It will be observed in each of the above sets of figures relating to pauperism, the condition of school children, and infantile mortality, that the figure for 1914 is either in excess of or almost equal to that for 1913 ; and that it was only subsequently that the decline began to appear. This is the natural consequence of several co-operating factors ; the ' time-lag ' in the rise of wages following on advancing prices, the delay in getting the machinery of army allowances into motion, and the absence of any extensive demand for munition workers till well into 1915. Thereafter, for the remainder of the actual war period, a decent standard of living was more easily maintained in the industrial centres.

Positive indications pointing in the same direction are not

[1] Annual Reports of the Education Authority of Glasgow on the Medical Inspection of Children, 1914–19.

[2] *Medical Officer's Report* (Glasgow), 1914–19.

wanting. The most useful index is probably that afforded by the returns of the Glasgow Savings Bank.[1] From these it appears that the number of people availing themselves of the facilities of the bank grew progressively during the war period. The total number of new depositors in the ordinary department of the bank in 1913 was just over 39,300; in 1918 it was over 50,000. The number of deposits increased from 877,500 in 1913 to more than a million and a quarter in 1918, and about 50 per cent. of the deposit transactions involved sums of not more than £1. The total value of deposits in the ordinary department of the bank, which was under £3,000,000 in 1914, was more than £5,250,000 in 1918. At the credit of the depositors there stood in the bank in 1914 £1,118,293; in 1918 the sum was £13,000,000; and in addition investments in Government Stock were made through the bank to the extent of more than £3,000,000. In this one savings institution alone, therefore, the savings of the people amounted to over £17,000,000.

[1] *Glasgow Savings Bank Reports*, 1914–19.

CHAPTER X

LIFE AND INDUSTRY DURING THE WAR AND AFTER

Impressions of the life of the Clyde Valley since 1914—mobilization, the harbour in the first week of the war, the shipyards, recruiting and domestic life, child-life, scarcity of housing, juvenile employment, women's work and welfare schemes, the streets during the war, travel and the coast traffic, demobilization, the boom and the slump, unemployment, local relief schemes; the problem as to how far consequences of the war are likely to have permanent effects on industry; increased productive power in engineering; standardization; shipbuilding; improved methods; steel—difficulties of the position in 1921–2; the improved lay-out of works; the coal trade; declining output of Lanarkshire coal-mines and the position regarding remaining workable coal; possible effects on industries of the Clyde Valley; possible compensating influences; water-power resources and industry; the proposed mid-Scotland ship canal; prospects as regards shipping and the industries of the district; final summary of prospects.

Already the memory of the life of the people during war time is becoming faint and blurred. This in fact is the inevitable consequence of a psychological law according to which, when both emotion and activity are most intense, the subsequent memory is faint. Accordingly, before it is too late, some attempt may be made to picture life in the industrial West of Scotland under war conditions. Yet not much more can be done than to afford glimpses etched, like Muirhead Bone's print of Denny's old workshop at Dumbarton, with more shadow than light.

While many of the characteristics of life between 1914 and 1918 were the same all over the country, there were differences. The latter were perhaps mainly of two kinds. On the one side the south and east coasts of Britain were within closer reach of the immediate area of hostilities, and were subject to air-raids. In the West of Scotland no reports of guns, fired in anger, were heard. It may have been for this reason, it may have been

through national temperament, that fluctuations of opinion concerning the course of the war were much less extreme than in some other districts. There were never the abrupt alternations between optimism and pessimism to which London was subject. Then on the other side there was a difference between a district such as this, which was in the thick of war production, and other places whose resources did not admit of such activities to a similar extent. Thus within the general picture of life during the war there are variations as between different localities.

The shock of the declaration of war brought the inevitable disorganization of the life of the district. Not only was there mobilization with its strain, but there were the business arrangements to be made during the service of masters and men who were mobilized in their territorial units. Then there was the preliminary uncertainty and lack of confidence concerning business of all kinds under the new and unknown conditions. The state of Glasgow harbour in the first week of war was typical of the great upheaval. It was jammed with shipping, so that not only were all berths occupied but the centre of the river was congested, sometimes three vessels being moored abreast in mid-stream. Some were German boats detained or brought in by the Navy, while many others were British and neutrals which were held back from sailing by the owners. The effect of the shock and of the consequent disorganization of the Foreign Exchanges was to make trade dull; there was unemployment and a number of people felt some anxiety about supplies of food being maintained. Before the end of 1914, or at least early in 1915, there came the beginnings of a change. There was the general movement towards ' business as usual ', supplemented, in the case of the Clyde, by the demands of the Admiralty on the shipyards and extending from these to all the related industries. The river during the war was a remarkable sight. The shipyards were working as they had never worked before. Warship building and repairing was being pressed on. Later, new slips were laid down when the demand for mercantile tonnage became intense. The yards were a scene of ceaseless activity.

In some places the ships were shrouded with canvas where new types of war-vessels were under construction.

At first, apart from the general personal anxiety concerning the war, there was little change in the social life and habits of the people. There was something of a 'dour' pride in the feeling that, apart from private grief and private anxieties, the enemy should not be allowed to disturb the usual life of the people. Changes, however, there were. Naturally many kinds of enjoyment were suspended, though later some reappeared in a modified form as organized entertainments for the members of the forces. Perhaps the first sign of the strain on social conditions by war emergencies was the threatened rent strike in Partick and Govan in September 1915. These districts were largely inhabited by shipyard workers, and the pressure on the shipyards had caused a demand for houses which was difficult to satisfy.

The joint effect of increased recruiting and the development of the production of munitions brought the first great changes in the social life of the district. Already, as recruiting developed, there had been upheavals in many houses. Now the women became industrial workers to a vastly increased degree. Not only so, but there was a great transference of women's work, taking the general form of a movement from other occupations to various forms of munition and related work. The working of the tramway system affords an illustration of the latter. The Glasgow system is an extensive one and some of the lines run far into the country. The total track is about 198 miles, and in 1918–19 464 million passengers were carried. The total staff numbered well over 6,000. In September 1914 the Corporation decided to raise and equip two battalions in the New Army, and within twenty-four hours 1,100 names had been given in by men in the Tramway Department, and by the end of the year 1,756 men had enlisted from that Department. At first there was some disorganization of the service during the training of women, but later it was carried on with remarkable regularity, considering the circumstances. The largest number of women employed was 2,388, of whom 306 were drivers. The replacement of men by women was thought out to minute details.

Thus a comparatively picturesque costume was designed for women conductors in which the celebrated green-and-black tartan of the Black Watch was utilized. The social consequences of the increased employment of women were of almost infinite variety. It is only possible to indicate some of the most important. Partly through the combination of separation allowances and munition earnings, possibly to some extent owing to the restricted liquor conditions, children were both better fed and better clothed.[1] While there was a considerable influx of female labour, much was drawn from the district. But in many cases it was not possible to provide housing accommodation where the labour was employed (as for instance in a new National Factory such as Georgetown) and the workers had to travel by train. Where there were children to be cared for, this added to domestic difficulties, and these became intensified when rationing came into force. To some extent this problem partly solved itself in so far as an urgent demand arose for boy and girl labour; which, though undesirable in several respects, had at least the effect of keeping young boys and girls out of mischief into which under war-time conditions they might otherwise have fallen. This effect was necessarily temporary; the absence of the fathers and the increased employment of the mothers in factories resulted in a serious relaxation of parental control, while the high scale of juvenile earnings fostered a sense of independence which has since manifested itself in several undesirable ways. The increase of crime in 1920–1 is to some extent attributable to this relaxation of parental control and constitutes an almost inevitable result of the exigencies of the pressure of war industry. The range of juvenile employment in Glasgow and the surrounding district was very remarkable. It was one of the social portents of war conditions to see the small scraps of humanity that were entrusted with comparatively responsible work, both in factories and in services outside them. Two glimpses may illustrate this. In the later stages of the war very young boys were set to drive horse-drawn delivery vans, and on one occasion two of

[1] *Supra*, p. 172.

these ' van-men '—to all appearance aged about eleven years —were driving vans loaded with small boxes which had been collected at the terminus of the North British Railway in Queen Street. The young hopefuls organized a race through the heart of the City, and as they whipped their ill-fed horses to a shambling canter, they were followed by a cascade of their freight behind them. Later in the war some boys were promoted to drive motor lorries. One of the features of Armistice Day was the behaviour of the lorries employed in bringing milk to the City. As the boy drivers got the news they ceased to deliver milk, and added to the prevailing noise by driving rapidly through the streets with all their cans rattling till their petrol was exhausted.

Closely connected with the extended use of the labour of women in factories were the schemes for welfare work applied to them and also to juveniles in industry. The welfare movement did not originate with the war. Welfare work, under that or some other name, existed in a few establishments throughout the country in the nineteenth century. Nevertheless it was the rush of women into munitions that brought the movement into prominence. In 1915 the ' Health of Munition Workers Committee ' pointed out the urgent necessity of a system of welfare supervision where women and girls were employed and its advantages in munition works where 500 men or 100 boys were employed.[1] With the rapid growth of National Factories and munition works in 1915 and 1916 the movement developed. The Welfare Section of the Ministry of Munitions was created; National Factories were compelled, and controlled munitions works were urged, to appoint welfare supervisors; night work for women was permitted by the Home Office only on condition that a responsible woman was appointed to supervise the female workers, and in 1916 the Police, Factories, &c. (Miscellaneous Provisions) Act gave powers to the Home Office to require the establishment of supervision where it seemed necessary.

[1] *Ministry of Munitions, Mem., No. 2, Welfare Supervision,* Cd. 8151, 1915, pars. 7, 9, 12, 13.

In that year the Rev. R. R. Hyde, appointed to the Welfare Section of the Ministry of Munitions, visited Glasgow on the advice of some of the sympathetic Labour leaders, one of whom said: 'If you want to test this scheme, try it on Clydesdale; if you succeed there you will succeed everywhere.' Interviews with employers in the Clyde area, severally and in groups, resulted in the appointment by a number of firms, of supervisors, either male or female. The male supervisors were in the main charged with the supervision of the boys and apprentices, being responsible for their engagement and subsequent conduct, and being at least consulted by the foreman before dismissals took place. Female supervisors were appointed where girls were employed temporarily in the machine shops. The movement met with the greatest encouragement in the engineering shops and shipbuilding yards, but by the end of 1918 other industries had come into line, and many supervisors, both male and female, had been appointed in the Clyde area. At the present time (1921), while the trade depression has prevented any considerable expansion in recent months, the movement holds its own. The Industrial Welfare Society, established in 1918 with H.R.H. the Duke of York as President, has as its Chairman Lord Invernairn, and other prominent Scottish employers are members of its Council. A Scottish Society of Welfare Supervisors was formed in 1918, and there is also a Scottish Branch of the Welfare Workers' Institute.

The welfare movement being still in its infancy, the most desirable line of development was and still is a matter for experiment and discussion. But two problems in particular demanded attention. The chief of these was the problem of securing suitable supervisors. For the duties to be discharged, both character and experience were required. Already many of those who had experience in organizing and controlling women had been absorbed in various kinds of material service, and it became necessary to devise intensified training for those who appeared likely to be suitable for the position. The Glasgow School of Social Study and Training early recognized the need, and, with the co-operation of the Ministry of Munitions, an

emergency course was organized as early as the summer of 1916. The results proved promising, and suitable courses of training were added to the curriculum of the school. The constitution of the school has since been modified so as to provide for the election of two representatives on the Board of the School, one from the Welfare Workers' Institute and the other from the Scottish Society of Welfare Supervisors.

The second problem was that of the scope of Welfare Work and the functions of the supervisor. In the West of Scotland at least there is as yet little uniformity of practice. Some supervisors, to quote one of themselves, are merely ' caterers of recreation ' ; and while the recreative side is an important one, to interpret welfare thus narrowly is to miss the great opportunity offered by this new instrument for the closer co-operation of all connected with the factory as a unit. In other cases a wider view of the possibilities of the movement has been gained ; and supervisors interview candidates for employment, select boys, and in some cases train apprentices. The performance of such functions obviously raises difficult problems of the relation of the welfare worker to the management.

Turning from life in the home and in the factory to that outside, during the period when war production was at its height Glasgow developed a special psychology. The centre of its activity was the river. The miles of shipyards were working night and day. As in the days of long ago the arrival of a ship was an event, often bringing tales of daring and hazard which recalled the great days of early navigators. The haunts of the seamen by the river thrilled to the adventures of the mercantile marine during the submarine campaign.

As regards the rest of the population there was the daily movement from and to the munition works. Thus in the forenoon the streets were strangely deserted. In addition to industrial work there were almost numberless relief works, as an instance of the magnitude of which may be mentioned the Belgian Relief Fund, the Scottish section of which was organized in Glasgow. As a pathetic indication of the strenuous occupation of the people, it was noticeable at this period of the day how

large a proportion of the scanty male population to be seen in the streets was obviously affected by some grave physical disability. In the industrial quarters the movement of new types of industrial products was a feature during the later stages of the war. The passage of tanks, for instance, could not fail to excite attention. It was in the night that the war-time life showed itself in the most striking and yet most mysterious manner. Under the general restriction of lighting, the City as far as possible was in darkness. One heard the steam hammers and other sounds of the larger industries. This was the time for specifically Government traffic. Long trains carrying munitions —guns, tanks, and aeroplanes—were sent off. The main incoming traffic consisted of Red Cross trains which were run direct to the sidings at the military hospitals. Meanwhile, the whole Clyde area had become a vast machine for ministering to the insatiable demands of the forces. New factories were constantly being erected, and every place that could hold a lathe was 'on munitions'. The demand for more and more production overflowed from the industrial districts into residential areas, and gas engines could be heard in sheds or even in old coach-houses, and in fact in any place where room could be found for them.

Subject to the special conditions of women's labour, war-time life resembled that in other large towns. In Glasgow, as in the other Clyde towns, queues never developed to anything like the extent that prevailed in the south. To some extent the other occupations of the womenfolk prevented the common temptation of joining any crowd that was forming outside a shop. In this connexion one recalls the excuse of a woman worker who came late to work, through seeing a queue, which she joined only to find when her turn came that it was for the sale of treacle and that she had no vessel to put it in. On the other side, when the hours of public houses were greatly restricted, the queues waiting for the opening were a melancholy sight. There were special circumstances which rather intensified the difficulties of travel when trains were fewest. The amount of war work involved a considerable volume of passenger traffic with

London, while the increase in official business had similar effects as regards Edinburgh also. Then, too, in normal times there is a large movement of population between the City and the towns and residences on the Firth of Clyde by means of fast steamers. Some of these were employed on war service, while navigation of the Firth was greatly curtailed by the boom at Dunoon—the sailings of the Clyde steamers being necessarily rearranged so as to provide services inside and outside this obstruction. Thus many of the business men who lived on the Firth and depended on a quick steamer service to get to their work were compelled to move elsewhere for a time, and to depend on the railways.

It would be natural to expect that, when the war production was so great, the reversion to the avocations of peace would involve a considerable amount of strain and friction. This, however, did not turn out to be so great as might have been anticipated as regards the displacement of women employed on war work. The larger proportion of women came from working-class families in the district; some of them, on the demobilization of their men folk, returned to the domestic duties they had previously performed. Others, who had been in employment before, sought work in their original occupations. In the special case of the railways and the tramcar service, the women employed were the wives or sisters of the men who had gone into the Army; and the latter, as they were demobilized, replaced their wives. Thus the first stage of the change-over to peace conditions was accomplished with much less disturbance than might have appeared to be inevitable. There were two further causes of this. Demobilization was slow; and, before it was finished, the boom had set in. When, however, one looked below the surface it became evident that the complete change-over to peace conditions had not been fully accomplished. In 1919–20 the industry of the district was still living in conditions which had been largely caused by the war. The circumstances from 1915 to 1918 had made great modifications in the productive capacity of the district. Particularly in shipbuilding and engineering it was equipped to do more business, but in

1920 the demand failed. In the special case of shipbuilding, in addition to other causes, the sale by the Government of German vessels brought acute depression to this industry, and that extended to all the other trades which were dependent either largely or altogether upon it. Thus the real reaction from the war-time demand for labour was reached in the summer of 1921 and subsequent months. By October 1921 the percentage of workers claiming unemployment benefit in the Scottish shipbuilding industry was 22·7. In the winter of 1921–2 unemployment figures were distressing. Early in 1922 the number of unemployment books remaining lodged with the Employment Exchanges in Glasgow were about 90,000. There was a slight diminution in February. The number for the week ending February 14th was 87,697, that for the following week was 84,800. In addition at the later date there were 10,821 persons returned as under-employed. These figures were increased in the next month through the lock-out of engineers.

It was inevitable that the wave of depression should hit the Clyde Valley with special force. The predominant war effort had been directed into the shipbuilding and engineering trades. Some of the causes of the exceptional depression in these have already been mentioned; and, as they declined, the heavy iron and steel trades were also affected very adversely. Moreover, the peculiar developments of war industry had diminished the element of compensation which had lessened the severity of previous industrial depressions, in so far as the variety of industries in the district tended towards stability of employment through all of these not experiencing the contraction to the same degree. In this case the expansion of the war industries (which became specially depressed) had upset the previous balance, and trades (such as tobacco) which had felt the slump to a slight extent were able to afford a relatively small measure of relief towards readjustment of the position.

At the date of writing it is too early to attempt any effective summary of the reactions of the post-war depression upon general social conditions. Such an estimate would only be possible when it could be ascertained that the depression was

over. The matter of prime importance will be the duration of unemployment since its effects will be cumulative. Up till early in the winter of 1921 the more prudent working-class families, by the aid of unemployment benefit, their savings, and other reserves of various kinds, had carried on without serious hardship. In addition to deposits in the savings banks, they had accumulated realizable property during the war. Unfortunately, as things have turned out, the improved conditions of living tended to be over-standardized, and realization became difficult. By the autumn of 1921 the sale-rooms were congested with cottage pianos and there was no market for second-hand fur-coats—these being the chief directions in which, as regards movable property, the ambition of war workers had found expression. In the winter the Lord Provost opened a relief fund, which was designed to help the unemployed to pay their rents as well as in other ways. In this connexion a device of the war period was revived. This was connected with the use of the City trams. Ordinary trade advertisements are not displayed on these cars, but only notices of a public character. This system was greatly developed during the war. Not only did the cars prove an excellent medium for concentrating attention on successive public needs, such as recruiting, provision of comforts for the troops, the war savings campaign, and other urgent requirements; a method was devised by which tickets (in addition to those for payment of fares) were sold by the car conductors, and the offer of substantial prizes made the development popular, so much so that £74,484 was collected in this way during the war. Though the intervention of the Scottish Law Officers limited this side of the operations of the Department, the public became accustomed to supporting a public object by small subscriptions in the form of the purchase of a special ticket. This scheme was revived in aid of the Unemployed by the sale of 'Rent tickets'—the proceeds being assigned to the Lord Provost's Relief Fund.

As a background to the unemployment of the winter of 1921–2, there is the problem of the estimation of the possible permanent effects of the immense diversion of productive

capacity in the West of Scotland towards purposes of war, and whether this is likely to leave lasting effects upon industry, modifying to some extent its normal basis when that stage will be reached. It is almost unnecessary to say that at present no final answer can be reached, but a number of definite data have emerged, and these show to some degree the conditions upon which the eventual solution must be based.

There is a preliminary aspect of the situation to which it may not be amiss to draw attention. It is a word of warning to the investigators of the future, who will be more fortunate in having at their disposal facts which cannot be as yet available. It is likely that at that time it will be found that industrial changes followed the war, and it may be not unnatural to infer that the war was the cause of these. Cases may arise—indeed there may be many of them—where a particular development had been arranged before 1914, but the outbreak of war prevented its being carried into effect, and it had to be postponed till peace had been restored. In such instances the war, instead of being the cause of that particular development, had the effect of delaying it. As a case in point, an important manufacturing firm had been gradually developing during a number of years before the war an extensive scheme for the entire reorganization of the methods in one of its departments, which involved something approaching a revolution in the previous system. The scheme was not quite complete in 1914, and the firm was very soon in the thick of war work. After the Armistice the plans were carried out; and, without a knowledge of the facts, it would be quite natural to conclude that the new departure was a result of experience gained during the war, whereas the war had actually postponed it.

The Clyde Valley emerged from the period of hostilities with its productive capacity in steel, shipbuilding, and engineering very greatly augmented. The increase in plant was subject to varying conditions as to its future use. At one period optimists predicted that there would be employment for the world's enlarged engineering equipment. Events have shown that this is highly improbable. In such branches of the trade as admit

of standardization, the effect of the experiences since 1914 has been to give a much greater impetus towards its adoption; and, as has already been said, in these branches on a revival in trade the advance of standardization is assured.[1] In others even in spite of the 'peace boom', it was thought necessary to scrap a considerable amount of the machines which had been introduced for work on munitions. As regards the industry in general the experience of the war has had the effect of making the minds of those in control more open to try experiments and to risk new methods. The hard teaching of adversity during the period of depression will drive this lesson home. In shipbuilding the demand for tonnage during the war resulted in improvements in and extension of the yards. Some of the changes in methods, introduced under the pressure of war conditions, have not been continued; but in other directions improvements have been effected which will remain. The increased building capacity is available for peace-time production. Even in the depths of the depression of the winter of 1921–2, when there were no orders in hand to take the place of those nearing completion, it is not unsatisfactory to find Sir James Lithgow, President of the Shipbuilding Employers' Federation, giving his considered opinion that 'he had no doubt that "the will to win" will again inspire our people and enable them to build up our shipbuilding industry to something resembling its former importance.'[2] Allowing for the restraint induced in a period of depression this is not an unhopeful pronouncement. It appears to contemplate a production on the Clyde 'somewhat resembling' the proportion of the world's tonnage which had been built previously. Whether such a production would require the pre-war building capacity or that at present available will depend on the future demand for tonnage, which in turn will depend upon the volume of overseas trade when a revival comes. It is confidently claimed that the technical efficiency of the yards has been so much improved

[1] *Supra*, p. 111.

[2] 'Shipyard Prospects' in *The Glasgow Herald Shipbuilding, Engineering and Commerce Supplement* for 1921, p. 37.

that production will be more economical than ever before, and that the Clyde should hold its own as against other districts, either in Great Britain or overseas.

In the case of steel the position as regards its production is in danger of being entangled in a vicious circle. The chief demand comes from the shipbuilding and engineering industries, and the steel-makers look to a revival in these for the restarting of their furnaces. On the other side, the shipbuilders and engineers contend that the obtaining of new business is dependent on lower steel prices. A further element of complication is that the steel masters fear foreign competition. Attention has already been drawn to the dangerous shortage of steel during the war and the strenuous efforts which were made to remedy it in Scotland.[1] Elsewhere there were similar problems, so that the existing productive capacity of the world is in excess of the demand that is at present in sight. The position in the Clyde Valley is made clear by the proceedings in the Courts regarding the valuation of the Lanarkshire Steel Works for purposes of rating. Prior to the war the last valuation had been made in 1900. The assessment of the City Assessor in 1921–2 in the case of the Dalzell Steel and Iron Works represented an increase of no less than 332 per cent., and in the remaining cases there were similar advances. The Lands Valuation Appeal Court recognized that, while the industry was suffering from an almost complete collapse of trade, a mere temporary set-back in an industry was no reason for altering the valuation. On the basis of the evidence it was decided that the world's markets could not absorb the total amount of steel which was capable of being produced, and that not for five years, at all events, was it likely that even the pre-war output could be marketed.[2] In the end the Court did not accept the figures of the City Assessor, and the valuation of the company mentioned above was fixed at an advance of 71 per cent. on that of 1900, on the basis of additions to the property up to 1914. Yet, though the immediate effect of the war upon the Scottish steel industry has been depressing and apparently almost disastrous, there are

[1] *Supra*, pp. 60–4.

[2] Judgement of Lord Salvesen.

aspects of it which are not devoid of hope for the future. Scotland was a pioneer in this trade, and therefore the works grew up piecemeal, and many of them were at a disadvantage as compared with those of later construction in other countries which had been planned on the basis of the latest discoveries. The increased production demanded during the war involved the erection of new works as single units ; and, almost for the first time, there was the opportunity of providing the Scottish steel trade with the latest type of plant, so that, in the words of Mr. John Craig, the Chairman of the Scottish Steel-makers Association, 'it can safely be asserted that there are steel plants in Scotland to-day which embody all the latest developments, and which can favourably compare with steel plants in any part of the world.'[1] Therefore, as in shipbuilding, the relative power of the Scottish Steel Trade to compete in the immediate future has been definitely increased.

For a final judgement on the future position of the steel industry reference must be made to that of the coal trade ; but, in view of certain aspects of it, this may conveniently be postponed for a little. Meanwhile it is worth glancing briefly at the provision made for the development of over-seas trade by the Harbour Trustees. In recent years the Trustees have been confronted with two diverse problems. On the one side, the ever-deeper dredging of the river has led to the collapse of some of the quay walls and the endangering of others. Thus very extensive rebuilding and strengthening of the existing quays have been necessary. On the other side, there is the extension of the harbour to provide for immediate and future needs. The Trustees have manifested absolute confidence in the growth of sea-borne traffic, since their scheme of development provides for the gradual construction of six miles of new quayage. This will involve the doubling of the area of the existing harbour, and the scheme will require 670 acres of land. It is interesting to note that some of the land to be used was acquired as far back as 1884. When this scheme is completed the cost, on the basis

[1] 'The Making of Steel' in *The Glasgow Herald Shipbuilding, Engineering and Commerce Supplement* for 1921, p. 30.

of estimates of 1921, will be between 16 millions and 20 millions. Such a comprehensive scheme, like another for a Clyde barrage, shows a large faith in the ultimate prospects of the Clyde shipping; and, in spite of the present depression, it is to be recalled that it was the development of this industry which laid the firm foundations of the economic progress of the West of Scotland.[1] That was extended by the development of the coal and iron industries, and here the future position calls for investigation. The chain of industries—steel, shipbuilding and engineering—depend for their prosperity upon coal. As regards the near future the coal-mining industry will ultimately readjust itself, so that the manufacturing costs in these trades will enable them to compete both with imports from abroad and in foreign markets. Taking a further view the outlook becomes more uncertain. The eastern and western coal-fields of Scotland are of unequal extent; the latter is the smaller and has been more worked in proportion to its size. At the 1st January 1917 the estimated amount of workable coal (in seams of 18 inches or over) in Scotland was 12,315 million tons. In the Lanarkshire coal-field it was 2,930 million tons. It was then stated that the output from the latter field for some years past 'had begun to show a decided tendency to decline'.[2] As the years go on the relative advantage in technical appliances and to some degree in skill may be more and more counterbalanced by increased difficulty in procuring coal. If this is a correct statement of the problem which is due to emerge, the solution of it will be the task of the next generation. That problem is linked with another which, unlike the former, is purely a legacy of the war, namely, how to find a profitable use for the existing surplus productive power. The main factor towards the solution of both will be the utilization of new methods of organization and of scientific discovery. As regards the coal position, something may be accomplished both in the economy of power and the utilization of other sources of power. The Committee of the

[1] *Supra*, p. 7 ff.

[2] *Report on Pig-iron Production in Scotland for Scottish Advisory Committee on Pig-iron Production*, 1917, pp. 10, 11.

Board of Trade on Water Power Resources is emphatic as to the 'entire practicability' of transmitting the hydro-electrical energy from nine districts which had been examined in the vicinity of the Great Glen to the industrial areas in Scotland, such as Glasgow, the Clyde Valley, Edinburgh, Aberdeen, and Dundee. These stations are estimated to produce power equivalent to that procured from 1·85 million tons of coal per annum.[1] After these stations had been dealt with in this manner there would remain a large surplus of water power in other parts of the Highlands. Alternatively, in the event of water power being utilized in the region where it is generated, as for instance for electro-chemical or electro-metallurgical processes, these would indirectly increase the general trade of the port as most of them would be reached by the west coast, the trade of which centres in the Clyde.

Another aspect of this highly complex problem is more fundamental, namely, whether the comparatively accidental severance of the western and eastern coal-fields should be accepted as a governing condition in economic organization. If it is, apart from new developments, the increase in the West of Scotland coal, iron, steel and heavy engineering trades would be restricted and progress would show itself more in the last. The combining of the coal-fields of Scotland for purposes of the iron trade gives a new point of approach to the project of a mid-Scotland ship canal which is designed to connect the Clyde with the Forth. This scheme has been under consideration for many years, and the main grounds upon which it has been advocated have changed from time to time. Of late the advantages from the point of view of shipping have been most prominent. The economic unit in the handling of sea-borne freight keeps increasing in size. But as ships become larger, it becomes more difficult to secure reasonably full loads. In the case of a vessel sailing from America, if it goes *via* the English Channel, there is a much better chance of securing a full load than if it sails to Glasgow. With a ship canal through Scotland better loading could be obtained, with unique advantages in

[1] *Interim Report of Water Power Resources Committee*, 1919 (Cmd. 79), p. 3.

bunkering and in collecting, loading and discharging cargo much superior to those afforded by the southern channel. At the same time it may be doubted if the shipping and allied interest will prevail in the near future in securing the large capital required for construction. If, however, it is recognized at a later date that much is to be gained by all sections of the commercial and industrial community through a more systematic development of the resources of Central Scotland, it is not improbable that by that time the scheme would command general assent. In particular the differences in the points of view of the ' easterners ' and ' westerners ' in Scottish economic organization would be reconciled, and it would seem that more was to be gained by co-operation than by isolation. If such a development came in due course it would prove the crown of that preponderance of the Clyde in trading relations with the Dominions and other new countries which has been increased during and since the war. Glasgow would then be the northern gateway for the western world in its transactions with Europe. The Clyde would be the main clearing house in northern Britain as between east and west. While the Forth ports would increase their business in bunkering and in cargoes passing to and from European ports, there would be an even larger trend of traffic to the Clyde, and it is probable there would be a marked increase in the re-export trade. The new water-way would be unlike any other in so far as it would pass through an industrial district much of which is considerably developed but which is capable of further progress under the new conditions. If the position as regards coal resulted in future developments in the iron and steel industries tending to take place in the east, improved communications would facilitate the further working of the material in the western district in which the advantages for shipbuilding and engineering will still remain very great.

These and other possibilities show that the West of Scotland is entitled to face the future with confidence. Wherever one looks amongst the main industries, it has emerged from the war with its material equipment improved—not only absolutely, but as far as can be judged also relatively in comparison with

its chief competitors. But, after all, this is no more than the body of the industry of the district. It is in its spirit that its chief asset is to be found. The long and varied acquaintance with large enterprises reaching into almost every part of the world, the alertness of mind to discern new opportunities and the promptness of judgement to seize these early and yet not too soon, are qualities of mind which deserve and, in the end, will ensure success. In the coming years it will be desirable that these most valuable characteristics should be informed and developed by the economic and scientific knowledge which will be required more and more in the new situation. Given these, there can be little doubt that a future, greater even than a great past, is in store for the West of Scotland. And in this connexion it may be recalled that hitherto each great advance has, with a curious and perplexing regularity, been preceded by a period of exceptional depression. The omens point to history once more repeating itself.

APPENDIX

I. COAL SHIPMENTS, 1913 [1]

(Thousand tons)

Destination	*From*			
	Scotland			*U.K.*
	East	*West*	*Total*	
North European countries	7,050	476	7,526	29,005
Mediterranean countries .	1,039	1,413	2,452	35,768
West Africa, &c. . .	2	4	6	502
British South Africa .	—	13	13	65
French Africa, &c. . .	—	1	1	319
Indian Continent . .	—	2	2	179
Ceylon, Strait Settlements, China, Japan, &c.	—	2	2	433
Canada, U.S.A., and Central America . .	8	88	96	189
Brazil, Uruguay, Bolivia, &c.	153	183	336	6,335
Peru, Chili, and Equador .	—	1	1	605

II. OUTPUT OF COAL DURING THE WAR

(Thousand tons)

Date	*U.K.*	*Scotland*		
		Total	*West*	*East*
1909–13 (average) .	269,575	40,959	25,177	15,782
1914				
First six months .	139,994	20,739	12,759	7,980
Second six months .	125,649	18,109	11,604	6,505
Total . . .	265,643	38,848	24,363	14,485
1915	253,179	35,473	22,879	12,594
1916	256,348	36,193	23,555	12,638
1917	248,473	34,246	22,923	11,323
1918	227,987	31,893	20,833	11,060
1919	229,000	32,458	20,857	11,601
1920	230,000	30,154	19,860	10,294
1921	190,500	—	—	—

[1] From *Iron and Coal Trades Review.*

III. EXPORTS OF COAL DURING THE WAR

(Cargo only, in thousand tons)

Date	U.K.	Scotland		
		Total	West	East
1912 . . .	64,445	9,703	1,907	7,796
1913 . . .	73,400	10,437	2,184	8,253
1914 . . .	59,040	8,378	2,201	6,177
1915 . . .	43,535	6,448	2,724	3,724
1916 . . .	38,352	5,301	2,297	3,004
1917 . . .	34,996	2,474	1,564	910
1918 . . .	31,753	2,412	1,213	1,199
1919 . . .	35,250	2,651	746	1,905
1920 . . .	24,932	1,336	109	1,227
1921 . . .	16,728 [a]	1,398 [b]	244 [b]	1,154 [b]

[a] Ten months, January–October. [b] Five months, July–November.

IV. EXPORTS OF COAL FROM EAST AND WEST SCOTLAND DURING THE WAR TO PRINCIPAL MARKETS

(Thousand tons)

(*Blanks indicate that figures are not available*)

To	1913	1914	1915	1916	1917	1918	1919	1920
Germany . . .	2,900	—	—	—	—	—	—	4
Denmark . . .	1,400	1,170	1,415	1,181	—	—	800	328
Sweden . . .	1,200	5,446	898	566	—	—	399	265
Italy . . .	950	—	739	866	371	—	431	32
France . . .	900	—	1,910	1,455	619	—	397	186
Russia . . .	850	—	—	—	—	—	13	27
Norway . . .	600	675	558	537	—	—	301	63
Belgium . . .	190	—	—	—	—	—	7	325
Spain . . .	210	—	153	156	—	—	18	2
Holland . . .	460	273	242	245	—	—	133	63
Other European countries . . .	780	—	—	—	—	—	—	—
Non-European countries . . .		—	23	30	—	—	82	27
Total exports .	10,440	8,478	6,448	5,301	2,474	2,412	2,651	1,336
Bunkers and home ports . . .	6,160	5,716	4,374	2,241	—	5,049	—	—
Total shipments .	16,600	14,194	10,822	7,542	—	7,461	—	—

V. NUMBERS EMPLOYED, TOTAL OUTPUT, AND AVERAGE OUTPUT PER WORKER IN COAL-MINING IN SCOTLAND

Year	*Underground workers*	*Percentage difference from 1913*	*Surface workers*	*Percentage difference from 1913*	*Total workers*	*Percentage difference from 1913*	*Total output*	*Output per employee*
							Tons '000.	*Tons.*
1913	118,976	—	28,573	—	147,549	—	42,457	287
1914	118,068	−1	28,110	−2	146,178	−1	38,848	265
1915	96,105	−19	25,750	−10	121,855	−17	35,473	291
1916	100,205	−16	26,899	−6	127,104	−14	36,193	284
1917	102,205	−14	27,822	−3	130,027	−12	34,246	263
1918	96,558	−19	27,919	−2	124,477	−16	31,893	256
1919	115,718	−1	31,321	+9	147,039	—	32,458	220
1920	—	—	—	—	146,692	−0·5	30,154	205

VI. DAYS WORKED AND DAYS LOST PER WEEK BY COLLIERIES, 1913–16

	Days worked per week by collieries			*Days lost per week by collieries*		
	England and Wales	*Scotland*	*U.K.*	*England and Wales*	*Scotland*	*U.K.*
1913						
3rd quarter	5·53	4·73	5·47	0·47	1·27	0·53
4th ,,	5·63	5·34	5·60	0·37	0·66	0·40
1914						
1st ,,	5·64	5·15	5·60	0·36	0·85	0·40
2nd ,,	5·41	5·20	5·39	0·59	0·80	0·61
3rd ,,	4·94	4·10	4·87	1·06	1·90	1·13
4th ,,	5·13	4·88	5·11	0·87	1·12	0·89
1915						
1st ,,	5·61	5·26	5·59	0·39	0·74	0·41
2nd ,,	5·70	5·33	5·67	0·39	0·67	0·33
3rd ,,	5·46	4·82	5·41	0·54	1·18	0·59
4th ,,	5·69	5·28	5·66	0·31	0·72	0·34
1916						
1st ,,	5·74	5·45	5·71	0·26	0·55	0·29

[1] Calculated on basis of returns in Reports of Chief Inspector of Mines.

VII. THE USE OF COAL-CUTTING MACHINERY IN SCOTLAND [1]

Year	*No. of Collieries using mechanical appliances*	*No. of machines in use*	*Mineral obtained by electricity* [a]	*Compressed air* [a]	*Total mineral thus obtained* [a]	*Percentage of output*	*Conveyors*
1913	—	876	7,727	1,608	9,335	21·9	125
1914	—	913	7,866	1,330	9,196	23·3	128
1915	—	908	7,691	1,207	8,898	24·3	109
1916	—	987	8,613	1,151	9,764	27·0	102
1917	234	1,039	8,982	859	9,841	26·7	102
1918	240	1,081	9,293	909	10,202	31·9	103
1919	247	1,189	—	—	10,379	31·9	105

[a] Thousand tons.

VIII. BLAST FURNACES IN SCOTLAND DURING THE WAR PERIOD [2]

Quarter ended	*Total in blast on last day of quarter*	*In blast on last day of quarter, making*			*Average in blast in the quarter*	*Average in blast during the year*
		Hematite	*Forge and foundry*	*Basic*		
1913						
March 31	93	51⅔	35	5	92⅔	88⅙
June 30	89	51	33	5	91	
Sept. 30	85	47	34	4	87⅓	
Dec. 31	68	36	31	—	81⅔	
1914						
March 31	76	40	32	4	72⅔	71¾
June 30	73	38	30	4	74	
Sept. 30	72	40	29	3	68	
Dec. 30	73	44	29	—	72⅓	

[1] Compiled from returns in *Iron and Coal Trades Review, Statist,* &c.
[2] Compiled from returns in *Iron and Coal Trades Review,* 1913–20.

VIII. BLAST FURNACES IN SCOTLAND DURING THE WAR PERIOD—*continued*

Quarter ended	*Total in blast on last day of quarter*	*In blast on last day of quarter, making*			*Average in blast in the quarter*	*Average in blast during the year*
		Hematite	*Forge and foundry*	*Basic*		
1915						
March 31	73	46	27	—	73	
June 30	72	46	26	—	69	72
Sept. 30	73	47	25	—	73	
Dec. 31	72	49	22	—	73	
1916						
March 31	70	50	19	—	$71\frac{1}{3}$	
June 30	73	53	10	—	$72\frac{2}{3}$	$74\frac{1}{3}$
Sept. 30	77	53	19	4	$73\frac{1}{3}$	
Dec. 31	82	56	19	5	80	
1917						
March 31	87	64	16	5	87	
June 30	86	62	17	6	86	$84\frac{1}{4}$
Sept. 30	81	57	15	6	82	
Dec. 31	77	54	17	6	82	
1918						
March 31	84	55	22	6	$83\frac{1}{4}$	
June 30	86	59	21	5	87	$84\frac{5}{8}$
Sept. 30	85	59	20	5	$84\frac{1}{3}$	
Dec. 31	85	58	21	5	85	
1919						
March 31	73	41	24	7	$73\frac{1}{4}$	
June 30	72	39	27	6	73	$69\frac{1}{24}$
Sept. 30	60	31	23	6	70	
Dec. 31	59	28	25	6	$59\frac{2}{3}$	
1920						
March 31	69	38	26	5	$66\frac{2}{3}$	
June 30	72	38	34	—	74	
Sept. 30	72	35	32	5	71	
Dec. 31	—	—	—	—	—	—

IX. OUTPUT OF PIG-IRON IN SCOTLAND DURING THE WAR PERIOD [1]

Year	Hematite		Forge and Foundry			Basic		Other qualities (Ferro Chrome Spiegeleisen, &c.)		Total quantity		Scottish production as percentage of U.K.
			Tons		Per cent. total							
	Tons	Per cent.	Forge	Foundry		Tons	Per cent.	Tons	Per cent.	Tons	Per cent.	
1913	740,557	54	127,566	424,200	40	69,269	5	7,667	1	1,369,259	100	13·4
1914	606,745	53	491,885		43	36,499	3	5,225	1	1,140,334	100	12·6
1915	710,486	64	74,974	318,926	36	—	—	—	—	1,104,386	100	12·6
1916	798,196	70	72,960	244,035	27	19,013	2	10,562	1	1,144,766	100	12·6
1917	777,170	67	42,689	208,112	22	105,140	9	23,813	2	1,156,924	100	12·7
1918	633,016	60	50,292	277,531	31	93,257	9	8,549	—	1,062,645	100	11·9
1919	—	—	—	—	—	—	—	—	—	900,000	—	12·2
1920	—	—	—	—	—	—	—	—	—	956,000	—	11·5

[1] Compiled and co-ordinated from a number of sources including *Report of Pig-iron Production in Scotland*, 1917; returns in *Iron and Coal Trades Review, Glasgow Herald Supplement*, &c.

X. QUOTATIONS FOR STEEL PLATES [1]

(*Price per ton*) [a]

		German £	*s.*	*d.*	*Scottish* £	*s.*	*d.*
1911	February	6	10	0	6	10	9
	March	6	11	0	6	10	9
	July	6	12	6	6	10	9
1912	August	7	7	6	7	14	5
	October	7	10	0	7	14	5
	November	7	12	6	7	16	9
1913	June	6	9	6	7	19	2
	July	6	6	6	7	19	2
	August	5	17	6	7	19	2
	September	5	17	6	7	9	8
	October	5	15	0	6	6	0
1914	January	5	15	0	6	1	2
	February	5	14	0	6	1	2
	March	5	11	6	6	1	2
	July	5	11	6	5	7	0
	Average	6	6	0	6	18	9

[a] Prices are net, delivered Clyde.

XI. COPY OF RECORD IN POSSESSION OF THE ADMIRALTY DOCKYARDS DEPARTMENT [2]

Refits, alterations, and repairs of damages were carried out to the following types of vessels:

Type of vessel	*No. of refits*
Destroyers	412
Flotilla leaders	33
Sloops	77
Mine-sweeping gunboats	35
Cruisers	59
Battleships	4
Submarines	28
Mercantile auxiliaries	285
Tugs	21
Yachts	8
Trawlers and drifters	9
Miscellaneous	25
Total number of refits	996

[1] *Shipping and Shipbuilding Industries after the War*, Report of Departmental Committee of Board of Trade, p. 79.

[2] Brief record of work performed on Upper Reaches of the Clyde, i. e. from Clydebank upwards, from November 1914 to March 1921. Re. A.W.P. 3166/20. Published by permission of the Admiralty.

The following vessels were reconditioned :

	Owners
Virginian	Canadian Pacific Ocean Services, Ltd.
Morea	Peninsular and Oriental Steam Navigation Co.
Armadale Castle	Union Castle Mail Steamship Co.
Columbella	Anchor Line (Henderson Bros., Ltd.). (This vessel was partly reconditioned by Admiralty and completed by owners under lump sum agreement.)
Empress of Britain	Canadian Pacific Ocean Services, Ltd. (Reconditioned under lump sum settlement.)

The following trawlers were also reconditioned :

Lord Wolmer	*Kennymore*
Lord Wimborne	*Unitia*
Ocean Princess	*Pavlova*
Strathlee	*Swan II*
Wistaria	*Martineta*
Princess Victoria	*William Stroud*
Triton	*Dorothy Gray*
J. H. Irvin	(Lump sum arranged)

In addition to the above the following work was supervised :

Construction of searchlight platform for fifty-eight in number vessels in accordance with orders received from H.M. Dockyards, Rosyth and Invergordon.

Construction of mast struts for H.M.S. *King George V*, and dispatch to Invergordon.

Construction of conning-towers, six in number, for light cruisers, in accordance with orders from H.M. Dockyard, Rosyth.

Flying-off platforms for H.M.S. *Courageous* to orders from Rosyth.

Range-finder platforms for H.M.S. *Tiger* (ditto).

Docking towers for docking small vessels at Rosyth.

Preparation of materials in connexion with repairs to submarines K 14 and K 22 at Rosyth.

Preparation of material for repairs to H.M.T.B.D. *Tarpon* and dispatch to Thames District.

Davits for H.M.S. *Valiant*.

The following contracts placed by Admiralty were supervised by Repair Overseers :

Construction of 250 in number Railway Oil-tank Wagons at Messrs. Hurst, Nelson & Co., Motherwell.

Construction of twelve in number Railway Wagons at Messrs. Pickering & Co. Ltd., Wishaw.

Construction of two in number Cradles for Haul-up slipways for Pembroke Dock, at Messrs. Armstrong & Main, Ltd., Glasgow.

Construction of hand-carts at the works of Mr. J. Kelly, Parkhead, Glasgow.

Surveys, without prejudice, to damages to private vessels alleged to have been caused by H.M. Ships, were carried out on approximately 150 vessels and reports forwarded to Admiralty.

Large Repairs Carried Out

Extensive alterations and repairs to :

Light Cruisers. *Blonde, Bellona, Boadicea, Castor, Caroline, Cambrian, Roxburgh,* and *Gloucester.*

Submarines. K 2, K 7, K 8, E 38, D 6, D 8.

Destroyers. Grounding and collision damages were made good to the following : *Mameluke, Mons, Nonsuch, Mindful, Peyton, Ardent, Observer, Orestes, Offa, Ophelia, Onslaught, Obedient, Peregrine, Patriot, Martial, Miranda, Restless, Michael, Radstock, Rocket, Ready, Scout, Sabrina, Sarpedon, Tirade, Undina, Vendetta, Vampire.*

The work involved in the above necessitated the vessels being in hand beyond the normal period allowed for refits.

Flotilla Leaders. *Faulknor, Kempenfelt, Marksman, Parker, Grenville, Seymour, Saumarez, Ithuriel, Lightfoot,* extensive collision damage at stern necessitating the reconstruction of the after part of the vessel.

Sloops. The following vessels were fitted with strengthened engine seats : *Sunflower, Marigold, Lupin, Larkspur, Iris, Godetia, Foxglove, Daffodil, Daphne, Dahlia, Camelia, Carnation, Bluebell, and Buttercup.*

The following damages were made good :

Poppy	Collision damage
Pansy	,,
Gentian	Bow damage
Eglantine	Grounding damage
Dorking	Side damage
Dahlia	Explosion damage
Crocus	Bottom damage
Carnation	Collision damage

MINE-SWEEPING GUNBOATS. Extensive repairs, necessary through age of the vessels, were carried out in *Jason*, *Circe*, *Leda*, *Shipjack*, *Gossamer*, *Speedwell*, *Seagull*, *Spanker*.

ARMED MERCHANT CRUISERS, &c. The largest repairs, &c., to A.M.C.'s, other than armament, were those to *Patuca*, *Hildebrand*, *Patia*, *Mantua*, *Columbella*, *Orotava*, *Kildonan Castle*, *Amsterdam*, and *Tithonus*.

Columbella had new stem fitted on two occasions due to collision damage.

Tithonus had extensive bow damage due to mine explosion, extending to No. 1 hold.

Orotava, extensive survey and overhaul.

Copy of Record in Dockyard Department, Admiralty

Submitted in accordance with A.W.O. 3166/20, the following are the classes and numbers of vessels in which the machinery has been refitted, repaired, or reconditioned on the Clyde:

Class of vessel	*No. of vessels refitted and repaired*	*No. of vessels reconditioned*
Armed merchant cruisers	161	7
Cruisers	56	—
Gunboats	26	—
Flotilla leaders	32	—
T.B.D.'s	352	—
Sloops	84	—
Submarines	35	—
Oilers	15	—
Sweepers	50	—
Trawlers	282	40
Drifters	243	12
Whalers	21	—
Yachts	71	—
Motor launches	84	1
Puffers	8	—
Motor yachts	2	—
Motor drifters	2	—
Tugs	48	—
Boarding vessels	1	—
Mooring barges	15	—
Boom vessels	5	—
U.S. Government ships	6	—
Total	1,599	60

The following vessels have had extensive repairs carried out :

A.M.C. Columbella, Sept. 15. Port condenser retubed. Dec. 15, star. condenser retubed. May 17, both condensers retubed.

A.M.C. Artois, Nov. 15. Crank shaft lifted, all main bearings re-metalled, thrust block seats stiffened and all new chocks fitted. Dec. 17, extensive refit of engines and boilers.

A.M.C. Montagua, Oct. 16. Both propeller shafts removed and skimmed up, bushes rewooded. Feb. 17, star. crank shaft, new M.P. crank pin fitted.

A.M.C. Calgarian. Both condensers retubed.

A.M.C. Changuinola, June 16. P. & S. tail shafts removed, skimmed up, and bushes rewooded ; shafting aligned.

A.M.C. Orotava, March 18. Extensive refit, boiler retubed.

A.M.C. Moldavia, April 16. Boilers partially retubed.
April 17. Extensive repairs to steering engine.

Cruiser Blonde, April 16 and Feb. 18. Extensive refits. Wrapper plates of three boilers removed. Port condensers retubed, new star. wing propeller fitted, boilers partially retubed, H.P. ahead and astern turbines opened up.

Cruiser Blanche, Oct. 17. Extensive refit. Boilers partially retubed.

Cruiser Bellona, Jan. 18. Extensive refit, turbines opened up for examination. Spare propeller fitted, port outer shaft, star. outer propeller repaired and balanced.

T.G.B. Gossamer, Jan. 17. Extensive refit, boilers partially retubed.
May 17. Port crank shaft repaired.
May 18. New port crank shaft fitted.

T.G.B. Shipjack, Aug. 16. Extensive refit, including removal of crank thrust and propeller shafts re-aligned.
May 16. Star. condenser retubed. Repaired fractured crank shaft, boilers drill tested.

T.G.B. Speedwell, March 17. Extensive refit. Boilers partially retubed.

T.G.B. Spanker, Aug. 18. Extensive refit of engines and boilers, boilers drill tested.

T.B.D. Seymour, Nov. 17. Extensive refit. Opened up P. and S.L.P. turbines, renewed shrouding on impulse blading in cylinder and on rotors as necessary.

T.B.D. Lightfoot, May 16. Extensive repairs due to collision damage, drill test of boilers, new port tail shaft machined and fitted, centre and star. tail shafts straightened, journal and cones skimmed, all intermediate shafts straightened and skimmed, A frames, outer and inner stern tube bushes renewed, stem tubes centre and star. bored out, and all tubes and brackets aligned. P.L.P. turbine removed from ship, opened out, refitted ; rotor trued up, balanced, &c., bearings metalled. Port and centre propellers renewed.

T.B.D. Radstock, April 18. Extensive repairs due to collision damage. Port main gear case renewed, pinions and gear wheels aligned, shafting straightened and aligned. H.P. and L.P. turbines opened and repaired.

T.B.D. Mameluke, Jan. 16. P. & S. A brackets renewed, centre A bracket removed, straightened and replaced, all brackets sighted, and bored out, three new propellers fitted, three new tail shafts fitted, four new intermediate shafts fitted, six new cast-steel stern and A frame bushes fitted, H.P. and two L.P. turbines opened up and rotors taken to shop and trued up, bearings re-metalled and new turning wheel fitted.

T.B.D. Scout, Nov. 18. Extensive refit. Both A frames renewed, aligned and bored out. Star. A frame bush renewed, star. propeller shaft renewed, port shaft straightened and skimmed, P. & S. propellers renewed, A frame and stern tube bushes, six in number, re-metalled, turbines opened up and examined, gear box opened up and refitted, thrust blocks refitted and adjusted, thrust shafts (both bent) straightened and trued up, intermediate shafts port bent, others tried in lathes and trued up. Butt straps and rivets renewed on lower barrels of boilers.

T.B.D. Trenchant, Feb. 18. Adjustment and balancing turbine gear wheels.

T.B.D. Ursula, Feb. 18. Modified hunting gear to steering gear fitted.

T.B.D. Archer, May 16. Star. and port turbines opened up, rebladed and reshrouded, as necessary.

T.B.D. Obedient, March 17. No. 1 Boiler room flooded, collision damage. Boilers examined and W.P. tested, all machinery opened up, examined and refitted, including four in number new cylinders fitted for fan engines.

T.B.D. Narwhal, Nov. 16. P. & S.L.P. turbines opened up and repaired as necessary.

T.B.D. Sarpedon, Jan. 17. New propeller and shaft fitted.

T.B.D. Nonsuch, March 17. Port propeller shaft renewed, centre and star. propeller shafts straightened, P. and S. intermediate shafts renewed, propellers renewed.

T.B.D. Rocket, Dec. 17. Extensive repairs to propellers, shafting, and bushes.

T.B.D. Valorous, Feb. 18. P.L.P. turbine opened up, blading renewed as necessary, nozzle diaphragms renewed.

T.B.D. Mischief, Nov. 18. Three in number shafts removed and journal skimmed.

T.B.D. Tirade, Feb. 18. P.H.P. turbine opened up, condensers retubed. Aug. 18, S.H.P. turbine rotor balanced, blades repaired. L.P. turbines opened up and examined.

Sloop Godetia, March 18. Main engines removed from ship, seatings rebuilt, re-aligned. Extensive refit and drill test of boilers.

Sloop Dahlia, March 18. Main engines removed from ship, seatings rebuilt, re-aligned, extensive refit of machinery including retubing condensers.

Sloop Foxglove, Feb. 18. Main engines removed from ship, seatings rebuilt, re-aligned, extensive refit of machinery.

Sloop Myrtle, July 18. Main engines removed from ship, seatings rebuilt, re-aligned, extensive refit of machinery, four-bladed propeller fitted.

Sloop Sunflower, July 16. Main engines removed from ship, seatings rebuilt, re-aligned, and extensive refit of machinery.

Submarine, E 38, Oct. 18 to May 19. Extensive refit.
,, K 2, Oct. 17 to Feb. 18. ,, ,,
,, K 7, April—June 18. ,, ,,
,, K 8, Aug.—Oct. 18 ,, ,, (turbines opened up).

ENGINEER COMMANDER.

NOTE ON THE NAMES OF SHIPS IN THE ROYAL NAVY

'Don't you observe, Mr. Simple' (said Mr. Chucks), 'that all our gun-brigs, a sort of vessel that will damn the inventor to all eternity, have nothing but low, common names, such as *Pincher*, *Thrasher*, *Boxer*, *Badger*, and all that sort, which are quite good enough for them; whereas all our dashing, saucy frigates have names as long as the main-top bowling, and hard enough to break you jaw—such as *Melpomeny*, *Terpsichory*, *Arethusy*, *Bacchanty*—fine flourishers as long as their pennants which dip alongside in a calm.'—*Peter Simple*, by Captain Marryat, Chapter XVII. In recent times, the names of the various types of vessel in the Royal Navy have lost much of their distinctiveness, but in the majority of cases they still retain some suggestion of the type to which the vessel belongs. Thus the battle-ships and battle-cruisers, in their several classes, have imposing names, such as *Iron Duke*, *Colossus*, *Queen Elizabeth*, and *Neptune*; *Lion*, *Repulse* and *Hood*. Light-cruisers have frequently classical names with the initial 'C', such as *Calliope*, *Castor*, *Ceres*, and *Calypso*, although there are also a 'D' class and other classes which do not follow any obvious rule. The Monitors, with the exception of *Marshal Ney*, *Marshal Soult*, *Erebus*, and *Terror*, are indicated by 'M' and a number, e. g. M 22; and patrol-boats by 'P' or 'PC' and a number, such as P 14, PC 43. Sloops, with the exception of the 24 Class (*Iroquois*, *Irwell*, and *Sir Hugo*), are all named after flowers or plants (*Aubretia*, *Acacia*, *Azalea*, &c.); paddle mine-sweepers and twin-screw mine-sweepers after towns (*Banbury*, *Chelmsford*, &c.); gun-boats after insects and birds (*Aphis*, *Moorhen*, &c.); and trawlers and whalers after rivers (*Boyne*, *Cherwell*, *Dee*, &c.). Among flotilla leaders are a 'V' class (*Valentine*, *Valkyrie*, *Vampire*, &c.), and a Scot class the names in which consist of Scottish family names; but there are also two classes, *Shakespeare* and *Kempenfelt*, the names in which do not seem to follow any principle. The torpedo-boat destroyers are in classes such as the Admiralty 'R', 'S' and 'V' classes, the Yarrow 'R' and 'S' classes, &c., but the initial of the names is not confined to the letter by which the class is indicated. Submarines are denoted by a letter and a number, such as E 23, G 4, H 21, J 1, K 2.

XII. THE RECORD OF WAR OUTPUT OF THE SINGER MANUFACTURING CO.

Shells of various calibre	749,874	15″, 13,280 6″, 617,024 Balance Admiralty shell.
Shell components in addition to components included in shell	2,705,147	
Aircraft A.G.S. parts	122,003,719	
Engine and fuselage parts	11,142,901	
Aeroplane under carriages complete and accessories	30,809	
Fuzes	2,655,101	
Fuze components in addition to the components included in fuzes	155,477,443	
Friction tubes	402,075	
Munition screw thread gauges	25,759	
Rifle parts	5,728,638	
Horse shoes	360,556	
Hand grenades, bombs, gun parts, tank parts, &c.	1,944,067	
	303,226,089	

Number of contracts accepted, over 5,000.

LABOUR

	Males	*Females*	*Total*
1916	6,073	4,836	10,909
1917	5,855	5,866	11,721
1918	5,759	8,209	13,968

XIII. IMPORTS OF CERTAIN MINERALS INTO GLASGOW [1]

YEAR ENDED 30TH JUNE

Tons	*1913*	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*	*1921*
Iron ore .	1,262,368	1,034,528	1,121,481	1,133,219	1,210,339	1,176,007	1,198,341	941,731	483,619
Limestone .	186,237	170,980	135,231	78,639	110,764	107,187	75,682	41,737	43,362
Pig-iron .	32,467	28,228	31,148	14,883	9,954	4,569	—	13,261	23,227
Nickel ore .	53,324	38,044	49,562	44,564	37,353	10,583	—	—	3,324
Coal . .	—	—	—	—	—	—	—	—	84,903
Other minerals	154,058	141,732	214,516	234,372	289,111	271,301	240,952	191,154	267,895

[1] *Clyde Navigation, Annual Statistics*, 1914–21.

XIV. CLYDE WORKERS' COMMITTEE

Objects

1. To obtain an ever-increasing control over workshop conditions.
2. To regulate the terms upon which the workers shall be employed.
3. To organize the workers upon a class basis and to maintain the Class Struggle, until the overthrow of the Wages System, the Freedom of the Workers, and the establishment of Industrial Democracy have been obtained.

Rules

1. The organization shall be known as the Clyde Workers' Committee.
2. Membership to be obtained by endorsing the rules and objects, and payment of 1*d.* per week.
3. Contributions to be collected by Shop Stewards.
4. On the requisition of three shops, yards or plants, a special meeting of the C.W.C. shall be called, the decision of such meetings shall be placed before the whole members for approval or otherwise.

Structure

The unit of organization shall be the Workshop Committee, composed of Shop Stewards or Delegates elected by the Workers in the Shop. From every Shop Committee shall be elected two Conveners, one of whom shall be a woman, where women are employed, who are to be the delegates forming the Clyde Workers' Committee.

From each district (such as Clyde Area) shall be elected delegates to a national Workers' Committee.

No Committee shall have executive power, all questions of policy being referred back to the rank and file.

The duties therefore of any elected body shall be those of disseminating information and co-ordinating policy and organization, locally and nationally.

Principles

Direct representation from the Workshop to the Committee. Direct control and action; the vesting of control of policy in the rank and file.

XV. SHOP STEWARDS IN A.S.E.

Rule 3, 5.

(District) Committees may appoint shop-stewards in workshops or departments thereof, in their respective districts, such stewards to be under the direction and control of the Committee, by whom their duties shall be defined. The stewards shall be empowered to periodically examine the contribution cards of all members, and to demand that

alleged members shall show their contribution cards for examination when starting work. They shall report at least once each quarter on all matters affecting the trade, and keep the committee posted with all events occurring in the various shops. They shall be paid 4*s*. for each quarterly report, namely 3*s*. for duty performed and 1*s*. for attendance, and report to Committee (Conveners of shop-stewards shall receive 6*d*. extra). Should a shop-steward be discharged through executing his duties he shall be entitled to full-wage benefit.

XVI. DRAFT SCHEME OF CONTROL IN THE ENGINEERING AND SHIPBUILDING INDUSTRY

(By Wm. Gallacher, of the Clyde Workers' Committee, 1916 ?)

In order that the Engineering and Shipbuilding Industry may be more efficiently carried on, and in order that the workers may be given more control of the conditions obtaining in the workshops, it is proposed to establish a system of Workshop Committees. The purpose of these Committees, elected by and from the Trade Unionists in the shop, would be to control and regulate, both generally and particularly, the conditions of labour in the interests of the workers.

The Committees shall be empowered :

(1) To see that all Trade Union standards and agreements are strictly observed.

(2) Generally to supervise and enforce agreements relating to the dilution of labour, and particularly to secure the strict observance of any shop or works agreement dealing with this matter.

(3) To be taken into consultation by the management in all cases where it is proposed to transfer labour from one department to another, from craft to craft, or in any way to change the existing practice.

(4) To keep a record of all changes in shop custom or practice. All such records to be forwarded to and systematically filed by the Allied Trades Committee mentioned in Clause VI.

(5) To act as representatives of the men in any negotiations with the management.

(6) The Shop Committee shall be invested with complete responsibility for production in the shop, and shall be the sole medium for contract between employers and workmen, having full bargaining powers in the matters of time allowance where premium bonus obtains and of rates under a piece-work system, that is to say all individual contracting between employer and workmen will be eliminated.

The immediate procedure suggested would be somewhat as follows :

(*a*) The convener of the Works Committee would be furnished by the employer with a complete list of existing piece-work prices or estimated time allowances for particular operations.

Similarly, departmental sub-committees shall be furnished with a list of prices and time allowances relating to their respective departments.

(*b*) When a job is to be put in hand the sub-committees of the section concerned shall consider the time allowance or piece-work rate offered by the employer. Should it be deemed inadequate, representations will be made to the departmental management. Failing agreement, the matter will be submitted to the Works Committee at the first meeting. Should the view of the sub-committee be upheld by the Works Committee negotiations will be entered upon with Works Management. In the event of a deadlock, the time allowance or piece-work rate proposed by the Shop Committee shall be adopted pending the decision on an appeal from the employers to the impartial tribunal to be set up by the Shipyards Labour Committee.

The Committee shall be elected by and from the Trade Unionists in the shop with due regard to the interests of the various sections of workers. For each department or section of departments numbering fifty workers or part thereof, there shall be one representative on the Committee, and an additional representative for any succeeding fifty or part thereof.

Each department shall elect sub-committees to act under the advice and direction of the main committees, and composed of the delegate or delegates to the main committee together with two other Trade Unionists in the department.

In each district an Allied Trades Committee composed of the district officials of the Engineering and Shipbuilding Unions, skilled or unskilled, shall be formed. To this Committee the various shop committees shall report and it shall be the business of this Committee to unify the methods adopted by the shop committees, and to act as intermediary between the shop committees and the Unions concerned.

In addition, this Committee shall be empowered to deal with questions affecting the district as a whole, but only after consultation with the shop committees. The District Committee shall act as sole intermediary between the shop committees in the area and the Shipyard Labour Committee.

Each Shop Committee shall draw up a schedule stating name, occupation and union of the men in the shop.

It shall be the business of the Shop Committee to receive reports from the representatives of the departments and to act thereon.

XVII. DETAILS OF DILUTION SCHEME PUT INTO OPERATION BY THE CLYDE DILUTION COMMISSIONERS IN THE ENGINEERING DEPARTMENT OF A GLASGOW FIRM

Operation	*Nos. affected*	*Present class of operative*	*Class of proposed new operative*	*Treatment of released operative.*	*Wages of present operative*	*Wages or present operative new position*	*Proposed remuneration of new operative*
Putting tubes in condensers	2	Skilled men and apprentices	Females	General extension of output	District rates and premium bonus	Same	20*s.* a week sliding scale according to proficieney till district rates reached
Testing and assisting inspectors on condenser tubes	4	,,	,,	,,	,,	,,	,,
Working small drilling machines	2	Semi-skilled men	,,	,,	,,	,,	,,
Fitting work, on deck fittings in shop	6	Semi-skilled men and apprentices	,,	,,	,,	,,	,,
Turning on vertical lathe No. 39 or 40 (assistant)	1	Skilled turner	,,	,,	,,	,,	,,
Universal milling machine No. 108 or 109	1	Skilled man	,,	,,	,,	,,	,,
Store-keeper in tool-room and twist-drill grinder	2	Semi-skilled men	,,	,,	District rates	,,	,,
Facing pipes and flanges in outside shop	4	Skilled men and apprentices	,,	,,	District rates and premium bonus	,,	,,
On shaper 361 and driller No. 369	2	,,	,,	,,	,,	,,	,,

XVIII. MANIFESTO OF CLYDE WORKERS' COMMITTEE (1917 ?)[1]

National Industrial Council for Scotland

In view of the present activities of the Government in endeavouring to set up Workshop Committees on the lines laid down by the Whitley Report, we herewith urge upon all workers the necessity for their immediate attention to this most important matter. We further regret to note that certain Trade Union leaders are prepared to support and lend their aid to further this scheme.

Fellow workers, the Trade Unions as such catering for sectional trades only and thus dividing the workers, are hopelessly inadequate to deal with the thoroughly organized employing class which blocks the way towards the workers' emancipation. Only by organizing as a class regardless of Craft, Creed, or Sex, can we as workers ever hope to successfully combat and overcome the Employing Class.

We must therefore change the tactics we have clung to so closely in the past, and organize *now* at the point of production right inside the Workshop, Mine, and Factory, on a class basis, simply because we are workers out to emancipate ourselves—and not as formerly, because we are engineers, joiners, and shipwrights, &c., out to defend our craft against members of our own class, even though they were forced to encroach in order to make a living.

We must throw out the craft spirit, and accept the true spirit of brotherhood, stand shoulder to shoulder with our fellow workers, knowing that 'UNITED AS WORKERS WE STAND, DIVIDED AS CRAFTSMEN WE FALL'.

Workshop Committees (not on Whitley lines) are now being formed, composed only of workers, and working *only* in their interests, in every workshop where the Employees are alive to their own well-being. The Committee will represent all workers in every trade employed in the factory, and will hold full local autonomy. From each Shop Committee at least two delegates will be sent to a district or Central Committee, representative of all workers in the area, from the Central or District Committee, Delegates will attend a National Industrial Council representing all the District Committees in Scotland.

This National Council will in turn be linked up with the English National Council, representative of all the English Districts. The duties of the National and District Councils will be those of disseminating information and co-ordinating policy and organization locally and nationally.

[1] From Manifesto published by the Provisional Council of the Clyde Workers' Committee. 1917 ?

The National Council will endeavour by means of propaganda, organization, &c., to consolidate the Workshop Committee Movement throughout Scotland.

XIX. MANIFESTO ISSUED DURING THE STRIKE AT PARKHEAD FORGE, 1916, BY THE ENGINEERS, ADDRESSED TO FELLOW WORKERS IN THE DISTRICT

We stoppcd work on Friday, 17th inst., and have been on strike since.

During the eighteen months of war our Shop Stewards have given every possible assistance towards increasing the output. The Convener, Bro. David Kirkwood, has been specially active in this respect, having, with the approval of the management, used all his influence in removing every cause of friction, and even in finding the ever necessary additional labour. While labour was scarce and no chance of reducing our status existed, our employers granted facilities to Bro. Kirkwood to visit the various Engineering Departments, where in the interests of the workers or the joint interest of workers and employers his service as Chief Shop Steward was temporarily required. The utmost harmony prevailed, and the management expressed gratification with such friendly relations.

About two months ago the Commissioners appointed by the Government to introduce the scheme for the dilution of labour to the Clyde visited Parkhead. We received them in the most cordial manner, and an agreement was made by which the employers pledged themselves not to use this scheme for the purpose of introducing cheap labour, and also to give an opportunity of seeing that this pledge was kept. But immediately after our consent to the scheme was obtained a new spirit was felt in the workshops. Soldiers, mostly Englishmen, were brought in, and these refused to join a Trade Union.

An agreement existed to the effect that all men employed must be Trade Unionists, but in the case of these soldiers the foreman did not apply this rule, as they did with other tradesmen engaged, and we had no means of enforcing compliance with it. In one shop, known as the 15″ shell shop, over 100 men were put to work at lathes turning these shells and at horizontal boring machines boring these shells at a rate of 6*d.* per hour. Machines of this type have been always manned by tradesmen who receive the standard rate of wages for engineers in the district. In another shop, known as the Howitzer shop, women were introduced, and on our shop-stewards visiting this shop to ascertain the conditions of female labour, the management strongly protested, and contended that Bro. Kirkwood, or any other shop-steward, had no right to discuss the question of wages or conditions with the women workers. Previously

our Shop Steward had perfect freedom to visit this shop if he felt it necessary to do so.

Next came instructions to our chief Shop Steward, Bro. Kirkwood, that on no account was he to leave his bench without permission from the management during working hours. All these things and various smaller changes made it obvious to us that our Trade Union representatives were to be bound and blindfolded while the trade by which our means of life are obtained was being reduced in the interests of capitalists to the level of the most lowly occupation.

We feel that during the period when unskilled labour is engaged in our industry more than ordinary freedom is required by our shop-stewards to ensure that under the cloak of patriotism greedy employers are not allowed to ruin our trade. This would be a very modest demand on our employers in view of the concessions we have made, but instead of being granted the greater facilities necessary we are being deprived, as already stated, of the limited freedom we enjoyed.

In reply to the question as to why we did not act through official channels, we wish to state that we submitted our grievance about the introduction of non-union soldiers to the Board of Trade, but, as far as we know, our complaint was not noticed. We directed the attention of our paid officials to the cheap labour in the shell shop but they have failed to protect us. Therefore when the restriction was imposed on our Shop Stewards we felt that our only hope lay in the drastic action by ourselves.

Fellow workers, we are fighting the battle of all workers. If they smash us they will smash you. Our victory will be your victory. Unite with us in demanding that during the present crisis our shop stewards in every workshop where dilution is in force shall have the fullest liberty to investigate the conditions under which the new class labour is employed, so that this may not be used to reduce us all to a lower standard of life.

XX. NATIONALITIES OF VESSELS ENTERING THE PORT OF GLASGOW[1]

(Tonnage, in thousands, entering during year ended 30th June)

Nationalities of vessels	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*	*1921*
British	6,630	6,246	5,359	5,006	3,987	3,674	4,688	4,392
Austria	28	1	—	—	—	—	—	—
Belgium	—	—	10	—	4	2	—	—
Brazil	—	—	—	—	—	3	—	—
Denmark	12	16	33	26	14	39	22	14
France	40	35	59	61	28	19	15	9
Finland	—	—	—	—	—	—	1	—
Germany	12	—	—	—	—	—	—	—
Greece	9	23	42	35	7	13	10	11
Italy	17	28	66	114	57	31	27	9
Japan	—	—	7	—	2	—	57	38
Norway	105	123	307	193	122	84	67	42
Portugal	—	—	—	—	3	8	5	3
Peru	—	—	—	—	—	—	2	—
Russia	14	30	27	57	8	—	3	7
Spain	53	122	183	85	12	19	64	49
Sweden	14	20	17	39	23	31	13	16
U.S.A.	—	—	3	3	25	66	175	321
Uruguay	—	—	—	—	—	—	—	4
	6,933	6,644	6,113	5,619	4,292	3,991	5,149	4,915
British percentage	95·6	94	87·6	89	92·9	92	91	89·3

[1] *Annual Statistics, Clyde Navigation*, 1914–21.

XXI. RETURN OF STEAM VESSELS USING THE HARBOUR OF GLASGOW IN THE FOREIGN TRADE. INWARDS

(Tonnage, in thousands, year ended 30th June)

From	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*	*1921*
Africa	23	43	49	42	72	111	112	76
Azores	—	—	—	—	—	—	—	—
America (Br. N.)	461	434	265	248	265	250	227	298
U.S.A.	615	554	574	492	492	452	583	671
America (East)	57	77	64	30	3	17	40	68
America (West)	28	31	29	44	49	33	5	32
Australia and N.Z.	117	61	2	24	32	3	40	56
Austria	14	1	—	—	—	—	—	—
Belgium	113	14	—	—	—	—	34	58
China and Japan	43	98	44	40	3	—	9	73
Denmark	—	5	—	—	—	—	7	8
France	38	36	30	27	17	14	32	38
Germany	5	—	—	—	—	—	—	4
Greece	42	25	18	24	10	3	8	8
India	315	234	279	262	100	144	209	243
Italy	9	4	4	—	—	—	5	—
Netherlands	2	7	2	—	—	6	—	—
New Caledonia	32	42	34	24	4	—	—	3
Norway	14	8	2	14	4	5	2	10
Portugal	20	25	17	7	7	12	10	13
Russia	38	29	40	33	7	1	16	3
Roumania	1	2	—	—	—	—	—	—
Spain	427	517	564	557	510	457	426	266
Sweden	36	38	36	20	3	15	24	19
Turkey	30	6	—	—	—	—	—	—
West Indies	2	3	6	13	18	22	10	3

RETURN OF STEAM VESSELS USING THE HARBOUR OF GLASGOW IN THE FOREIGN TRADE. OUTWARDS

(Tonnage, in thousands, year ended 30th June)

To	*1914*	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*	*1921*
Africa . .	416	240	219	179	91	127	203	228
America (Br. N.)	528	354	225	247	159	137	197	223
U.S.A. . .	657	544	554	441	265	160	322	307
America (East) .	339	269	174	132	65	69	132	136
America (West) .	160	82	81	70	34	45	85	49
Australia and N.Z. . .	207	141	139	99	41	76	123	158
Austria . .	27	1	—	—	—	—	—	—
Belgium . .	68	11	—	—	—	—	44	66
China and Japan	220	235	155	126	43	44	170	265
Denmark . .	10	9	12	1	—	10	9	10
France . .	201	469	570	448	321	148	76	39
Germany . .	4	—	—	—	—	—	—	7
Greece . .	—	1	—	1	—	—	—	—
India . .	695	486	468	356	213	248	567	530
Italy . .	271	301	389	324	456	233	123	35
Netherlands .	—	—	—	—	—	10	—	—
New Caledonia .	19	10	6	8	2	—	—	—
Norway . .	62	48	16	25	20	7	4	11
Portugal . .	14	26	19	8	5	12	18	11
Russia . .	62	24	9	4	—	1	5	—
Spain . .	81	78	100	79	29	28	61	17
Sweden . .	66	49	48	25	9	10	30	31
West Indies .	80	55	18	24	7	52	61	92

INDEX

INDEX

(The reader will probably get more guidance from the Table of Contents on pp. xiii–xvi than from this index.)

OUTLINE OF PLAN

FOR THE

ECONOMIC AND SOCIAL HISTORY OF THE WORLD WAR

I

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