GAS IN THE NATIONAL PLAN

THE ARCHITECTURAL REVIEW
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GAS IN THE NATIONAL PLAN

A SPECIAL NUMBER OF THE ARCHITECTURAL REVIEW FOR APRIL 1947

This is the second special number on power supplies which has been produced in collaboration with the Association for Planning and Regional Reconstruction. The first, *Electricity in its Regional Setting*, appeared in April 1945. It dealt with the subject of the location of electric power stations and their bearing on architectural design. Recent events have served to emphasize how vital is the efficient and economic use of our national resources both to the individual industrialist and to the community at large. This number on gas has been prepared therefore to complement the earlier one on electricity. The articles have been contributed by a number of independent specialists. The aim has been to provide factual information upon which the architect and town planner can depend in tackling the problems connected with gas supplies and those manufacturing processes which result from the by-products of coal carbonisation.

VOLUME CI NUMBER 604

The Cover. In West Yorkshire gas is distributed by means of a gas grid and the cost of gas over the area is considerably reduced per thousand cubic feet. This diagram showing the grid and its intended extensions is illustrated in greater detail on page 130. Gas grids are developing rapidly and the gas undertakings in London, which were linked together during the war, now form the largest gas grid in the world. In addition to lowering costs generally, grids encourage the use of high-pressure gasholders, which are smaller and neater than the well-known low-pressure types.

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THREE SHILLINGS AND SIXPENCE

The by-product coke ovens at the Broken Hill Proprietary Co., Newcastle Steel Works, seen from a works locomotive. These coke ovens, which are in three batteries with a total of 161 ovens, are among the most modern in the world.

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INTRODUCTION

THIS special number of THE ARCHITECTURAL REVIEW relates the present position and tendencies of the gas industry to our developing national life and economy. The principal emphasis is placed upon facts rather than upon matters of taste and opinion.

Technical matters are discussed mainly in connection with three factors of great national importance: the thermal efficiency of coal utilisation, smoke abatement, and utilisation of the chemical value inherent in coal. Coal economy is and will continue to be of the utmost importance because (*a*) reserves of easily mined British coal will approach exhaustion comparatively soon; (*b*) in consequence, the price of coal will inevitably rise (or equivalent effects will be felt through control and subsidy measures) over and above the increase necessary to ensure an adequate standard of living for the miners, bringing scarcity to the domestic consumer and higher production costs to the industrial user; and (*c*) a limited supply of a key raw material should obviously be used to the greatest advantage. Smoke abatement is directly linked with coal utilisation efficiency and economics (avoidance of waste and material damage), and with human health in many aspects. The organic chemical industry relies upon coal as its principal indigenous source of raw materials.

The gas industry, which produces gas primarily, coke and tar as by-products, is one of the two great branches of the carbonising industry. The other is the coke-oven industry, which produces coke primarily (at present largely for metallurgical use), and gas and tar as by-products. These two industries process approximately equal amounts of coal annually, together treating nearly a quarter of the total national consumption. Of industrially important processes based on coal, carbonisation shows the highest thermal overall efficiency, and also makes best use of the chemical value. From the point of view of smoke abatement, gas gives rise to no smoke and negligible sulphur pollution, coke to sulphur pollution only. The main advantage of these products over electricity, which at best produces little pollution of any kind and can be generated from coals at present of little chemical value, lies in their considerably greater overall efficiency for heating purposes. As compared with district heating, the chief advantages of gas are the simpler mains and lower distribution costs; coke is an excellent fuel for district heating stations. The relative merits of these heating systems will depend upon many factors, one of some importance being the facilities already existing.

Thus, as an intermediate producer of secondary fuels, the gas industry forms a link in a process which by national criteria stands second to none. This is not to say that all coal can be carbonised (many types in fact are almost smokeless and yield little tar), or that all fuel users can advantageously employ gas, coke or tar fuels. But the industry can legitimately lay claim to a share in the future fuel programme considerably larger than it at present possesses.

The series of articles which follows begins with a review of coal reserves by the Director of Fuel Research, D.S.I.R., followed by G. E. Foxwell's survey of methods of coal utilisation, having special reference to domestic heating and the position of the gas industry. The third and fourth articles, by R. Hughes and W. M. Ogden respectively, deal with the transport of raw coal, coke and gas; these questions have an important bearing on the location of the coal-using processes, and also on the choice of process. Industries ancillary to the gas industry are next considered by O. W. Roskill, and æsthetic aspects of gas manufacture, with particular reference to the gasholder, are discussed by M. Hartland Thomas in the sixth article. The seventh contribution, by a group of architects, illustrates the kind of way in which smoke could be eliminated in a new town and an existing town. And, finally, the past and future of the industry are discussed respectively by Compton Mackenzie and W. A. Robson.

Coal conservation

A. PARKER

Until the end of the eighteenth century Great Britain was primarily an agricultural country supporting a population of no more than 10 millions. It was during that century that there appeared the first definite signs of an expansion of industry based on the use of coal, as indicated by an increase in the annual output of coal from about 3 million tons in the year 1700 to between 10 and 15 million tons in 1800. In the next century there was a rapid acceleration in industrialization with an increase in the output of coal to 220 million tons in 1900 and an increase in the population to 37 millions. This development was set on its path by the skill and enterprise of our engineers and industrialists of 100 to 150 years ago, who led the way in foreseeing the possibilities of coal as a source of heat, power and light; but the development could not have been so rapid and extensive if Great Britain had not been fortunate in possessing large reserves of coal of good quality and of the best types. As a pioneer, this country soon occupied a prominent position in world industry, with no great competition from overseas.

It was inevitable, however, that others would follow. Industrialization later spread rapidly to some other countries with good reserves of coal, particularly in Europe and America; and there are signs of similar developments in other parts of the world. As a result competition has increased; and though the output of coal in Great Britain rose from 220 million tons in 1900 to 287 million tons in 1913, it later declined, partly owing to a reduction in exports, to an overall average annual output of roughly 230 million tons over the period 1921 to 1938. There has also been a slowing down in the rate of increase in the population.

Coal represents the accumulations of enormous stores of energy over past geological ages. It is certain that these stores of energy are being drawn upon at a rate vastly greater than they can be replaced as coal. It is important, therefore, that in planning for the future, we should have as much information as possible about our coal reserves, particularly those that can be economically worked.

During the past 75 years there have been several estimates of the coal reserves of Great Britain, in seams of not less than one foot in thickness and at depths not greater than 4,000 feet from the surface. These estimates have differed somewhat; but deducting the amounts of coal mined since the different estimates were made, the figures lead to the conclusion that the proved reserves in seams of one foot or more in thickness and within 4,000 feet of the surface are in the region of 100,000 million tons with probable and possible reserves of the order of 50,000 million tons, or a rough overall figure of say 150,000 million tons. Such estimates, however, do not take into account the quality of the coal; nor can it be concluded that all this coal is economically workable.

If the reserves of coal that could be economically worked were as great as 150,000 million tons, they would meet an output of 250 million tons a year for six centuries. There is no doubt, however, that the more easily accessible coals of good quality have been and are being worked first and that in consequence the difficulties of mining coal are likely gradually to increase. It would be unwise, therefore, to assume that our reserves that can be worked without an appreciable increase in technical difficulties and in relative cost will provide 250 million tons a year for more than say 150 to 200 years.

What is the position of Great Britain in comparison with the position of the rest of the world? Though the estimates for other parts of the world are not so reliable as those for Great Britain, it is probable that world reserves are at least 7 to 8 million million tons or sufficient for about sixty centuries at the maximum pre-war output of about 1,200 million tons a year. In certain countries with very large coal reserves, many of the seams are thicker and more easily accessible than the seams of Great Britain. In addition some of these countries have large quantities of natural oil, whereas no appreciable reserves of petroleum have been found in Great Britain. Nor is it probable that the harnessing of atomic energy, or further developments in the use of water power or other sources of energy in Great Britain, will cause any appreciable decrease in our need for coal for a very long time. It is clear, therefore, that if we are to maintain our position in industry, our coal reserves must be drawn upon as economically as possible and used with the maximum practicable efficiency.

So far in this article, only the quantity of coal in reserve in relation to demand has been discussed. But quality and type of coal must also be considered. For example, only coals of certain types are suitable for the manufacture of gas and coke for many industrial and domestic requirements.

For more than twenty years, the Fuel Research organization of the Department of Scientific and Industrial Research, which has a Coal Survey Laboratory in every important coalfield in Great Britain, in addition to a Central Research Station at Greenwich, has been undertaking a physical and chemical survey of the coals of the country. As a result, there is more information about the types and qualities of the coals available in Great Britain and their suitability for various purposes than there is about the coals of any other country. Recently the Fuel Research organization has completed a preliminary survey of coal reserves and production, relating quantity to type of coal; and the results have been published as Fuel Research Survey Paper No. 58.

The results of this survey lead definitely to the conclusion that for the country as a whole no type of coal is being worked at a rate disproportionate to the developed reserves. As an example, it is of interest to consider the requirements of the coal carbonising industries, comprising the gas industry and the coke-oven industry. These industries together use about 40 million tons a year of gas coal and coking coal. It is now known that the planned outputs of these types of coal in Great Britain are sufficient to assure the requirements of these industries for at least 100 years and even to allow of substantial expansion of both industries, with some further reserves for beyond 100 years. Gas coals are also widely used as general purpose coals, and the output has always exceeded the needs of the carbonising industries. It is not surprising, therefore, that at times of low output, such as the present, the shortage of coal is felt by these industries in common with others, though the output of gas and coking coal is still more than adequate for the carbonising industries alone.

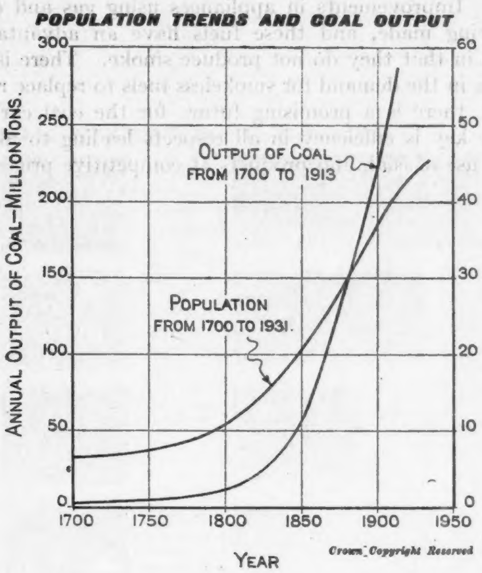
It may be suggested that if there is enough workable coal of all the main types in reserve for 100 or 200 years, there is no cause for anxiety. But such a period is short in terms of the life of a nation; and as already mentioned there are other countries with very much larger reserves in relation to output.

There is another very good reason why our reserves of coal should be used as economically and efficiently as possible. The cost of coal is a charge on industrial undertakings, shops, offices, hotels or householders, and others using it directly or indirectly as a source of heat, power, light, oils, and chemicals. If there is unnecessary waste in the use of coal for any purpose, the prices of manufactured goods are higher than they need be, competition is more difficult to meet, foreign and home trade suffer, and the standard of living also suffers.

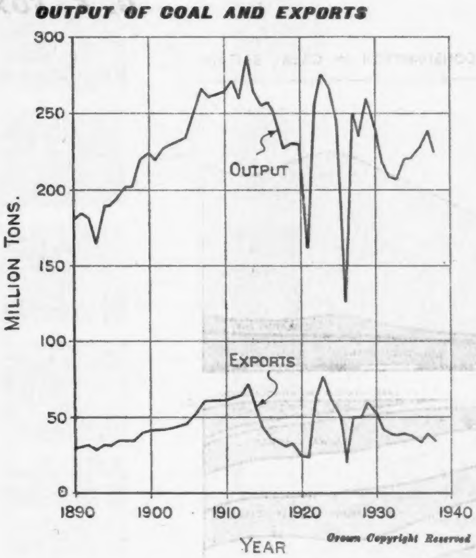
In the past, coal has been relatively cheap in Great Britain and this has been one of the reasons why in many quarters far too little attention has been given to using it efficiently. For example, in domestic heating Great Britain has been far behind North America and several continental countries, where the average efficiency of using fuel in dwellings is twice as great as in British homes, and the houses are better insulated. Great improvements in our domestic heating appliances could easily be made, with a saving in fuel, and with greater comfort. Many examples of avoidable waste of fuel in industry could also be given. It is certain that by the greater application of existing scientific and technical knowledge and skill, much improvement could be made in the efficiency with which coal is used, with a reduction in pollution of the atmosphere, and with financial savings; and there is no doubt that continued and more intensive research will lead to further advances.

During the last war, coal was not so plentiful in relation to demand as during the inter-war years, and steps had to be taken to reduce

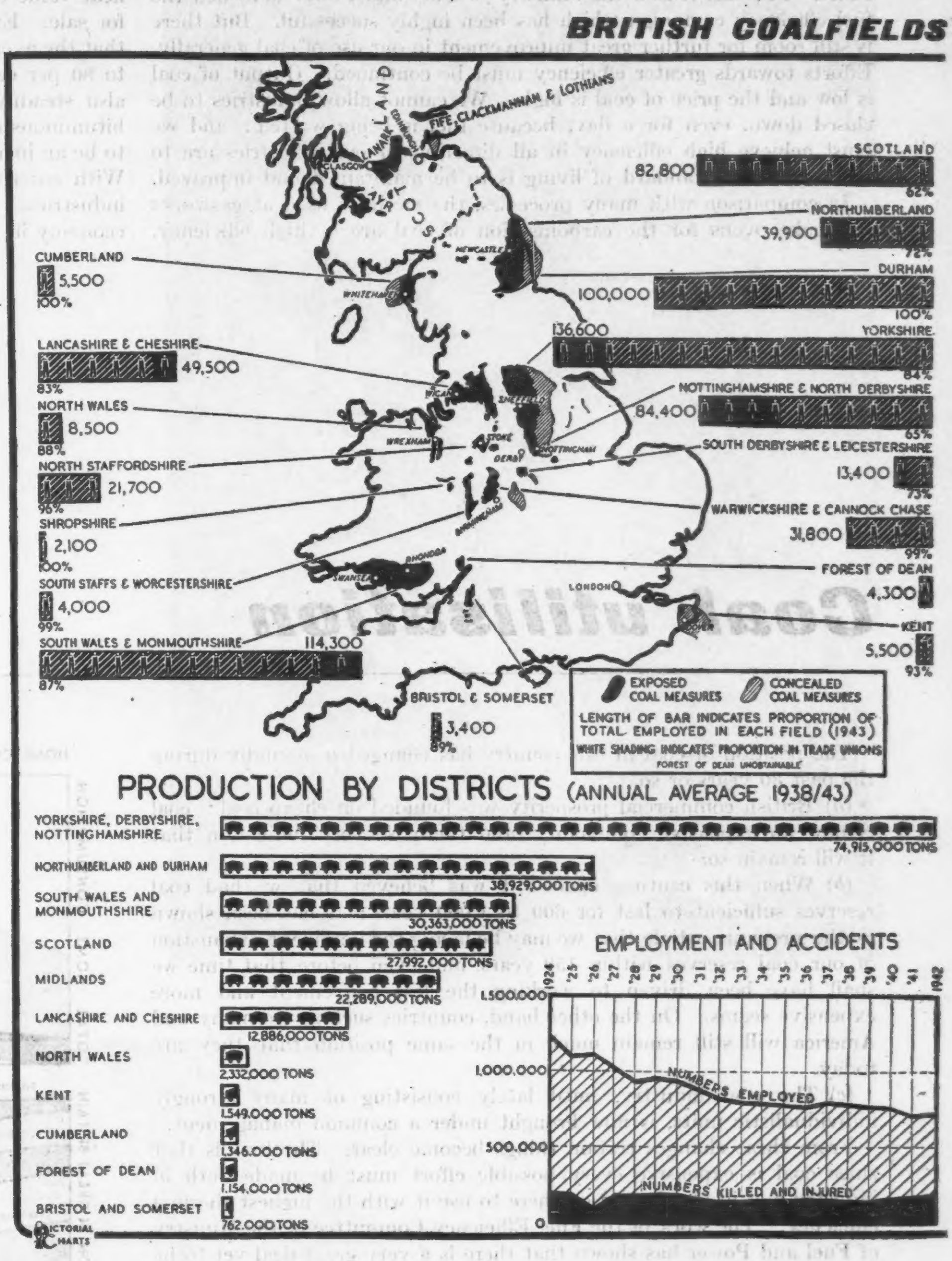
POPULATION TRENDS AND COAL OUTPUT



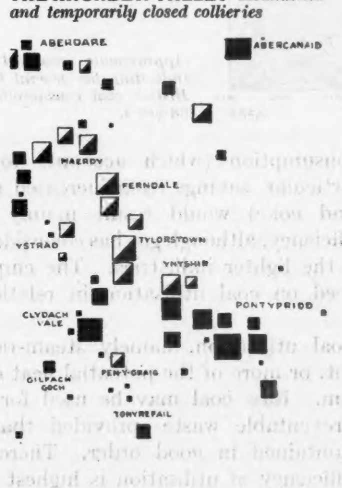
OUTPUT OF COAL AND EXPORTS



BRITISH COALFIELDS



***THE RHONDDA VALLEY** Abandoned and temporarily closed collieries*



Work at the coal face

the waste of fuel, and thus to avoid serious interference with the war effort. For this reason the Ministry of Fuel and Power launched the fuel efficiency campaign which has been highly successful. But there is still room for further great improvement in our use of coal generally. Efforts towards greater efficiency must be continued. Output of coal is low and the price of coal is high. We cannot allow industries to be closed down, even for a day, because fuel is being wasted; and we must achieve high efficiency in all directions if our industries are to thrive and our standard of living is to be maintained and improved.

In comparison with many processes, the methods used at gasworks and coke ovens for the carbonisation of coal are of high efficiency. The overall efficiency at gasworks is such that about 73 per cent. of the heat value of the coal used is obtained as gas, coke, tar, and benzole for sale. Even so, there is room for improvement and it is probable that the average for the gas industry as a whole will gradually be raised to 80 per cent. Improvements in appliances using gas and coke are also steadily being made, and these fuels have an advantage over bituminous coal in that they do not produce smoke. There is certain to be an increase in the demand for smokeless fuels to replace raw coal. With enterprise, there is a promising future for the coal carbonising industries. The key is efficiency in all respects leading to maximum economy in the use of coal, and products at competitive prices.

Coal utilisation

G. E. FOXWELL

The position of coal in this country has changed profoundly during the past 30 years or so.

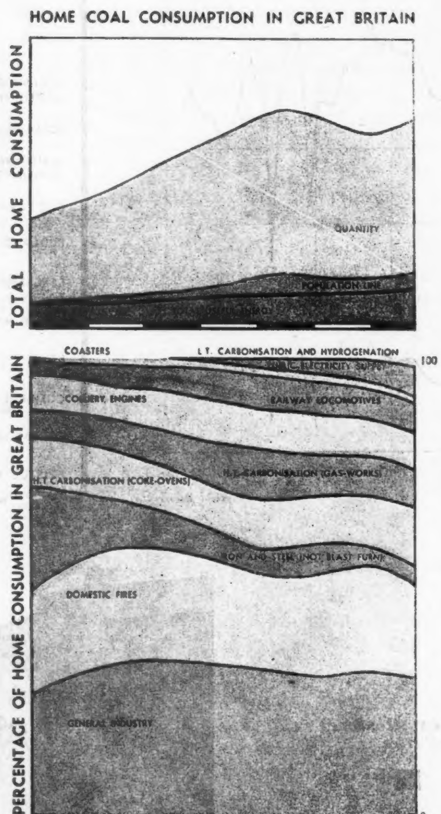
(*a*) British commercial prosperity was founded on cheap coal; coal is now an expensive commodity, and there is every indication that it will remain so.

(*b*) When this century opened it was believed that we had coal reserves sufficient to last for 600 to 1,000 years; it has been shown in the previous article that we may be facing the imminent exhaustion of our coal reserves within 150 years, and even before that time we shall have been driven to working the less convenient and more expensive seams. On the other hand, countries such as Germany and America will still remain much in the same position that they are today.

(*c*) The coal industry, until lately consisting of many strongly individualistic units, is now brought under a common management.

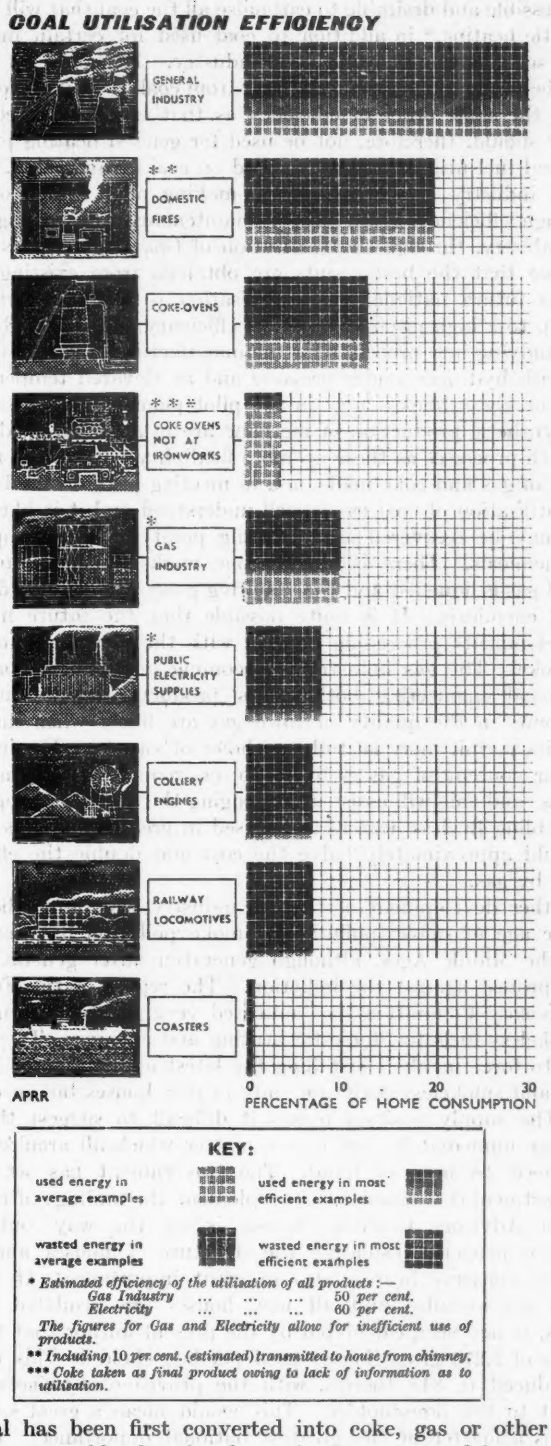
From these changes certain things become clear. The first is that since coal is expensive every possible effort must be made both in industry and in the domestic sphere to use it with the highest thermal efficiency. The work of the Fuel Efficiency Committee of the Ministry of Fuel and Power has shown that there is a very great deal yet to be done before the position is even approximately satisfactory in that respect. Household appliances are less efficient in this country than in other lands. "*Our coal is used for domestic heating with a degree of inefficiency which is not, so far as we can ascertain, even approached in any other country in the world*" (Report of the Fuel and Power Advisory Council, p. 8). Existing appliances in industry are very often markedly inefficient. The Ministry is watching new appliances and furnaces as they are being installed to see that they are efficient, but skilled men must also be trained to operate them. The Ministry of Fuel and Power, the Institute of Fuel and the Institutions of Gas and Electrical Engineers are actively engaged in sponsoring a programme of industrial education and training in the practice of fuel utilisation. The need for using our coal reserves with efficiency is paramount. This is the more so in view of the imminent exhaustion of our best seams, and the not-far-distant exhaustion of our total coal reserves. The chaos of this winter has shown what our position will be if fuel supplies fail. With the new set-up of the coal industry it will be possible to formulate a national fuel policy, because of the centralisation of control under the Minister of Fuel and Power.

Coal is our principal source of power, heat and light, and the foundation of the British organic chemical industry. It is necessary to balance our requirements for these various services and to study how to use it to the best advantage. Although something like 80 per cent. of Britain's coal is used in transport and industry, the maximum saving which could be realised by the application of existing knowledge in these spheres is not so very much greater than a corresponding effort could produce in domestic consumption (which accounts for the remaining 20 per cent.). In particular, savings from increased use of carbonisation products (gas and coke) would result mainly from improvements in domestic fuel efficiency, although gas has a considerable actual and potential market in the lighter industries. The emphasis in this article is therefore placed on coal utilisation in relation to domestic heating.



Approximate smoothed curves indicating the general trend of British coal consumption over 68 years.

In one important field of coal utilisation, namely steam-raising, it is possible to secure 80 per cent. or more of the potential heat of the coal in the form of useful steam. Raw coal may be used for such purposes without undue, or preventable waste—provided that the plant is well managed and maintained in good order. There is a number of uses for which the efficiency of utilisation is highest when



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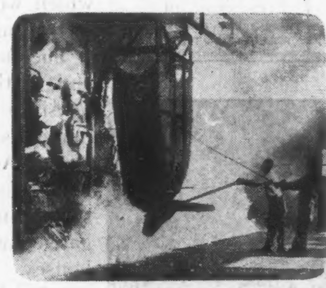

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1, *Coke Ovens. Suspended in front of the oven doors is the oven door-lifter and coke guide. This mechanically removes the oven door and then drops back into position to form a guide for the coke which is pushed out of the oven by a huge mechanical rammer and falls into the coke train.* 2, *Red hot coke being discharged from a retort after the process of carbonisation.*

the coal has been first converted into coke, gas or other products. It is demonstrable that for domestic purposes, coal is saved by first carbonising it, and using the coke and gas in the household appliances. To quote again from the Fuel and Power Advisory Council's report : "*We are using excessive quantities of coal ; we are providing inadequate heating in the houses ; we are pouring out masses of soot and tar into the atmosphere. In our view we cannot afford to maintain our low standards of heating ; we cannot afford to continue to depress and destroy the life of our cities by smoke pollution ; we cannot afford to waste our limited national coal reserves. . . . It is therefore of fundamental importance entirely to replace bituminous coal for use in the individual small house by smokeless fuels.*"

The position of carbonisation in this situation may be summarised briefly :—

(*a*) Carbonisation is the only known method of producing smokeless open fire fuels from bituminous coal.

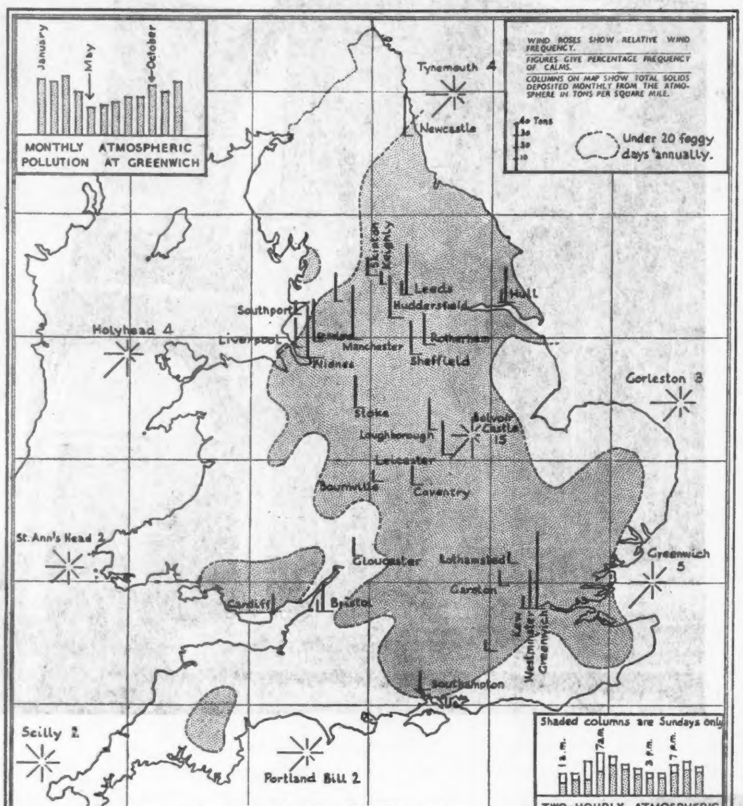
(*b*) In spite of the heat consumed in the process, carbonisation conserves coal, because the coke and gas can be used to much greater effect in domestic appliances than raw coal is used in the appliances now installed. It has been estimated that some 20 million tons of coal might eventually be saved annually if all domestic coal were carbonised before use.

(*c*) Carbonisation promotes employment. When the present eager demand for goods is satisfied, it will be important in relation to our policy of total employment that the carbonisation of coal and the use of its products gives employment to twice as many persons as the mining and combustion of 1 ton of raw coal direct.

(*d*) Carbonisation provides the bulk of the materials used by the

ATMOSPHERIO POLLUTION

Bottom, Stepney; even on a bright summer day the streets are veiled by smoke. The map shows, shaded, those parts of Britain having more than twenty days of fog a year.



organic chemical industry and is a prolific source of chemicals, especially of plastics, alcohol, fine chemicals and many other materials that are not yet manufactured from coal in this country.

(*e*) Considerable additional quantities of smokeless coal can be obtained from South Wales when man-power permits new mines to be sunk.

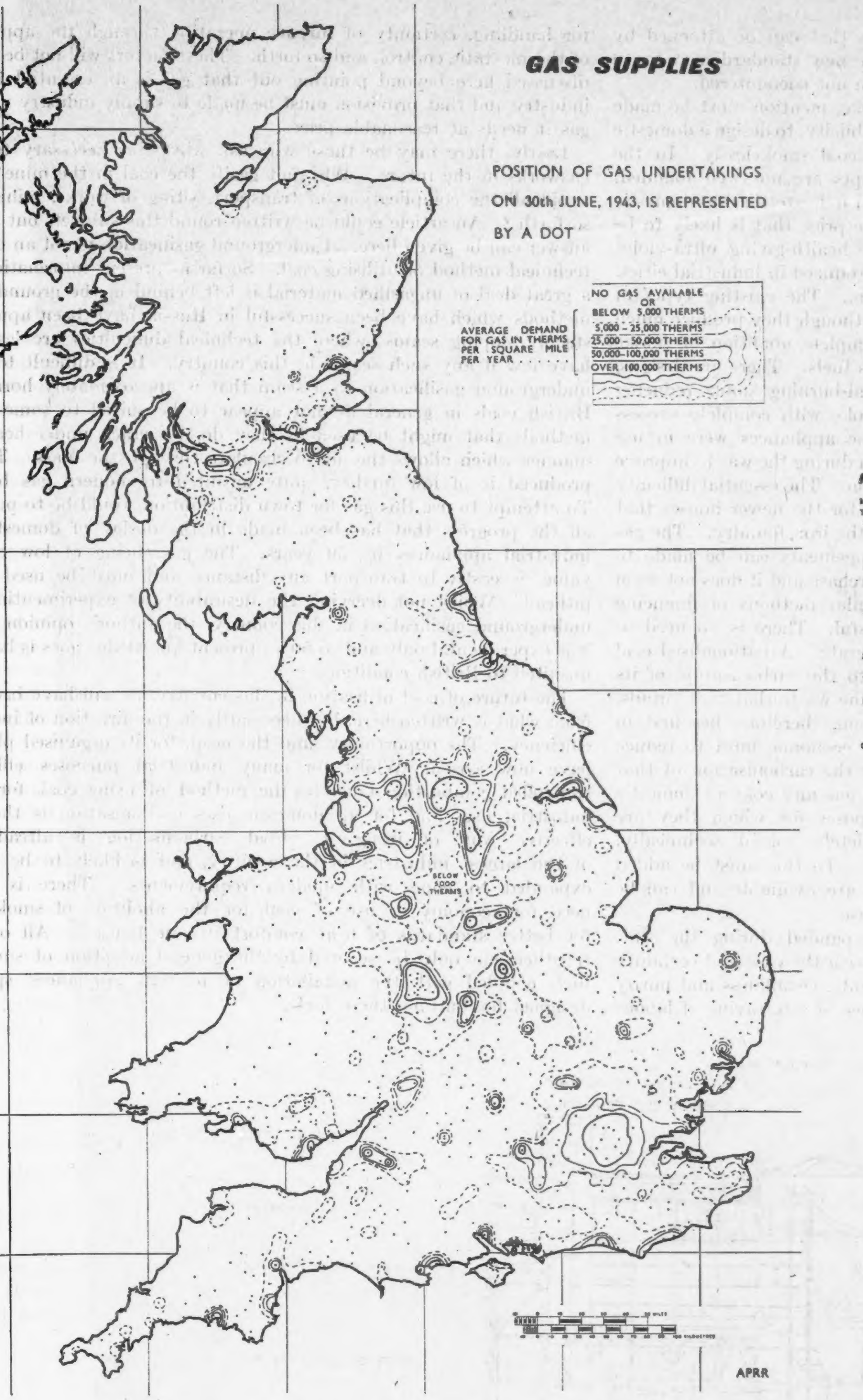
In any national fuel policy, therefore, carbonisation should be given a prominent place. It may not be necessary to carbonise all coal, but it is possible and desirable to carbonise all the coal that will be used for domestic heating,* in addition to coal used for certain industrial purposes, such as the iron and steel industry. It should be pointed out that the production of domestic heat from coal by way of electricity is only of the same order of efficiency as that of the open coal fire. Electricity should, therefore, not be used for general heating purposes in a national fuel utilisation policy based on coal conservation.

The gas industry has developed gas-making plant which operates at very high efficiency, given proper maintenance and management, and the industry, through the Institution of Gas Engineers, is taking pains to see that the best results are obtained from existing plant. Indeed the future national gas organisation is likely to bring the industry up to a high pitch of technical efficiency. The Gas Research Board is studying new processes for the manufacture of gas by treating the coal with hydrogen under pressure and at elevated temperatures. A process on these lines is now in the pilot plant stage. Researches into the synthetic production of methane are in a similarly advanced stage. Such processes as these promote flexibility both in the relative proportion of gas and coke made, and in meeting peak demands. The chemical utilisation of coal gas is well understood and it is likely that ethylene may be recovered as a starting point for many important organic chemicals. There is already one works in this country at which coal gas is liquefied and the resulting gases are converted into a variety of chemicals. It is quite possible that the future may see these developments proceeding parallel with the production of town gas and coke. The gas industry is becoming increasingly connected with chemical engineering both in its products and its methods. Improvements in the quality of town gas are likely when improved coal supplies permit more latitude in choice of variety. For instance, the sulphur content of gas is likely to be reduced to infinitesimal proportions, and this will assist in prolonging the life of gas appliances and in enabling flueless heaters to be used in greater numbers, a step which would approximately halve the cost and double the efficiency of heating by gas.

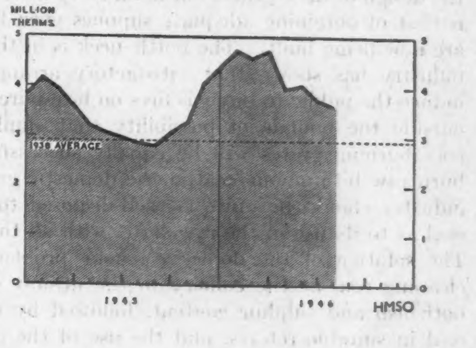
The further development of the gas industry will bring about the end of the age of smoke pollution. Smoke pollution has been with us since the Middle Ages, although generation after generation has made its protest against the infliction. The report of the Fuel and Power Advisory Committee has indicated very forcibly the need for using smokeless fuels for domestic heating and cooking. To put this scheme into force involves installing the latest appliances for burning gas, coke and smokeless coals not only in new houses but in existing houses. The supply position makes it difficult to suggest that this can be done immediately, but it is a matter which all architects and builders need to bear in mind. The Government has set up an Inter-Departmental Committee to implement the findings of the Fuel and Power Advisory Council. Smoke is on the way out! The necessity for properly insulating the structure of houses and other buildings to conserve heat is also of great importance. If efficient appliances are installed and all new houses are insulated against heat losses, it has been calculated by the present author that the pre-war figures of 1,275 gross therms used per household in this country can be reduced to 818 therms, with the provision of twice as much useful heat to the householder. This would mean a great saving in coal, and is a matter of the greatest national importance. The gas and coking industries could not meet such new demands with their present plant, because some 35,000,000 tons of raw bituminous coal would have to be replaced by smokeless fuel, including gas and further quantities of Welsh smokeless coals. All told, to heat our houses to the new housing standards of heat comfort, we should require to carbonise a further 33,000,000 tons of coal, less the contribution of the Welsh smokeless coals.

How the smokeless fuels that can, and will, be made available are to be used depends upon the wishes of the consumer. The domestic consumer can choose from a wide variety of combinations, the extreme cases being on the one hand to burn solid fuel almost entirely and on the other to use gas for everything. Taking the 3-bedroomed house

* Journal of the Institute of Fuel: xix, 103.



MONTHLY CONSUMPTION OF GAS 1945/6



recommended in the Housing Manual, with a floor area of 850 sq. ft., L. W. Andrew, E. W. B. Dunning and G. C. Holliday* suggest gas fires in each bedroom; convector heaters in the hall, kitchen and living room; radiant heater in the bathroom; a multi-point water heater; cooker, refrigerator; wash boiler and drying cupboard; thus providing a complete heating, cooking and hot water service for an expenditure of 565 gross therms of gas annually. The average weekly cost of this, using gas only, would be 8s. 2d. with gas at 9d. a therm, but this cost could be reduced if the houses were thoroughly insulated. If householders still stick to their open fires the modern coke-burning grate, which will equally well burn smokeless coals, is reasonably efficient, easy to operate, and cheaper to run.

One important feature of the house that burns no solid fuel is the absence of any discharge of sulphur into the atmosphere. Coal and coke both contain sulphur, usually to the extent of 1 to 2 per cent. Under atmospheric conditions this sulphur will form sulphur dioxide and may form sulphur trioxide and, in presence of water, sulphuric acid. The injury that these sulphur acids can do to ironwork and stonework is well known. It is by no means certain that sulphur acids will do the same injury in absence of smoke, since many believe that the smoke absorbs both moisture and sulphur acids and thus promotes contact with solid surfaces. Nevertheless, the ill effects of sulphur on materials cannot be overlooked. The effect of the fuels available therefore may be characterised thus: raw bituminous coal creates smoke and sulphur pollution and thus affects both health and materials detrimentally; coke and other solid smokeless fuels do not generate smoke, and thus have less effect on health, but sulphur acids arise from their combustion which affect materials; town gas, being purified from all but traces of sulphur, is healthy and without any marked corrosive effects on materials. We say "*marked*" corrosive effects, because normal town gas as previously sent out containing some 20 to 30 grains of sulphur per 100 cu. ft. has some corrosive

* L. W. Andrew, E. W. B. Dunning and G. C. Holliday: Technical Aspects of the Gas Industry's Contribution to Post-war Housing: I.G.E. 278/111 of 1945.

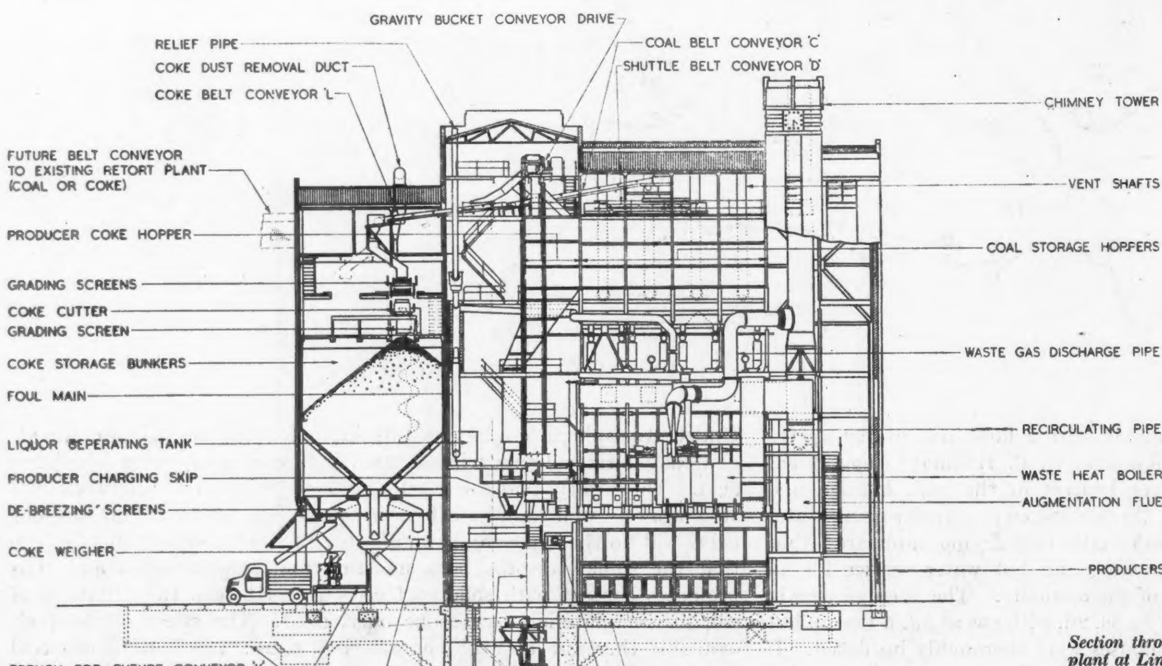
effect on gas appliances made from metals that can be attacked by sulphur acids. When purified down to the new standard of 5 to 10 grains of sulphur, these corrosive effects are not encountered.

Whilst upon the subject of domestic smoke, mention must be made of the attempts, which have received wide publicity, to design a domestic open fire that will burn raw bituminous coal smokelessly. In the opinion of the present writer these attempts are not well founded. The conditions under which smoke is formed indicate that no domestic open grate can be produced at a reasonable price that is likely to be smokeless. A smoke haze may screen the health-giving ultra-violet rays nearly as much as the heavier smoke produced in industrial cities. Complete smoke abolition must be the aim. The existing types of modern coal-burning fire are not smokeless, though they produce much less smoke than the older appliances. Complete abolition of smoke can only be secured by the use of smokeless fuels. There are designs, very much less in first cost than the coal-burning smoke-reducing grates, for appliances that will burn gas coke with complete success as an open fire. Many thousands of these appliances were in use before the war. Opportunity has been taken during the war to improve the design of these grates out of all recognition. The essential difficulty is that of obtaining adequate supplies even for the newer houses that are now being built. The bottle-neck is in the iron foundry. The gas industry has shown that satisfactory arrangements can be made to induce the public to buy gas fires on hire-purchase and it does not seem outside the bounds of possibility that similar methods of financing coke-burning grates will be equally successful. There is no need to burn raw bituminous coal in the domestic grate. A nationalised coal industry should be quite as well-disposed to the carbonisation of its coal as to its use in the raw state, with all the waste that that entails. The solution of the domestic smoke problem, therefore, lies first in cleaning coal at the colliery to the utmost economic limit to reduce both ash and sulphur content, followed by the carbonisation of that coal in suitable retorts, and the use of the gas and coke in domestic appliances specially designed for the purposes for which they are required. This problem has been completely solved technically. All that remains is to put it into practice. To this must be added the use of such Welsh smokeless coals as are available and can be transported economically to the place of use.

Industrial uses for gas have further expanded during the war. There are many reasons for this connected with the ease and certainty of application, absence of storage requirements, cleanliness and purity of gas, control of furnace atmosphere, absence of ash, saving of labour for handling, certainty of furnace operation through the application of thermostatic control, and so forth. These factors will not be further discussed here beyond pointing out that gas is an essential fuel for industry and that provision must be made to supply industry with the gas it needs at reasonable prices.

Lastly, there may be those who ask why it is necessary to build gasworks in the future. Why not gasify the coal in the mine and so avoid all the complications of transport, siting of works, mining and so forth? An article could be written round this subject, but a short answer can be given here. Underground gasification is not an efficient technical method of utilising coal. So far as present information goes a great deal of ungasified material is left behind in the ground. The methods which have been successful in Russia have been applied to steeply sloping seams, where the technical difficulties are less; we have few if any such seams in this country. It is difficult to apply underground gasification to a seam that is approximately horizontal. British coals in general do not appear to be suited to some of the methods that might be used as they do not crack under heat in a manner which allows the air to circulate through the mass. The gas produced is of low quality, quite unsuited to modern gas burners. To attempt to use this gas for town distribution would be to put back all the progress that has been made in the design of domestic and industrial appliances by 50 years. The gas, being of low calorific value, is costly to transport any distance and must be used at the pithead. Whilst not decrying the desirability of experimenting with underground gasification in this country, the author's opinion is that it is experimental only and so far as present knowledge goes is basically unsuited to British conditions.

The future of coal utilisation in this country, as will have been seen from what is written here, lies necessarily in the direction of increased efficiency. The opportunity, and the need, for its organised planning have now arisen. Whilst for many industrial purposes efficiently controlled combustion must be the method of using coal, for other industrial uses and for all domestic uses carbonisation is the most effective way of using it. Coal carbonisation is already one of the largest industries in the country, and is likely to be greatly expanded to cope with modern requirements. There is urgent need for economy in use of coal, for the abolition of smoke, and for better standards of heat comfort in our houses. All of these together can only be secured by the general adoption of smokeless fuels coupled with the installation of modern appliances specially designed for burning these fuels.



LONGITUDINAL SECTION THROUGH RETORT HOUSE

Section through a vertical retort installation in a new plant at Lincoln.

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The transport of coal and coke

R. V. HUGHES

The need for facilities for the conveyance of coal brought into existence most of our earliest railways, many of our canals and a large number of our ports. The traffic was profitable and plentiful; and facilities for conveying it were provided in profusion, competition between railways and between ports being brisk. We thus inherit a transport system which is ample or more than ample for handling the normal peacetime flows of coal traffic but which is perhaps too lavishly provided with capital assets. History bequeaths us the very doubtful blessing of a great deal of expensive equipment which is still too useful to jettison but which limits the dimensions of the units of conveyance to a disturbing extent.

Whilst this limitation also applies to canal boats and to sea-going ships, it is of particular importance on the railways. To secure economical transport it is essential that the tare (i.e. unladen weight) of wagons should be as small as possible in proportion to the payload. The need to improve this ratio has led many to advocate the use of much larger wagons, such as four-axle wagons with a 40-ton capacity; but there are difficulties :—

(1) At most collieries the railway layout and the clearances under the screens preclude the use of such wagons;
(2) At most coal shipment and bunkering ports, railway motive power depots, etc., the discharge of wagons is by tipplers which are designed exclusively for two-axle vehicles;
(3) Many port, factory and gasworks layouts depend on the use of wagon turntables, commonly of only 10-foot diameter;
(4) Retail coal merchants like to save handling and demurrage costs by receiving coal in small wagon-loads and bagging it at the wagon door (except in certain parts of the country where coal-drops are used for coal received in hopper-bottom wagons).

The subject is a most contentious one, on which experts (not always disinterested) disagree warmly, but the following conclusions are fairly widely accepted :—

(1) Small wagons, say 8 to 10 tons capacity, with a tare of about 6 tons, are uneconomical units, but they represent many millions of poundsworth of capital and cannot be scrapped yet;
(2) The most economical universal wagon which can be designed for coal traffic is of 16 tons capacity with a tare of about 7½ tons and a wheelbase of 9 feet;
(3) Wagons of between about 22 and 35 tons capacity would not give a favourable tare/payload ratio.

It thus appears that for coal the payload cannot be expected to exceed 66 per cent. of the trailing tonnage and may be only 60 per cent.

What has been said about coal applies in a lesser degree to coke,

21 ton coke wagon

16 ton coal wagon

because :—

(1) The transport of coke on a large scale began rather later;
(2) Coke conveyed by rail is usually in large consignments from one large plant to another (usually pit-head coke ovens to ironworks); and
(3) Distribution of coke is largely based on the production of the local gasworks rather than on rail imports.

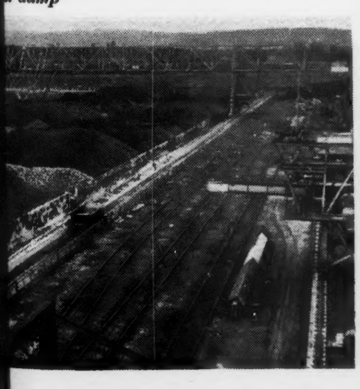
The limitations on rolling stock being less severe, coke traffic is largely conveyed in high-sided two-axle wagons of 21 tons capacity and about 9 tons tare, which is a quite economical ratio, particularly when it is taken into account that coke in bulk weighs about 35 to 50 per cent. less per cubic foot than coal. (The figures are, for coke 34 lb. per cubic foot or less, coal 49 to 56 lb. per cubic foot.) Thus although theoretically coke is at a disadvantage because it is bulkier than coal, the fact that it can be conveyed in larger wagons makes it slightly more economical to carry by rail in bulk. (The payload would be about 68 per cent. of the trailing tonnage with the wagons mentioned, giving an advantage of from 2 to 13 per cent. in favour* of coke under existing conditions.)

The standard charges per ton are basically the same for coke as for coal (except for consignments of under 7 tons), but the railways are empowered to quote " exceptional rates " to encourage traffic passing in considerable quantities between fixed points, and it is natural that on the whole these rates tend to favour the traffic which is cheapest to carry. It is not possible in this short article to deal adequately with the very complex economics of transport, however; but in general it may be said that charges consist of :—

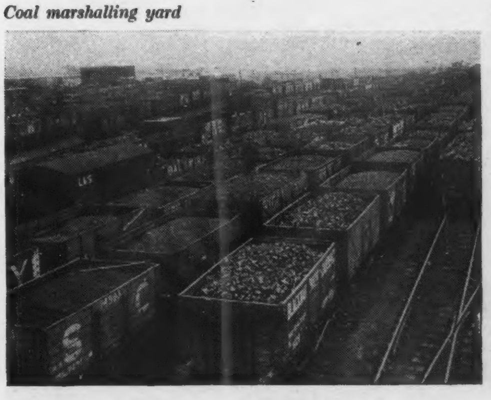
(1) The actual cost of moving the traffic and of handling it at the terminals, plus
(2) As large a contribution towards the upkeep of track and equipment and towards the payment of interest on borrowed capital as the Tribunal appointed by Parliament considers the traffic to be able to bear (on the analogy of national taxation, which is spread according to ability to pay).

* Against this must be set the fact that the gross calorific value per lb. of coke is at least 5 per cent. lower than that of the coal from which it was made.

l dump



Coal marshalling yard



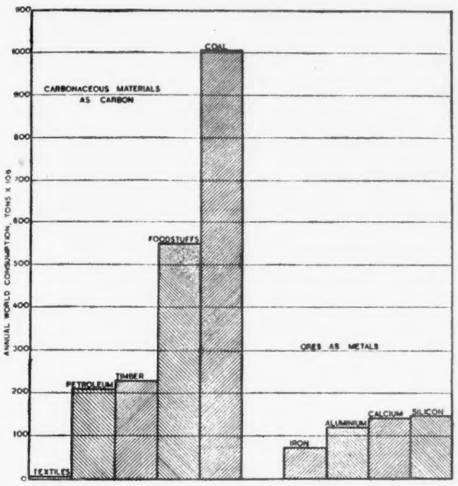
Coal wharf

Coal barges

RAIL TRANSPORT

WATER TRANSPORT

Handling costs at terminals are an important element in the cost of transport, and are proportionately more important on short hauls. Although mile for mile canal transport is cheaper than rail or road, it is at a disadvantage when coal or coke has to be thrown up out of boats by hand, and it has been found that over a short distance it is cheaper to carry by road in a tipping lorry even though the pit and the consignee's premises are both alongside the same canal. Canal transport of minerals is more efficient when the containers can be lifted bodily out of the boats by crane or hoist. As between coal and coke there is little difference in cost of conveyance, except that containers designed for coal and used for coke are less economical than those designed specifically for the lighter cargo.



This diagram shows the principal materials used by man. The significant position in the world's economy occupied by coal is further confirmed if we compare the main sources of energy upon which human life depends. The first and most ancient is the food which warms us and sustains our muscular activity, but the whole 2,300 millions of the world's population do not take in as much energy directly in the form of food as is consumed in the form of coal by that fraction of the human race (less than one-third) which constitutes the industrial population.

Road transport is specially suitable for handling coal from open-cast workings and from certain small pits and drifts. Apart from that its principal contribution is in retail distribution.

A point which may be noted in connection with storage of coal in bulk for transport is that in deep heaps or bunkers it is liable to spontaneous combustion, whereas with coke the risk is negligible.

The main streams of coal traffic before the war were from the pits to the nearest ports (for export, bunkering or coastwise shipment), and from the Midlands and North East to London, plus a maze of lesser streams feeding centres of industrial and domestic consumption all over the country. For supplying London, coasters were becoming proportionately more important with the establishment of generating stations and other large consumers alongside tidal wharves on the Thames. The war checked coasting trade and virtually killed coal exports, causing a marked increase in long-distance internal rail transport, in many cases over routes which previously carried but little coal. Exports being still almost non-existent, many of these wartime internal streams of traffic still persist, whilst the ports formerly prominent as exporters of coal, like Barry, are having a very thin time.

The comparatively low value of coal in relation to its weight imposes an automatic economic check upon undue cross-haulage (such as existed in foodstuff and other trades before the institution of wartime zoning), but there are inevitably some cross hauls because of the great variety of coals, some of which are specially suitable for certain purposes (e.g. steam-raising, coking, gasworks or domestic). For the same reason it is not unknown for coke to be carried from one coalfield to another coalfield over a hundred miles away because the local coal is either unsuitable for coking or produces a coke too sulphurous for metallurgical use.

The distribution of gas

W. M. OGDEN

"*Whereas a number of coking plants have been installed and are being worked in West Yorkshire: and . . . whereas the quantity of coking plant gas now produced could be largely increased if facilities existed for its distribution: and whereas the plant existing at the gas works of supply undertakings is sufficient for the manufacture of larger quantities of gas than are at present required for the supply by such undertakers: and whereas with a view to the co-ordination of gas supplies and the elimination of small and uneconomic or redundant gas manufacturing units as to the provision of cheap supplies of gas for towns and industrial purposes it is expedient that facilities be provided for the distribution of gas produced at the coking plants . . . and of gas produced by the fuller utilization of the said existing gas works plant:*" so is the need for the West Yorkshire gas grid shown in the preamble to the West Yorkshire Gas Distribution Act of 1938.* This passage is instructive since it sets out most of the advantages of gas grids, which are: full utilization of existing resources of plant, the elimination of uneconomic plant and the co-ordination of undertakings to provide cheap supplies. The preamble does not mention specifically the other basis of gas grids: the location of the producing units in their most economic positions for production.

A gas grid is a system of pipes, working at high, medium or low pressure, with holder stations, pumping units and pressure governors. It interconnects several production units and distributes gas to the consumers. The desirable extent of any one system is not easily determined, as Messrs. Hodkinson and Taylor† point out in their paper on the West Yorkshire Grid. It should not be assumed that a gas grid is exactly like the electricity grid; the costs of distributing energy as gas exceed those for electricity, and the maximum size of production units (individual plant) is smaller; moreover, a gas grid includes holders for storage, whereas no method has been evolved to store large quantities of electricity. Lower distribution costs allow an electricity grid to be more extensive than a gas grid. A lower maximum size for the gas production units necessitates more of these (but not necessarily more stations). Storage allows each individual station to work on a higher load factor, and extensive interconnection of stations is not so important. In many other ways the purposes of the two grids are identical: elimination of redundant plant, saving in the provision of stand-by plant, increase of overall load factor, uniformity of pressure and quality of the product, are factors common to both kinds of grid.

The costs of gas manufacture arise from :—

(*a*) Capital charges on land, plant and buildings.
(*b*) Maintenance and running costs of the plant and buildings.
(*c*) Purchase of fuel.
(*d*) Costs of distribution.
(*e*) Receipts from the sale of by-products (credited).

The Heyworth Report* allocates 20-25 per cent. of the cost to capital charges, about 33 per cent. to manufacture (which includes fuel costs and also, presumably, receipts from the sale of by-products), about 33 per cent. to administration, and only about 10 per cent. to distribution and storage. These percentages roughly agree with those given by Hodkinson and Taylor: e.g. total costs about 60 pence per thousand cubic feet of gas, including about 6d. for distribution and storage. Thus an increase in fuel costs is likely to have a bigger effect on the ultimate price than an increase in distribution costs. These factors tend to favour the siting of stations where fuel is cheap.

The ideal distribution system also involves a study of "*economy of scale.*" The Heyworth Report states that economy results from increasing the size of a gas production unit up to an output of 10 million therms per year. Larger units may be less efficient. A unit of this optimum size would supply gas to about 120,000 people, assuming that 200 therms would be used by four people in each house, and that about 40 per cent. of the total production would be used for non-domestic purposes. The difficulty with larger production units is the removal and disposal of coke; but methods of reducing coke production per unit of gas produced are known, so that the optimum size of station may increase in the near future.

* West Yorkshire Gas Distribution Act, 1938: 1 and 2, Geo. 6.

† W. Hodkinson and H. B. Taylor: The Development of a Gas Grid: Institution of Gas Engineers: Communication No. 298.

* Report of the Committee of Enquiry: The Gas Industry: Ministry of Fuel and Power; Cmd. 6699. (H.M.S.O.). 1945.

According to the Heyworth Report, in areas of high demand in England, Scotland and Wales there are thirty-eight works producing more than 1.25 million therms per year and forty-two producing less than this amount, and stations with the smaller outputs are not likely to have thermal efficiencies above 75 per cent.; some may operate at only 60 per cent. For outputs of 5 million therms or more the efficiency may be 82 per cent. If it be assumed that gas grids are practicable in areas of high demand, the forty-two inefficient stations could be eliminated, with consequent saving of coal, labour and plant.

That the West Yorkshire grid has cheapened supplies is suggested by the costs for distribution given by Messrs. Hodkinson and Taylor, assuming that the grid has not increased production costs which is a plausible supposition. Distribution costs in 1944 in the area of fifteen stations alone were 8.20d. per 1,000 cubic feet. Over the whole area of 19 stations they were 6.81d. per 1,000 cubic feet.

The true social cost difference between two potential station sites will equal the economic difference only when coal transport charges are based upon real cost, as distinct from discriminating tariffs. Two production units have been compared* to show that a coke oven plant at a colliery using coal at 38s. 1d. per ton can produce gas at 9.44 pence per 1,000 cubic feet (after allowing for the sale of residuals) whereas a similar plant a few miles away using coal at 44s. 1d. per ton would produce gas at 13.27 pence per 1,000 cubic feet (1946 prices).

H. J. Escreet† has calculated the costs of transmission of gas by various systems and deduces the following figures for supplying 25,000 houses by means of high-pressure trunk mains and storage (1938 prices):

Distance from station	*High-pressure system* Cost in pence per 1,000 cu. ft.
10 miles	3.30
25 miles	4.45
50 miles	6.35

Transmission costs may have risen by 100 per cent. from 1938 to 1946, but the figures enable a more concrete comparison to be made between the effects of location on fuel costs and on distribution costs. Corresponding transmission costs through a low-pressure system would be respectively 1.70d., 3.60d. and 6.10d. per 1,000 cubic feet.

H. J. Escreet has also compared the different methods of distribution as between towns of 25,000 houses (about 100,000 people) and of 5,000 houses (about 20,000 people) respectively. (Diagrams of the larger town are reproduced.) Escreet suggests that the consumer can only be given a steady supply of gas if supplied by an intermediate pressure system; and it is possible that all future installations will incorporate this principle.

Demand varies considerably between summer and winter. Diurnal variations can be overcome by an adequate storage system, but not

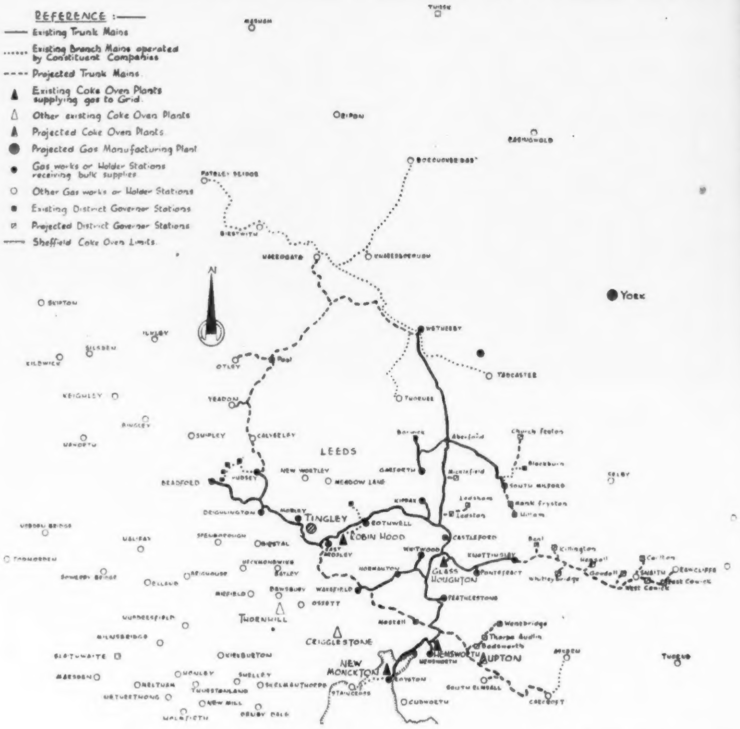
* W. Hodkinson and H. B. Taylor: The Development of a Gas Grid: Institution of Gas Engineers: Communication No. 298.

† H. J. Escreet: The Design of Distribution Systems to Supply Post-war Development: I.G.E. Communication No. 259. 1943.

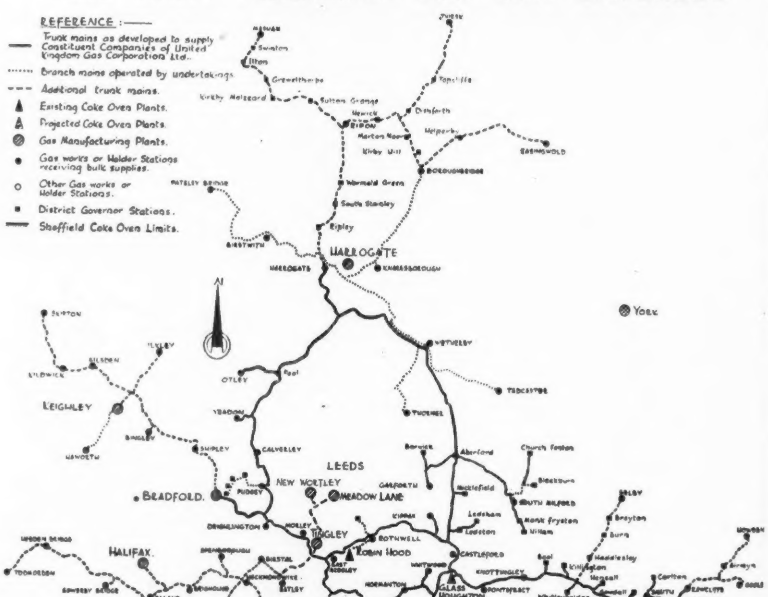
summary of costs of supply, in pence per therm

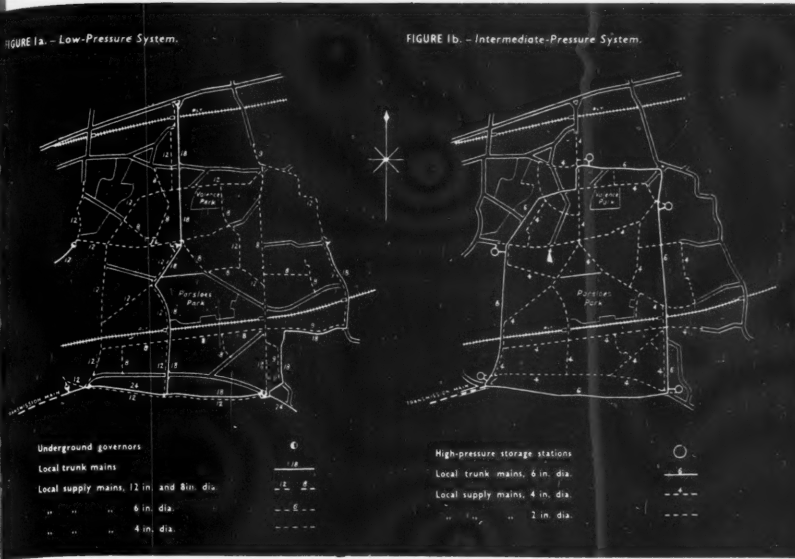
Type of System.	A	B	C	D	D_1
	Direct supply to low-pressure distribution system	Direct supply to intermediate pressure distribution system	Supply through high-pressure storage to intermediate pressure distribution system	Supply through six low-pressure holders to low-pressure distribution system	Supply through one low-pressure holder to low-pressure distribution system
1	2	3	4	5	6
Local distribution	1.23	1.42	1.42	1.23	1.23
Local storage and/or trunks mains	0.27	0.22	0.60	0.63	0.53
	1.50	1.64	2.02	1.86	1.76
Town of 25,000 houses: Transmission					
10 miles	0.70	1.03	0.66	0.34	0.34
25 ,, ...	1.54	1.71	0.89	0.72	0.72
50 ,, ...	2.42	2.47	1.27	1.22	1.22
Total costs					
10 miles	2.20	2.67	2.68	2.20	2.10
25 ,, ...	3.04	3.35	2.91	2.58	2.48
50 ,, ...	3.92	4.11	3.29	3.08	2.98
Town of 5,000 houses: Transmission					
10 miles	1.12	1.49	1.04	0.77	—
25 ,, ...	2.59	2.69	1.77	1.67	—
50 ,, ...	4.54	4.62	3.02	2.92	—
Total costs					
10 miles	2.62	3.13	3.06	2.63	—
25 ,, ...	4.09	4.33	3.79	3.53	—
50 ,, ...	6.04	6.26	5.04	4.78	—

THE WEST YORKSHIRE GAS GRID TODAY

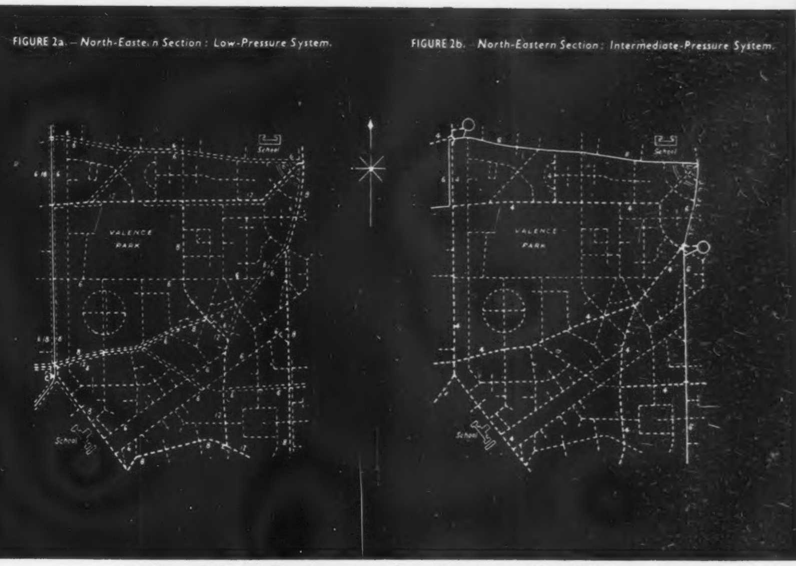


THE WEST YORKSHIRE GAS GRID EXTENDED





1a and 1b, distribution systems for a town of 100,000 inhabitants



2a and 2b, detail enlargement of north-eastern section of the same town

so the seasonal variations, which necessitate stand-by capacity in mains and manufacturing plant. The seasonal variations can be reduced by increased use of gas in industry and for water heating in the house; also by increasing the area of supply. The greater the load factor, the cheaper the gas, and annual variations can often be minimised by a grid system which spreads the load over residential areas, business areas and industrial areas alike.

Gas grids have been developed steadily during the last few years. The undertakings in the London area have been linked together since the war to form the largest gas grid in the world. Even in rural areas it has been found possible to provide high pressure systems in an economical manner. It need scarcely be added that rural areas are unlikely to raise enough demand to justify the building of a station making 1,000,000 therms per year, but the basis for economic size in those areas must be related to the alternative supplies of energy, whether electric, oil, coal, wind or manual.

Having pointed out that discriminating charges on the part of the coal transport undertaking may affect optimum locations, it is only fair to mention that the company operating a gas grid might alternatively discriminate against certain districts, or charge uniformly over wide areas, and thus upset the cost calculations for other industrial projects.

In conclusion it may be asserted that the gas grid is a normal development in an age which is studying economics of scale. It enables man to live more abundantly, to use the land more effectively, and also encourages the use of high-pressure gasholders, which are smaller and neater than the well-known low-pressure types.

Ancillary industries

O. W. ROSKILL

The industries which may be considered ancillary to the gas industry fall into two main groups. The first group, which is entirely dependent on the gas industry, includes manufacturers of plant and other equipment used in the production, storage, distribution and utilization of gas. The second group includes a wide variety of industries which use gasworks by-products. In this article it will only be possible to examine a few aspects of these industries and briefly discuss the trends which they indicate.

plant in gasworks

On a thermal basis, the production of gas rose 24 per cent. between 1935 and 1945. Since the war there has been a further outstanding increase in gas production: figures for the first six months of 1946 show that the average weekly production of gas was nearly 30 per cent. more than in the previous year.*

In the early part of the war, shortage of plant was one of the chief difficulties of the gas industry, particularly because, even when high priority was granted, new plant often took eighteen months to complete. This shortage is still being felt and is likely to continue for several years to come. In addition, it must be remembered, there has been some wastage of plant due to war damage. The gas plant industry, which is organised in the Society of British Gas Industries, also contributes substantially to exports, and in 1944 exports of gasworks and chemical machinery amounted to £272,254.† Many gasworks, both in the Empire and foreign countries such as those of South America, are equipped with British plant.

As regards carbonisation, the tendency at present is towards continuous vertical retorts because they are economical in operation and have the advantages (also applying to the intermittent vertical type) of occupying less ground space and being cleaner than horizontal retorts. The latter, however, have other advantages: for instance they are less exacting as regards the kind of coal used, and they produce a better quality of coke and if required a higher calorific value of gas. In large works, coke oven units are being favourably regarded.

During the war one constructor of gas plant installed altogether 805 retorts and reset approximately 4,370. At the end of 1945 another company had under construction 30 new gas making plants with a total daily coal carbonising capacity of 2,818 tons, 25 out of the 30 being the continuous type.

The hot gases from the retorts pass through a hydraulic main and condensers, where ammonia liquor and tar are collected. Tar is further extracted by other devices. The gas mixture later passes to the washers where, by a series of operations, the removal of further ammonia, naphthalene, benzole and water vapour takes place. The purifiers, which consist of chambers containing trays packed with iron oxide (bog ore, etc.) are employed to extract sulphur. The iron oxide can be partially revivified by exposure to the atmosphere, and when finally spent is generally used for sulphuric acid manufacture.

Benzole recovery plant was installed in a number of gasworks before the war, and in others during the war as a result of Government encouragement to extract as much as possible (in 1936 benzole was recovered from only about 50 per cent. of the coal carbonised). Because of the coal shortage it is now regarded as more important to secure maximum output of gas rather than of benzole, and some benzole

* Based on figures in the Monthly Digest of Statistics (H.M.S.O.), which give weekly gas production in million therms by statutory and non-statutory undertakings.

† Gas plant is not separately specified in the Statement of Trade of the U.K. issued by the Board of Trade. The figure quoted is for "gas and chemical machinery not elsewhere specified." Items of gas plant are no doubt included under other headings in the Machinery Section, and a proportion of exports of refractory bricks (£183,106 in 1944) is probably intended for retort construction.

recovery plants may not be maintained in full operation.

The purified gas passes to gasholders for storage. These are of two main types—water-sealed and waterless. The spirally guided water-sealed gasholder appears to be the most popular in recent installations.

This brief account is intended only to stress the wide range of plant, much of it of a massive character, which is employed in gasworks. The list is far from exhaustive. In addition to items of a more delicate and complicated character, such as gas testing apparatus and meters which are specially manufactured for gasworks, there is a considerable amount of equipment which, though used in gasworks, is not peculiar to the industry, including hoists and conveyors, pumps, pipe lines and fittings, boiler plant, electrical plant and tools.

The gas industry is still faced, as it was all through the war, with shortage of gas making coals, particularly of the qualities preferred. This gives rise to a number of problems. There is one solution which makes a valuable contribution to flexibility : some undertakings may gasify part of the coke they produce to make water gas, which may be enriched to the required calorific value by cracking gas oil in the plant. Most undertakings have installed carburetted water gas plant for this purpose.

plant for gas distribution

The mains and other pipe lines used in the distribution of gas form an important part of the output of cast iron pipe manufacturers. Steel tube is used for high pressure mains and service pipes.

There have recently been some interesting developments in the method of laying pipes. Instead of laborious excavation by hand, excavating machinery may be used which removes the earth, lays the pipes and later fills in the ditch. This will reduce the cost of laying mains if gas grids are extended. Proposals have already been made* to extend the gas grid in north-east England, now used for the supply of crude surplus gas from 9 batteries of coke ovens to 10 gas undertakings, by about 42 miles of gas mains, which would complete the principal lines of the grid. The cost of constructing these, together with the necessary compressing and auxiliary plant, is estimated at £250,000. A more ambitious proposal is to cover an area of 235 square miles in Glamorgan and Monmouthshire with high pressure mains, at a cost of £1,400,000. The major items of plant which will be required if these and other gas grid extensions are made include compressing and pumping equipment.

industrial gas plant

There was a very large increase in the use of industrial gas plant during the war, largely due to the convenience and flexibility of gas compared with other fuels, whether controlled by hand or automatic gear.

The biggest strides have been made in the metal industries, both steel and non-ferrous, and in the engineering industries, and there is likely to be a still bigger demand for gas-fired plant in this field in the future. It is here that close control, not only of temperature but of the atmosphere inside the furnace, is particularly important. It is possible to produce either an oxidising or a reducing atmosphere, the latter, for example, being essential for bright annealing, which, by eliminating scale, saves labour, equipment and material in later processes.

Gas heat treatment furnaces have been widely used in the fabrication of light alloys such as duralumin used in the manufacture of aircraft, and much progress has been made in this field during the war.

Although gas has been used very little in the past for pottery manufacture, there is a marked trend in recent pottery installations towards gas-fired plant, particularly tunnel kilns, and there is every likelihood of its adoption on a big scale in the near future. Preparations are being made by Stoke-on-Trent Gas Department to meet the increased demand for gas. Tunnel kilns with special characteristics such as controlled temperature gradient and atmosphere have been developed.

Other industries in which gas plant has made great progress are food manufacture and bakery, paint and varnish manufacture. One of the most important industrial applications of gas, which has been brought to a high efficiency in the past few years, is the gas-heated "*infra-red*" method for rapid drying of paints and varnishes, stove enamelling, etc.

industries which use gasworks by-products

It is only possible to consider briefly the industries which, while not entirely dependent on the gas industry, make use of gas by-products.

The dye manufacturing industry utilises a number of coal tar derivatives of which the chief are anthracene and naphthalene. The same by-products and intermediates are often used for pharmaceutical products closely allied to dyes in composition : for instance, salvarsan was developed from methylene blue. Aspirin and saccharine, M and B 693, and other drugs have their origin in coal tar by-products.

Anthracene production (40/50 per cent.) was 1,900 tons in 1942 and 2,500 tons in 1944 ; crude and hot pressed naphthalene production together amounted to between 23,000 and 24,000 tons per year during the war.

For road making, road tar is likely to be in considerable demand in the future after the comparatively low wartime demand. Coal tar fuels form another outlet.

The gasworks output of sulphate of ammonia is sold to farmers. In 1942 about 60 per cent. of the cereal acreage received the equivalent of 1¼ cwt. sulphate of ammonia per acre ; this was a considerable increase on pre-war practice.

Carbolic acid is used for the manufacture of disinfectants and sheep dip.

The plastics industry has important links with the gas industry. Phenols and cresols form the basis of some of the most important synthetic resins. Ammonium thiocyanate is the source of thiourea, which is also used in the manufacture of moulding powders.

Benzole and toluole (used in wartime for explosives) are at present being diverted from motor spirit to chemical works for the manufacture of solvents and organic chemicals. Gasworks benzole production rose from about 23 million gallons a year at the beginning of the war to nearly 40 million gallons in 1943 (the peak year). 1945 production was down to about 33 million gallons. It is estimated that if all gas were stripped the output from gasworks would be around 50 million gallons a year.

Other applications of gas by-products include the use of creosote for timber preservation, pitch for coal dust briquetting, and certain coal tar derivatives for greases. Spent oxide is treated for sulphuric acid manufacture and the recovery of cyanides.

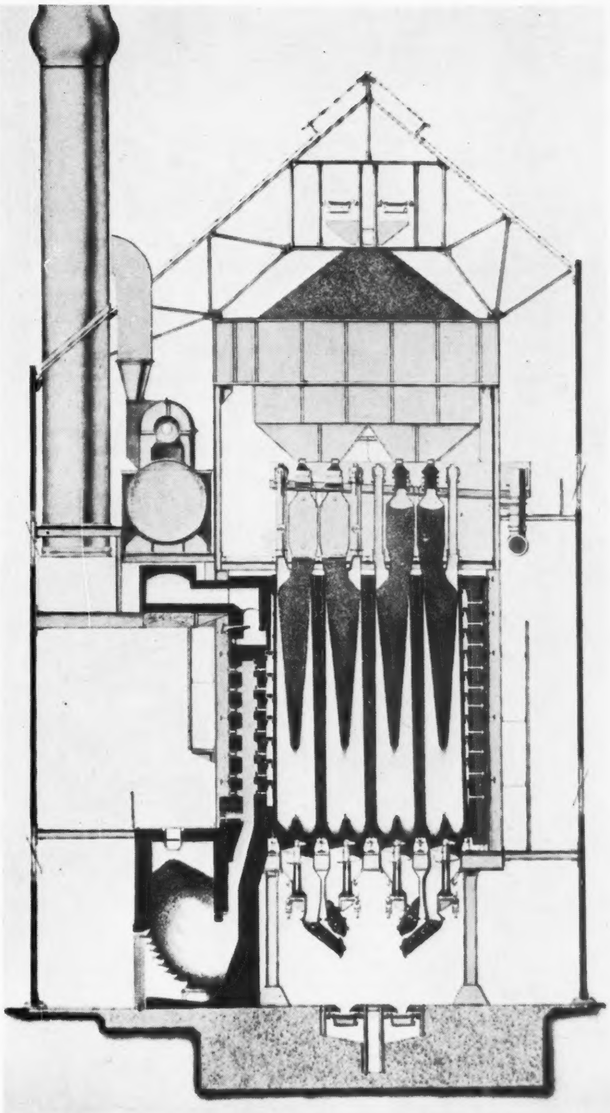
The growth in output of some of the principal gasworks by-products is shown in the accompanying table.

output of by-products by gas industry in Great Britain and of products made therefrom

	Pre-War	1942	1943	1944	1945
		(all figures expressed in tons)			
Crude Tar	1,230,000	1,260,000	1,288,000	1,290,000	1,310,000
Products derived therefrom :					
Road tar	400,000	380,000	390,000	360,000	380,000
Creosote/pitch mixture ...	*	320,000	370,000	350,000	330,000
Creosote oil	230,000	190,000	140,000	155,000	170,000
Pitch	400,000	280,000	230,000	240,000	250,000
Naphthalene	18,000	19,000	20,000	18,000	19,000
Pyridine bases	*	400	360	350	350
Phenol	3,000	4,900	5,200	5,500	4,900
Cresylic acid	14,000	17,000	20,000	19,000	19,000
Anthracene	*	1,100	1,400	1,500	1,200
Crude Benzole	97,000	156,000	172,000	169,000	145,000
Products derived therefrom :					
Motor benzole	60,000	80,000	80,000	60,000	60,000
Other benzole	6,000	9,000	17,000	30,000	25,000
Toluole	5,000	13,000	18,000	19,000	13,000
Xylole	1,300	2,500	4,000	4,700	3,500
Naphtha	5,000	7,000	8,000	8,000	8,000
Ammonia liquor					
(expressed as 25% NH_3 liquor)	140,000	*	*	*	*
Coke	10,800,000	11,200,000	11,400,000	11,500,000	11,600,000
	(* figures not available).				

The above table contains, in the main, estimates calculated by indirect means and no great accuracy is claimed for it.

* Report of the Coal Processing Industries Panel of the Northern Industrial Group : December, 1945.



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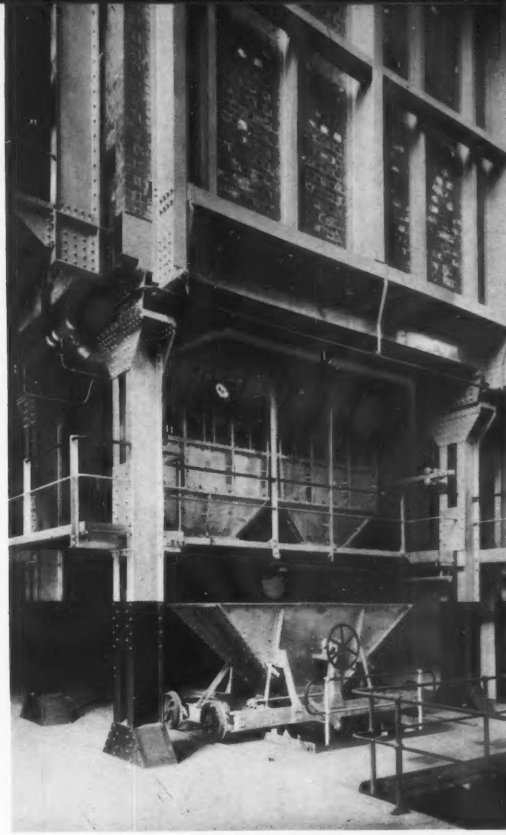

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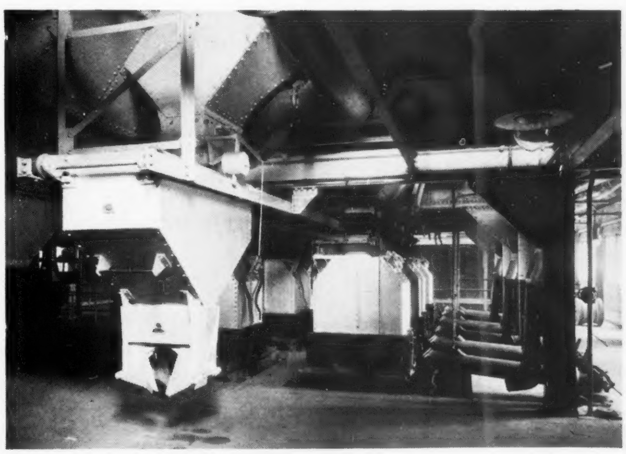
THE VERTICAL RETORT 1, *section through a vertical retort.* 2, *coke discharging floor where a vacuum plant extracts the coke dust, thus providing greatly improved working conditions.* 3, *stoker's platform on a modern vertical retort. Attention has been directed towards providing light and air for the operators. Note individual cold air douche inlets.* 4, *inside the retort ; as the uncarbonised coal descends the retort, the increasing cross sectional area makes space available for expansion. Through the pressure of the carbonising coal, the coke wall is burst and the segments come into contact with the retort walls which stop further expansion at this level. With a further descent of the charge there is again a rupture of the second skin of coke and it is natural that the fissures in the outer skin of coke should extend into the second skin. This process continues as long as there is an increase in the cross sectional retort and as long as there is coal left to carbonise and provide the bursting pressure. With the disappearance of the coal core, the fissures extend from the retort wall to the centre of the charge.* 5, *the governor house where gas is controlled to give balanced pressure to consumers.*



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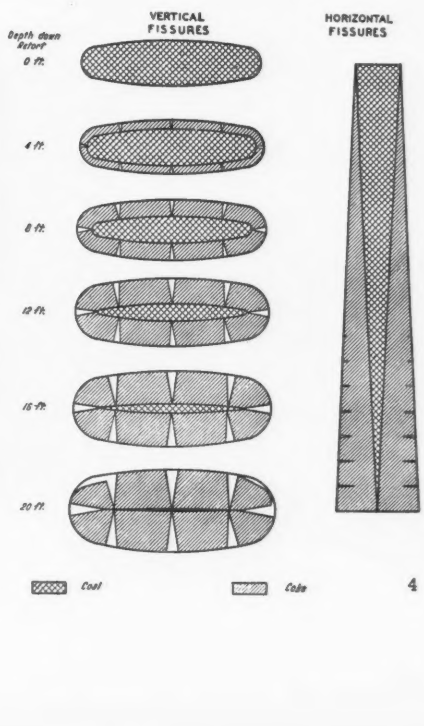

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BY-PRODUCTS OF THE GAS INDUSTRY

1, sulphuric acid chambers. 2, naphthalene washers. 3, ammonia scrubbers and washing plant. 4, making moth balls. 5, analysing liquid by-products. 6, water-gas plant. 7, salt bath. 8, benzole plant. The plan on the right and on the facing page is of the gasworks and by-product works at Beckton. The diagram below shows the process of gas manufacture and by-product recovery in the gasworks. The white lines show the progress of the gas, the shaded lines show the by-products.


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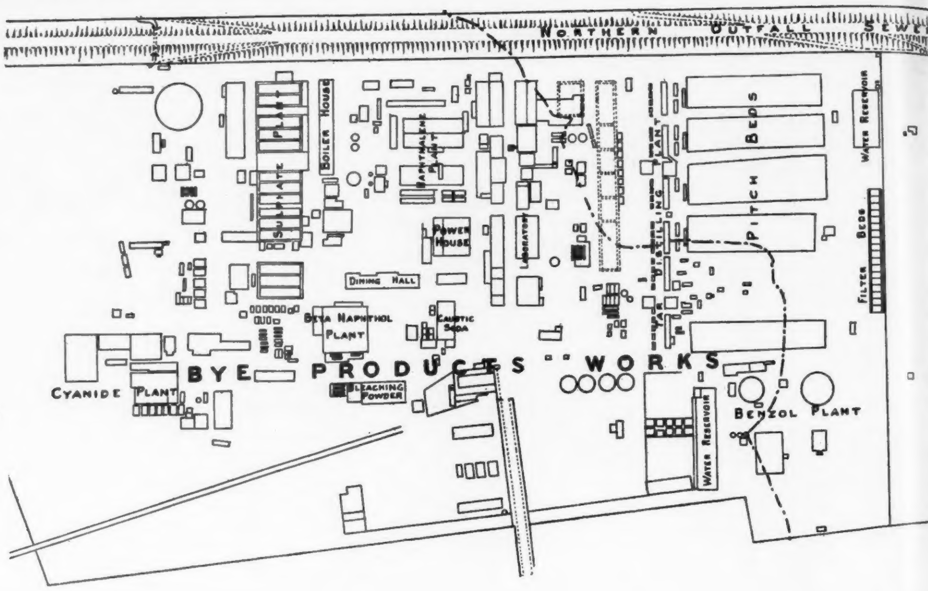


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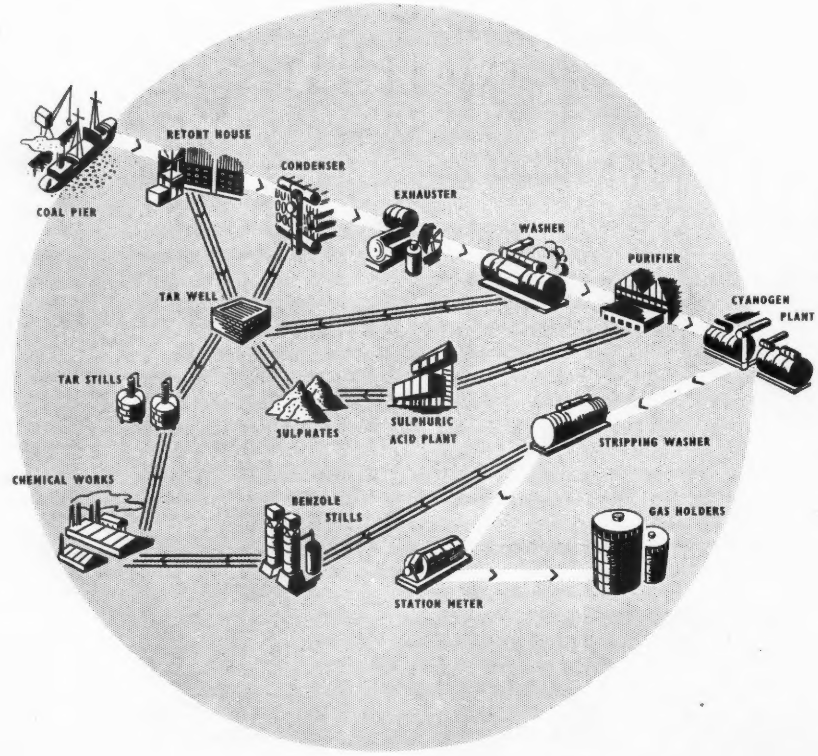

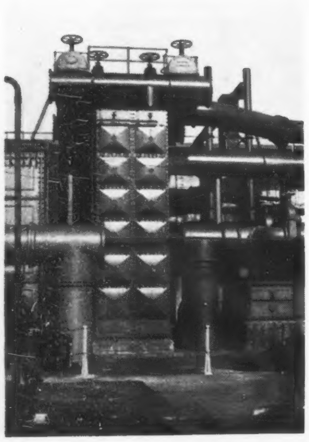
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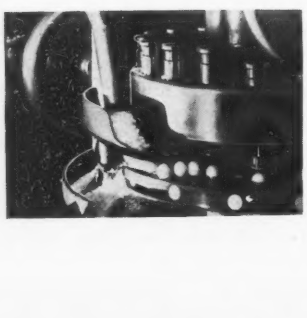
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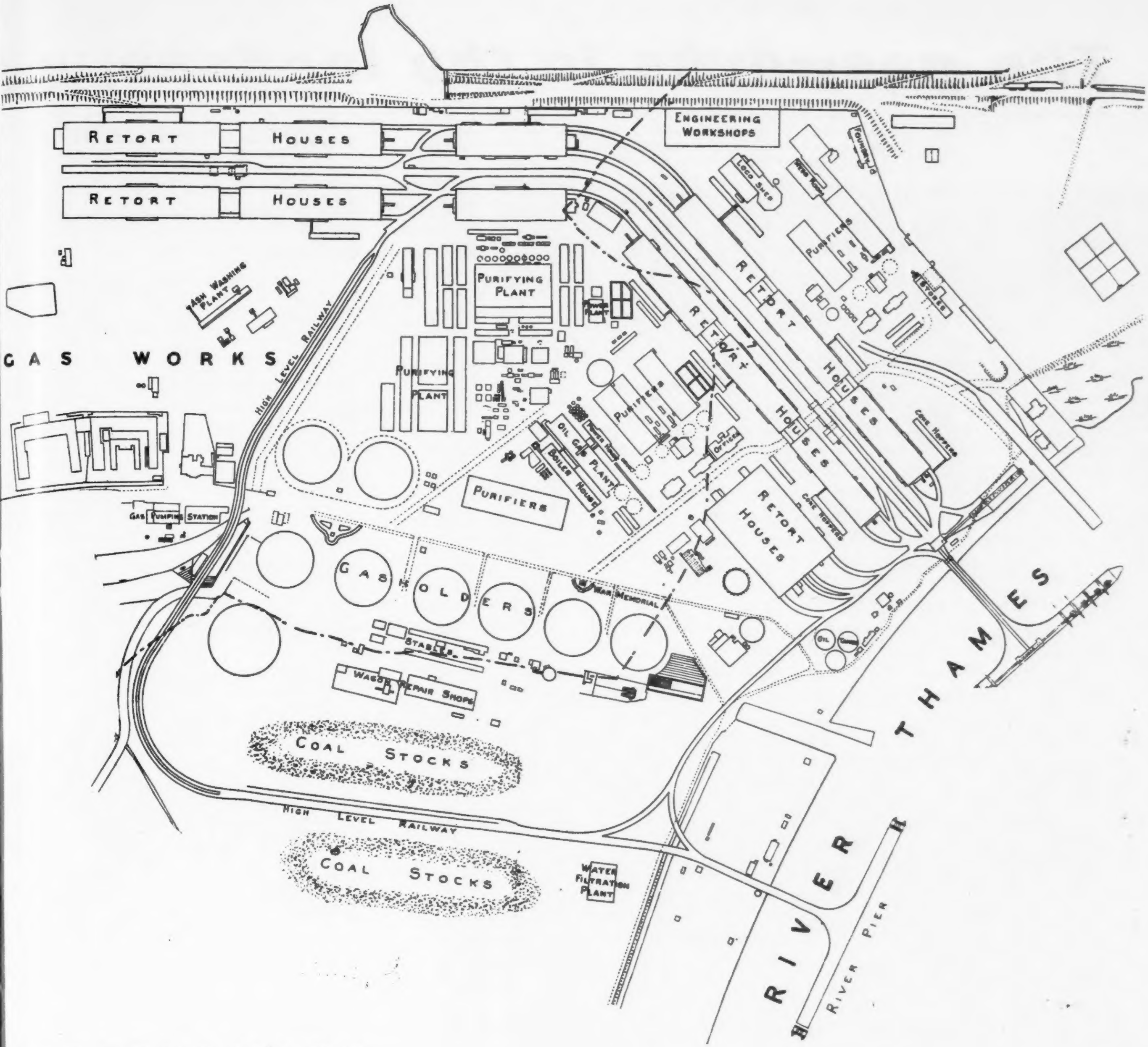
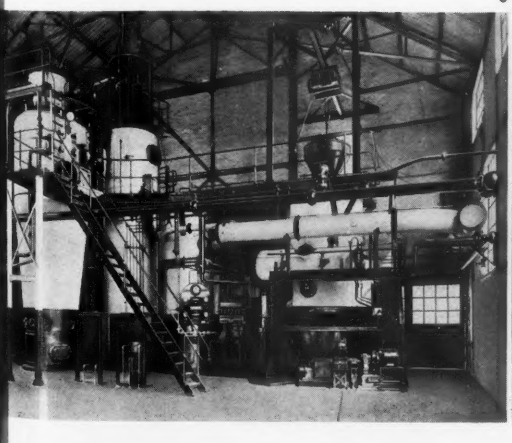


RETORT HOUSES
RETORT HOUSES
ENGINEERING WORKSHOPS
GAS WORKS
HIGH LEVEL RAILWAY
PURIFYING PLANT
PURIFYING PLANT
PURIFIERS
PURIFIERS
PURIFIERS
RETORT HOUSES
RETORT HOUSES
RETORT HOUSES
RETORT HOUSES
OIL GAS PLANT
BOILER HOUSE
COKE HOPPERS
GAS PUMPING STATION
GASHOLDERS
WAR MEMORIAL
STABLES
WAGON REPAIR SHOPS
COAL STOCKS
COAL STOCKS
HIGH LEVEL RAILWAY
WATER FILTRATION PLANT
RIVER THAMES
RIVER PIER
SCALE 100 0 100 200 300 400 500 600 700 800 FEET

6



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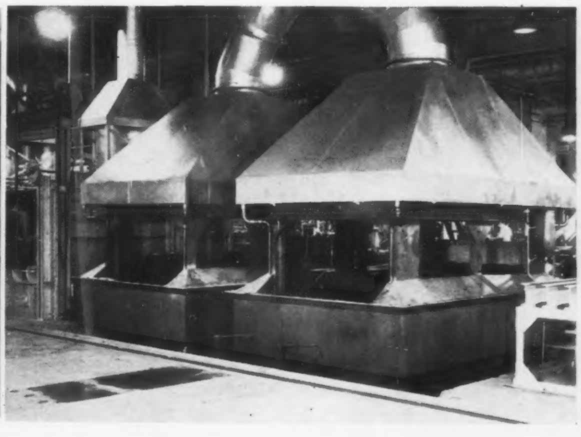

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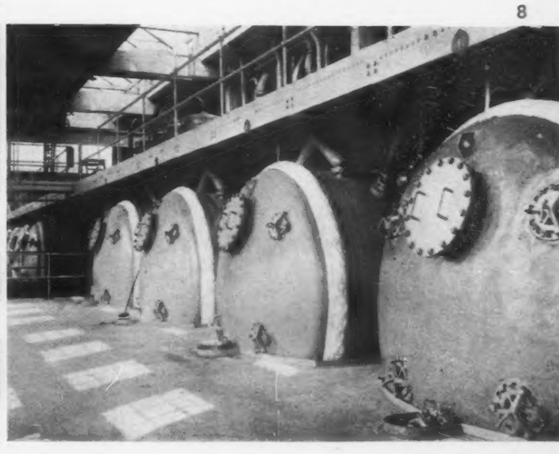


The gasworks in the landscape

M. HARTLAND THOMAS

The gasworks is considered to be an eyesore in any landscape, town or country. The gasholder is the especial object of dislike. Though this universal detestation of the gasworks is unreasonable, it must be admitted that the gasworks as commonly known to man does little to curry favour with him.

On approaching a gasworks, the first thing noticed is an all-pervading stink. Next, several enormous gasholders loom up over the roof-tops crowded in behind people's houses. One feels sorry for the people. Somewhere around behind one knows there is the usual devastation of coal dumps, ash dumps, chimneys and a confused jumble of construction in which works of structural and mechanical engineering jostle one another in a tangled mass. One feels sorry for the workers, especially the manager.

Such is the gasworks in the town. In a more open suburban or near-country site, all the same elements are there, but opened out a little. The stink is there, only fewer smell it because the houses are not quite so close. The gasholder is there, more of it visible. The jumble of ill-arranged construction is strung out so that we can get a really good view of it. The general untidiness, lack of what the Americans call " good house-keeping," is ever-present: perhaps the gas industry is not the chief or only offender in this respect. But there will be one difference: the management, realising what an unwelcome neighbour their gasworks must be, has tried to make some concession to " amenity " (that overworked and little understood word!) and has found an architect willing to dress up one flank of one of the constructions, which approximates to the scale and proportions of a straightforward building, with the familiar trappings of a Florentine palace or Gothic town hall. Or, perhaps, they have tried to plant out the gasholder with a row of poplars.

In all this we are confronted with a situation that is hardly tolerable. In spite of half-hearted attempts to put a better face on it by a little falsification and some concealment, the public is not mollified, the gasworks remains an offence to nose and eye, the gas engineer is shame-faced and the architect diverts his interest to more promising subjects. A revolution in our attitude to the gasworks is demanded.

There is no logical reason why the whole equipment of a gasworks, even the enormous containers—perhaps, especially these—should not be a thing of great beauty, an asset to any landscape. It is no good being half-hearted. We have had too much of *negative* amenities—"*preserving*" rural England, "*protecting*" ancient buildings, banishing a new power station to the wrong site because it hurts our feelings to view it at the same time as York Minster. Let us make the typical construction of our own age into *positive* amenities, as past ages did with their very utilitarian castles, markets, town halls, bridges, mills.

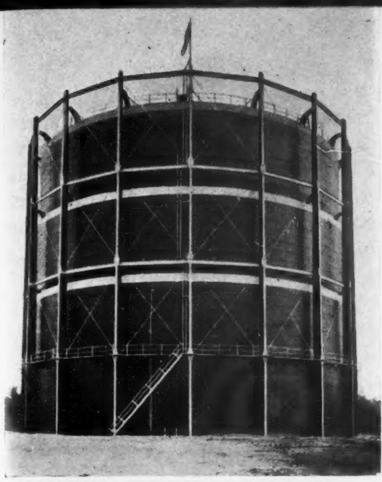
If our industrial constructions are to become again works of art, the indispensable motive for a work of art must be there—a strong emotion. We must be proud of them, excited about them, thrilled with their performance. Emotions like these made the great iron vaults of the railway stations and Brunel's bridges the only architecture worth having in the heyday of the Victorian age. Similar emotional drive creates the beauty of the aeroplane to-day. Beauty in public works cannot be imposed by a few specialists in beauty—artists, architects, industrial designers—for the field is too vast and too many workers are involved in a particular project. The scope is not confined to an easel picture, a single building or a radio cabinet whose form can be controlled by a single mind. We must show all the specialising engineers that they need not be shame-faced about their works, that the cult of beauty is a human activity from which a man is not debarred because he uses a slide-rule. But first of all we must reassure them that the public is keenly interested.

A sound reason for public interest is not far to seek in the case of the gasworks. Its importance to us all is hard to exaggerate. It must be clear to readers of the other contributions to this issue that in spite of the possibilities of water-power and oil, or rumours of atomic energy, coal remains our fundamental national asset and the utilisation of it in the gasworks is by far the best way of applying coal to many of our needs. For most of us coal is essential for the support of life on this island—four out of five of us could not live here but for coal. Coal is precious: we are beginning to realise just how precious now that we have endured several winters of difficulty in getting enough of it to heat our homes and offices. When we realise too that electricity is as wasteful a luxury as the present

A typical suburban gasworks

GASHOLDERS IN THE LANDSCAPE

1, a typical standard type gasholder. 2, a Swiss gasholder. 3, new style advertising on a gasholder. 4, an example of the latest type of telescopic gasholder. 5, gasholder at Southall. 6, an earlier type of gasholder, in which subdued architectural details are used in an attempt to domesticate new, unfamiliar forms. 7, four pressure holders at Reading; lack of courage has led to an attempt to screen them with a row of trees. 8, a high pressure gasholder.



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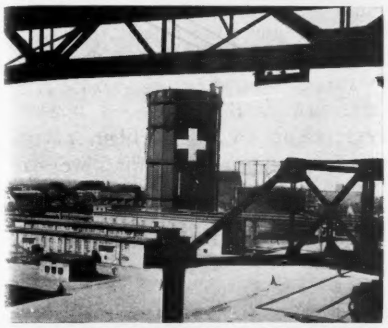

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open coal fire, that squandering coal in electric heating or in open fires means that we must shiver for half the winter and go short of all the other products, besides heat, that coal can give us, then we shall recognise the gasworks for what it is—one of our greatest material benefactors. For it offers us all the heat we want and all the other products of coal into the bargain. Public recognition of the gasworks can convert it from the dirty slut we have always known to the honoured mistress of the household.

But even given the will, the æsthetic problem is not an easy one. In previous ages buildings were the constructions of greatest size. The vessels and retorts and piping of early industrial production were easily dwarfed by neighbouring buildings. Moreover, the forms and proportions gradually developed through long ages in the construction of buildings exerted a dominant influence upon the scale and contours of all other things made by man—from the windmill and the oast-house to ships, coaches and waggons; down to storage vats of oak and leaden water tanks; and smaller things like furniture and crockery, not excluding the first pumping engines and early scientific instruments. Architecture was looked up to as the *mistress art* and the discipline of architectural composition pervaded all these things.

Architecture is not the mistress art to-day, although architects still occupy a position of high responsibility intermediate between the artist and the engineer. They are trained to understand the language of art and the language of science, and their task is to make these two streams of human activity flow together again.

In recent decades the development of architectural forms has been proceeding on lines that allow the forms of engineering construction to be assimilated again. Engineering forms ran out of hand for two reasons: first, because they grew so large—bunkers, pipe gantries, retorts and storage cylinders outmatched the neighbouring buildings in sheer size; and second, because the mechanical engineer learned new structural techniques and, no longer dependent as he used to be upon the building craftsman, saw no reason to submit his new construction to the age-old discipline of architectural form.

But now architecture has come half-way to meet him. Building is now using techniques of construction no less advanced than engineering. Architecture employs geometrical form in a freer manner. The long raking line of the coal conveyor, the convolutions of pipes on a gantry, the inverted pyramids of a hopper, the attenuated heights of the factory chimney itself, these are no longer impossible for an architect to handle except by the application of fancy-dress or concealment. The experiments in form of the abstract artist have opened our eyes to the visual possibilities of the shapes of modern things. If the engineers will play too, we can assemble all these errant shapes into compositions that will also bring out clearly their functional meaning.

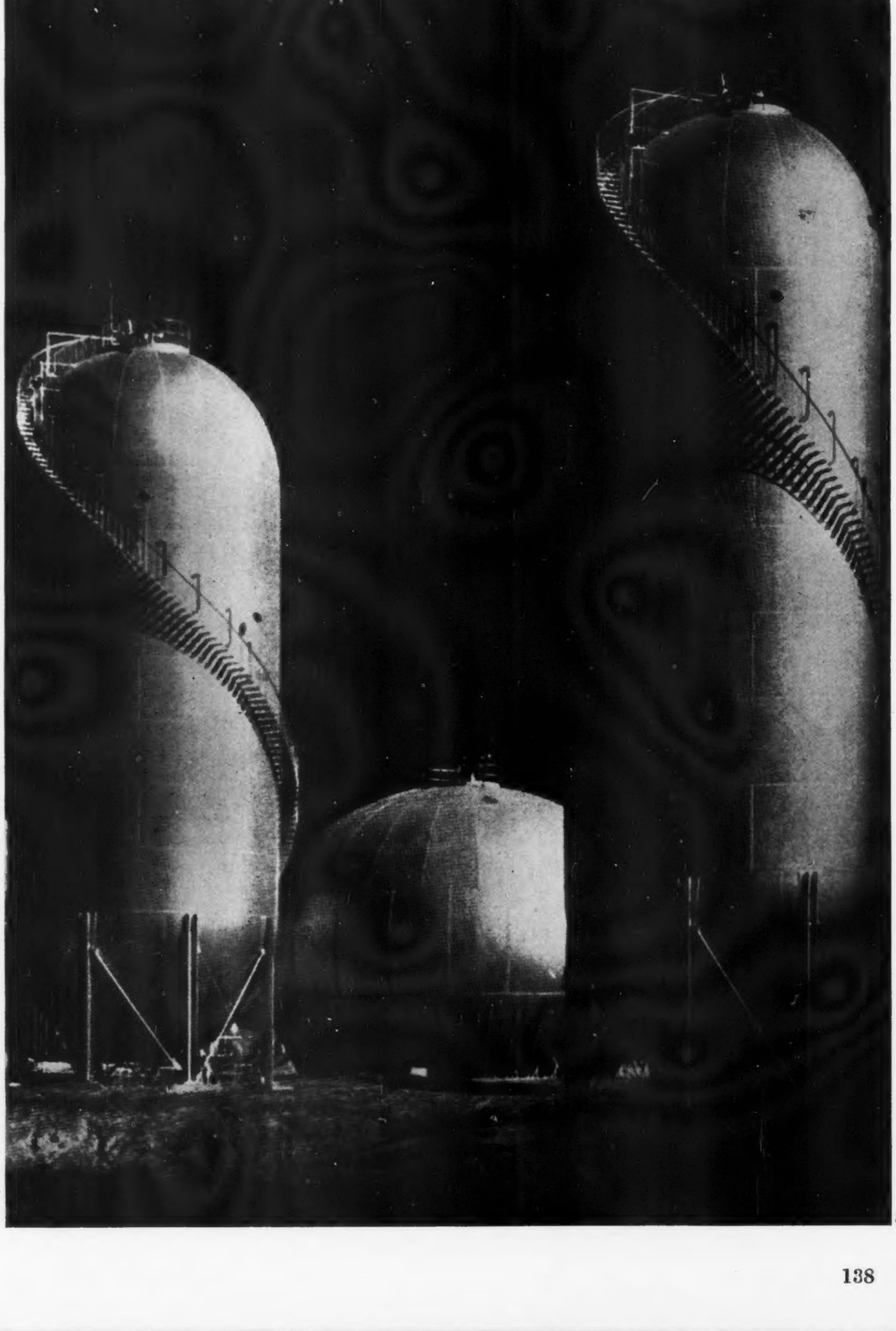
It is not merely a question of grouping the diverse objects of architecture and engineering with visual discretion—"*sharawaggi*" is not the whole story. There are two other elements. The first is folk art: the public must take a real interest and every worker however humble must play his part. And the other is the proper application of functional design, which does not mean and never has meant that what is efficient is thereby beautiful, but that it is not enough for an apparatus to work well: it should also look as if it did.

The answer, then, to the problem of the gasworks in the landscape is that we can if we will make it an asset and adornment to any landscape without misgiving or shamefacedness.

1, a classical meter house of 1889; *although it has great charm, it shows pathetically little perception of the architectural potentialities in building for gas.* 2, *a modern attempt at disguising some large storage tanks, a fantasy which fades into insignificance beside the fantasy of the real thing;* 3, *American steel alloy gas containers.*


1


2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The end of the smoke age

J. VARMING & ARCHITECTS CO-OPERATIVE PARTNERSHIP

Heavy atmospheric pollution occurs in most of the larger towns in this country, with consequent detriment to health and environment. Soot and dirt fall on certain dwelling quarters of Middlesbrough at the rate of more than 450 tons per square mile per annum. A great variety of technical means is now available to make new, as well as existing, towns smokeless, but the brevity of this article will only allow a few of these to be outlined.

Smoke, which is composed of a conglomeration of soot, ash and other dust particles, fumes (mainly acidic) and vapours (distillates), is produced in any burning process. The main sources of pollution are the open domestic coal fire and industrial plants. Coal (unless burnt efficiently) is one of the worst smoke producing fuels. Coke and smokeless fuels, which are by-products from the gasworks, burn without smoke, but produce fumes. Gas and oil give rise to little pollution of any kind.

We cannot, as a general policy, solve the smoke problem by installing oil-burners or gas boilers in individual houses; such an undertaking would involve heavy initial expenditure. The needs of the community as a whole must be considered.

Smoke can be prevented from reaching the atmosphere by filters, but these are of high cost and only practicable in large installations such as power stations, district heating stations, gasworks and industrial plants. Electrostatic filters are often used at power stations for final cleaning, but smoke washing is used to remove the bulk of the solid matter. The smoke washers are chambers in which the smoke is brought into contact with alkaline waters. This, in addition to removing the dust particles, absorbs and neutralizes acidic vapours. After passing through the washer the gases remaining are for all practical purposes clean, i.e., they consist of steam, carbon dioxide and residual air.

A smokeless town could be heated by (*a*) Electricity, (*b*) District Heating, (*c*) Gas, (*d*) Smokeless Fuels; or by a combination of these methods.

(*a*) Electricity is a convenient but extravagant fuel. The overall efficiency of a coal-burning power station, however modern, does not exceed 22 to 25 per cent., the remaining heat content of the coal being dissipated in smoke, condensers, auxiliary motors, etc. Electric thermal storage makes it possible to buy electricity at cheap rates at night and utilize the energy during the day, when the power stations carry their maximum load. Although the load on the power station would then become more equalized, the rates of charge, no longer being off peak, would inevitably rise. Heating by electricity (produced from coal) is an uneconomical way of utilizing the natural resources of this country.

In certain cases the unfavourable thermal efficiency of electricity production can be offset by the heat pump. All matter with a temperature above absolute zero (minus 273°C.) contains heat energy, and the object of the heat pump is to raise such energy to a temperature level at which it can serve a useful purpose. In principle the heat pump is equivalent to a reversed power station (see fig. 1, below).

In the case of the power station Q_T is the fuel used, Q_E is the electricity produced and Q_C is the waste heat produced in the condenser. In the heat pump Q_T is the energy produced, Q_E the expensive source of energy (electric), and Q_C the cheap source of energy (river, air or water). The heat pump is only economical when the difference between the temperature at Q_T and Q_C is relatively small, and a temperature of about 110°F. in the heating system is all that can be expected. The use of a heat pump from a national economic point of view is only justified where hydro-electric power is available, or when waste heat is present in abundance. Electricity, therefore, with or without the aid of the heat pump, is not generally suitable for heating towns in this country.

(*b*) District heating is a system in which heat is generated at a central station and transmitted to buildings over a large area through underground pipes. The design for a distributing system should be based on a survey of a variety of factors, such as: the density and rate of population increase in different parts of the town; the position and classification of business and industrial areas, power stations, gasworks, etc.; present and future steam and power consumption of factories; the topographical and geological properties; and, in existing towns, a survey of the numerous and often half-forgotten street mains. The heating stations can be based either on heat production alone or on combined heat and electricity production. The first method is extensively used in the U.S.A., but in Europe is considered suitable only for small layouts. The combined power and district heating station has been developed to such an extent on the Continent that the other method is only considered if combination with electricity production is impossible.

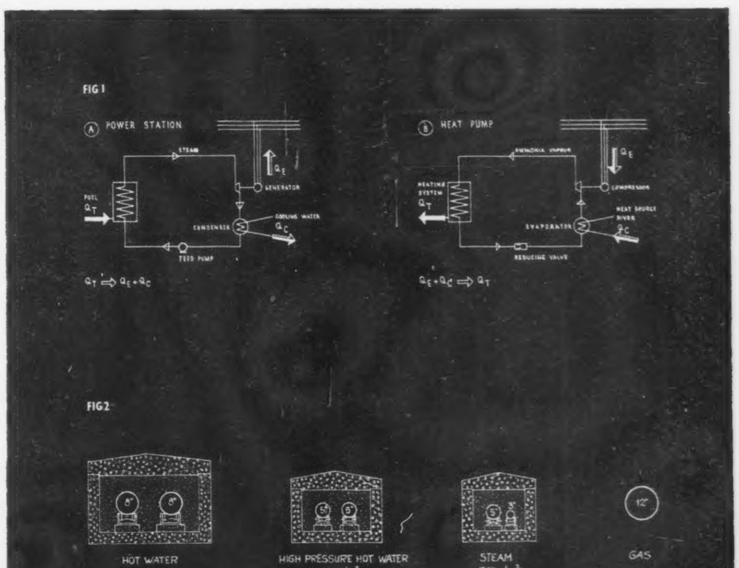
The greatest problem of the combined station arises from the difference in time of the heat and electricity peak loads, and for this reason the aid of the back pressure turbine is limited. At a large combined station the difference may be met by a combination of back pressure and condensation turbines. If the back pressure plant produces all the power in winter and none in summer, the efficiency of the station varies correspondingly from 90 per cent. to 22 per cent. Another remedy is found in the installation of heat accumulators, which are well-insulated high-pressure storage tanks, receiving steam from back pressure turbines and storing it at a pressure level higher than the working pressure of the district heating system.

District heating mains are constructed to carry low-pressure hot water, high-pressure hot water or high-pressure steam. Fig. 2 shows the space required for ducts carrying the same load, but with different distribution media. Low-pressure hot water is suitable for relatively small layouts, and is normally used with ordinary central heating boilers. High-pressure hot water is extensively used in large layouts, the advantage over steam being the lack of steam traps and drains. The generating station for this system is slightly more complicated than with the steam plant, but the running costs are lower, since there is no loss through condensate removal.

One of the most important considerations in the planning of district heating systems is the choice of metering, or the method of sale. For hot water systems suitable meters are available, but they are rather expensive and only economical to install in fairly large buildings. In small systems radiator-meters can be employed; these are used extensively in the Scandinavian countries. They work on the principle of evaporation, and while their accuracy is not very great, they are generally accepted as a means of determining the amounts due from the various tenants of a building. The main advantage of these meters is that they are fairly cheap; and with metering householders can economize by regulating their own consumption. It has been found that the fuel consumption in a block of flats is reduced by about 33 per cent. when radiator-meters are fitted. For district heating systems based on steam the consumption is easily estimated from the amount of condensate.

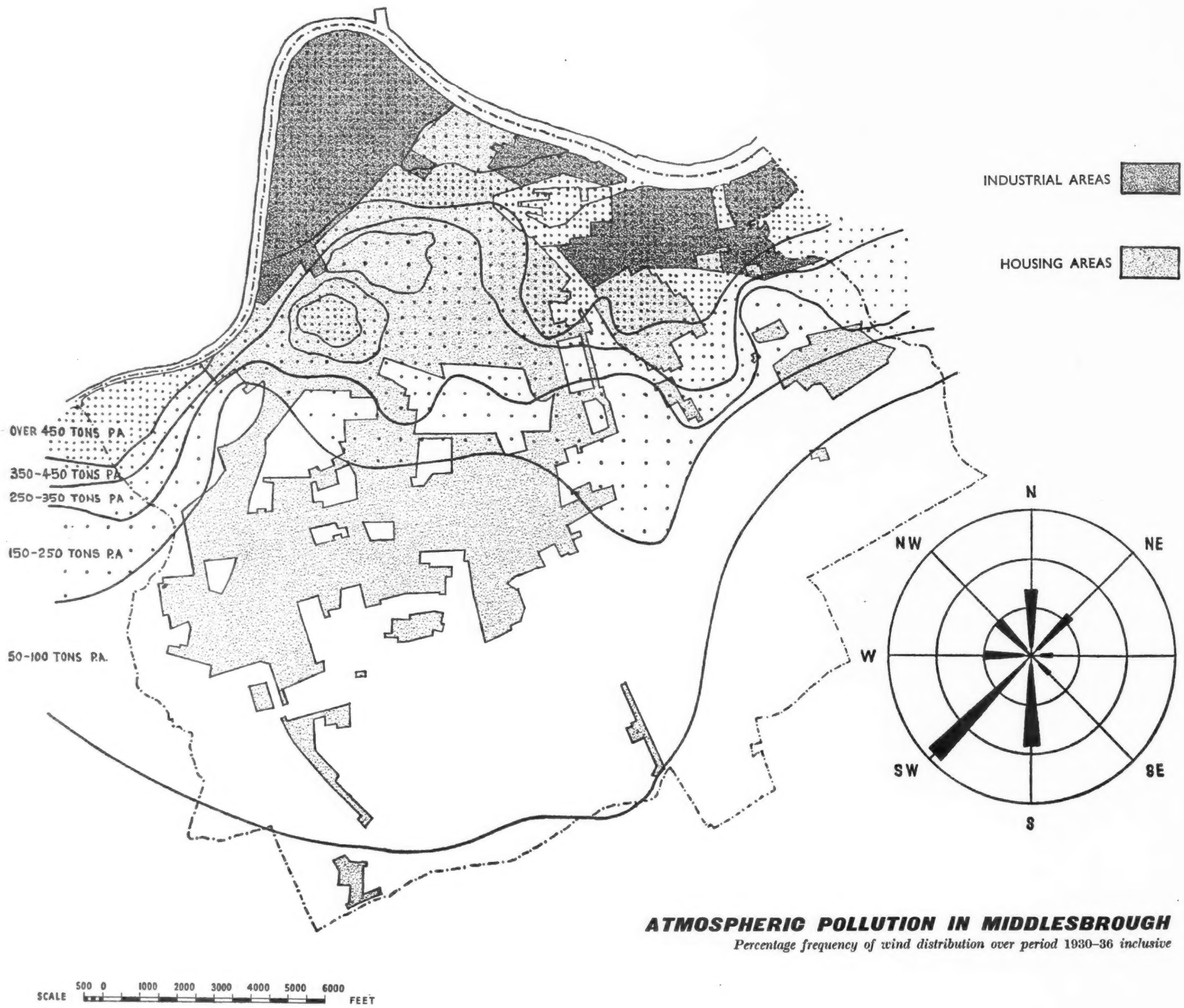
(*c*) Gas. A gas street main of capacity similar to the district heating ducts is shown in fig. 2, below. Obviously this cast-iron main is cheaper than the district heating mains; furthermore, gas boilers have a very high efficiency (85 per cent.). Gas is easy to meter, easy to handle and altogether an excellent fuel with no solid content and very little acid fume in the smoke. It is, therefore, a worthy competitor to the district heating systems.

Up to a point, the larger the gas-



works the greater the efficiency and the more plentiful the saleable by-products. Large modern gasworks would not be economic in all towns in this country, but in many cases a high-pressure gas grid could be established and fed from one or several large stations, including coke-ovens. In the case of Middlesbrough, the possibility of basing a large-scale heating scheme upon gas already exists. The town could be divided up into zones—commercial and housing—each furnished with a gas-burning district heating system. To cut down the initial cost, the capacity of these systems would be such that the boiler plant could be placed in the basement of one building in each group. A plan based on this principle could be carried out step by step and would not require the investment of large capital sums long before full benefit could be obtained from the system. Alternatively, in order to make use of existing gas mains where adequate, each building might have its own gas boiler.

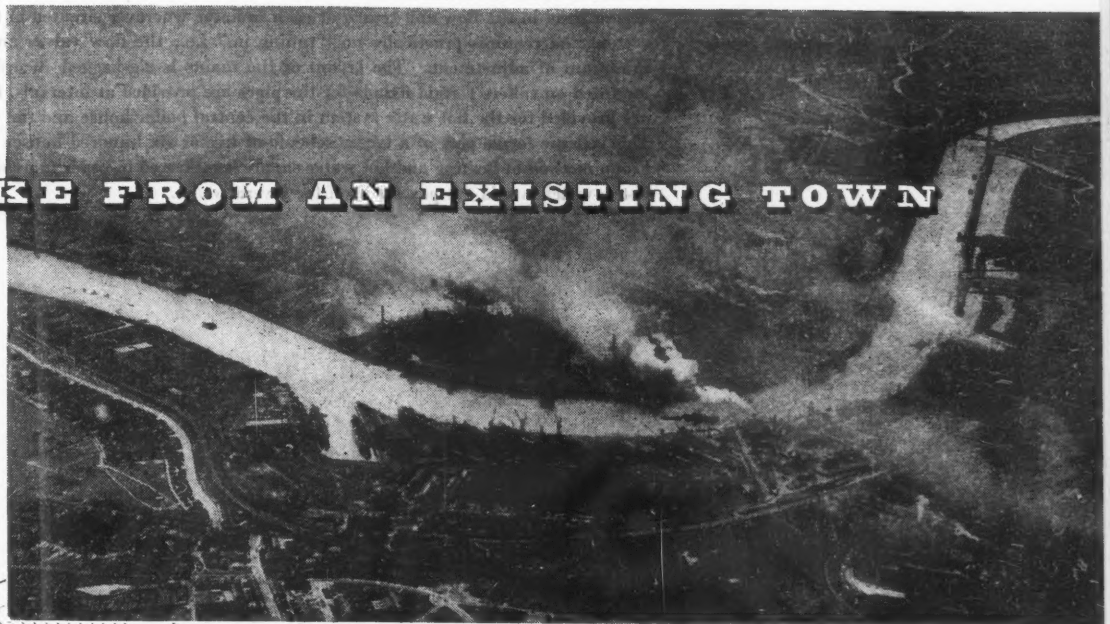
(*d*) Smokeless solid fuels, which form a very large and important proportion of the products of the gasworks, offer another solution to the smoke problem. The present system of heating in houses and flats necessitates the distribution of small units of solid fuel to thousands of householders. This method requires transport, double or even triple handling of the fuel, the provision of storage space; and after all this, the fuel is not used very efficiently. For this reason solid fuels, whether smokeless or not, should preferably be used in large plants for greater ease of handling and efficiency. Special appliances are also available for the domestic user. The best case for using these is found in existing houses, which owing to design or age are not readily adapted to other means of heating.



ATMOSPHERIC POLLUTION IN MIDDLESBROUGH

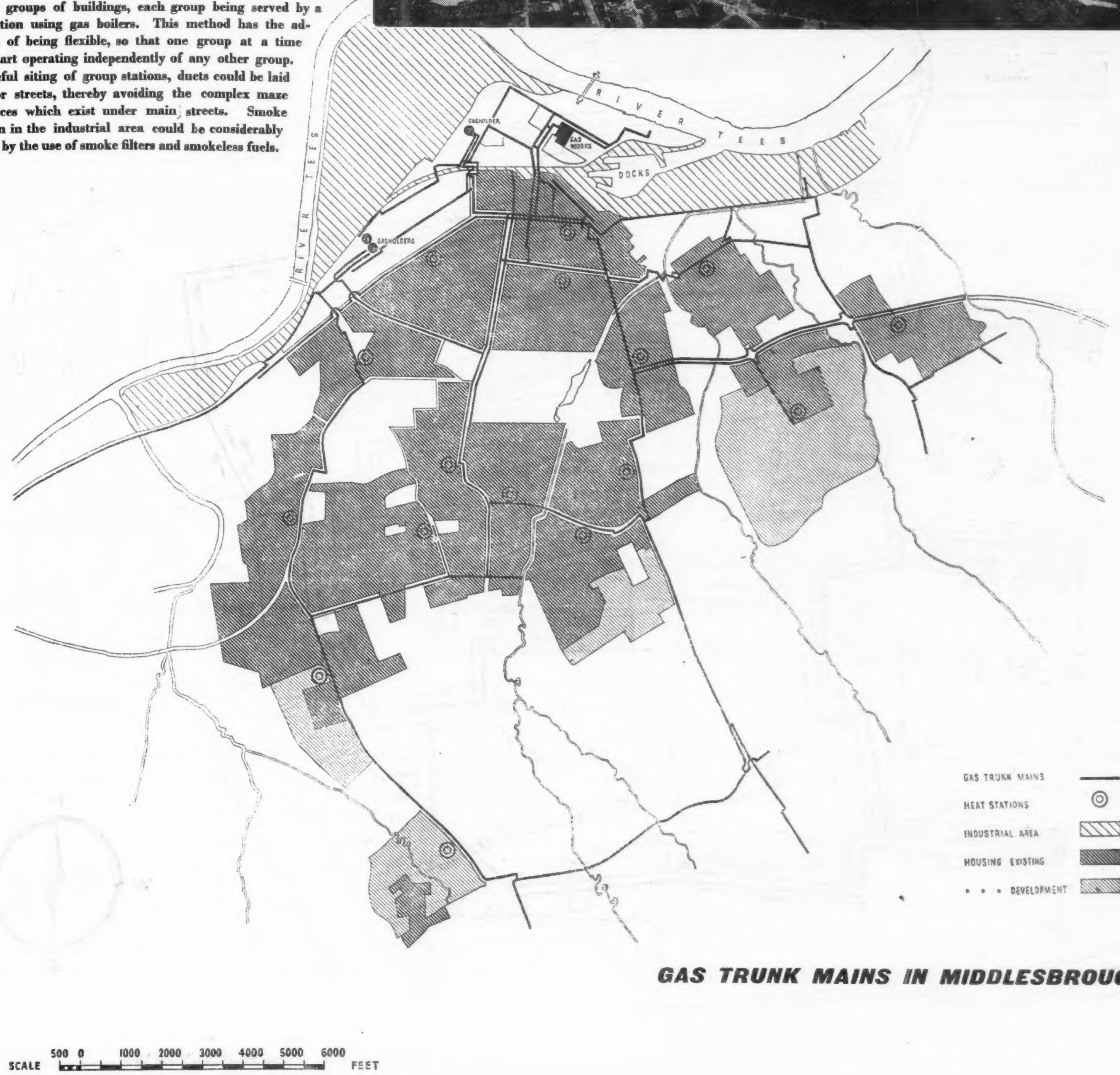
Percentage frequency of wind distribution over period 1930–36 inclusive

CLEANING SMOKE FROM AN EXISTING TOWN



MIDDLESBROUGH

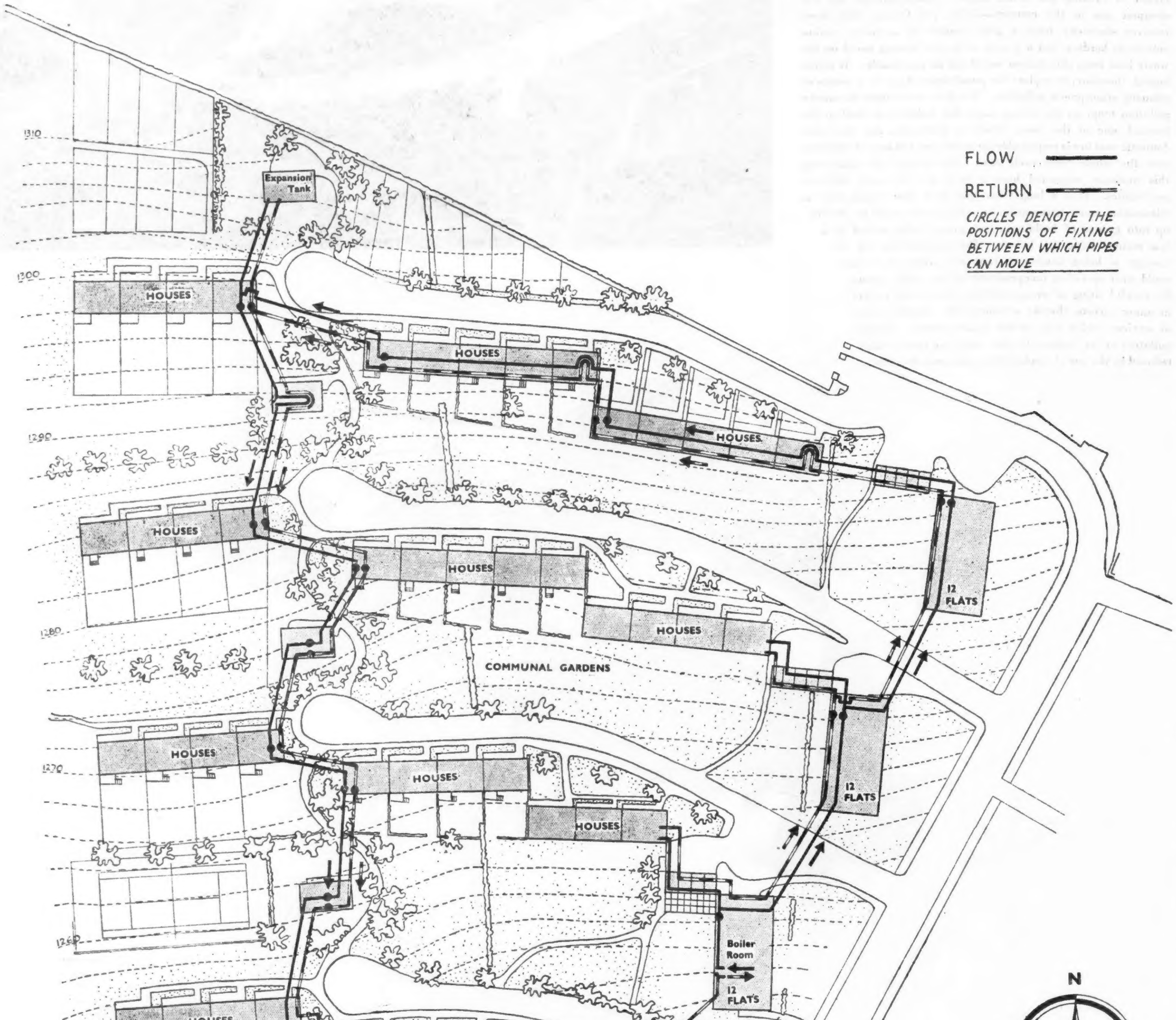
Below, a diagrammatic plan of Middlesbrough showing the layout of existing gas trunk mains. Middlesbrough has the cheapest gas in the country—5.22d. per therm. The town receives electricity from a grid supplied by a power station outside its borders, and a system of district heating based on the waste heat from this station would not be practicable. It seems logical, therefore, to explore the possibilities of gas as a means of reducing atmospheric pollution. It will be noted from the smoke pollution map, on the facing page, that industry is sited to the leeward side of the town, which is fortunate, but the open domestic coal fire is responsible for producing 150 tons of pollution over the whole town each year. The method of eliminating this nuisance suggested here is only one of many different possibilities. It is a long term plan as a plan which aims at elimination must necessarily be. The town could be divided up into groups of buildings, each group being served by a heat station using gas boilers. This method has the advantage of being flexible, so that one group at a time could start operating independently of any other group. By careful siting of group stations, ducts could be laid in minor streets, thereby avoiding the complex maze of services which exist under main streets. Smoke pollution in the industrial area could be considerably reduced by the use of smoke filters and smokeless fuels.



GAS TRUNK MAINS IN MIDDLESBROUGH

DISTRICT HEATING FOR A NEW HOUSING SC

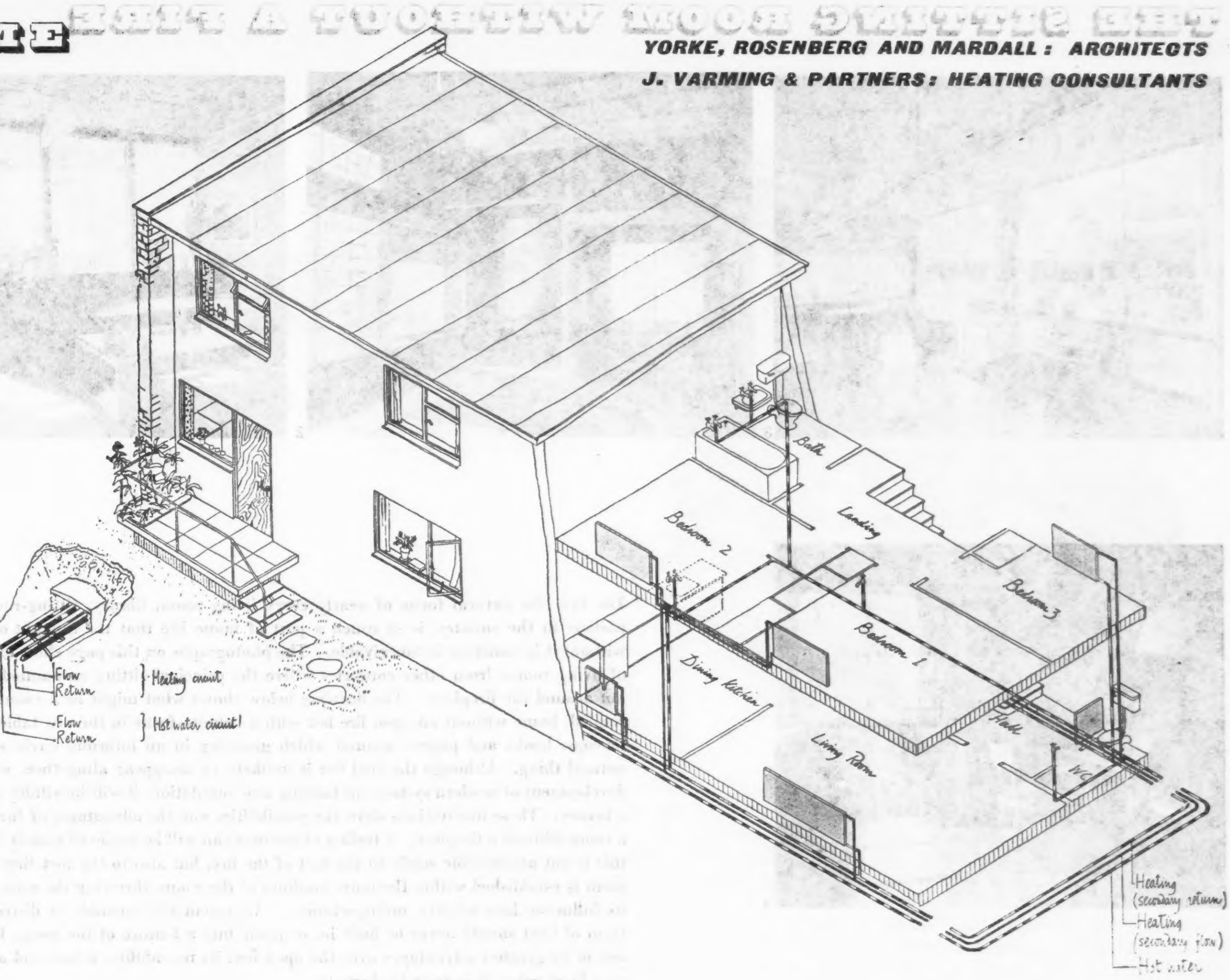
Below, the plan of a housing scheme in South Wales for industrial workers with group heating and hot water supply. The main boilers are housed in the basement of one block. The primary circuit (heating) is the ring system which gives a constant loss of head in the flow and return at each radiator wherever situated in the circuit. This method ensures a well-balanced system and requires practically no " tuning in," i.e., the flow valves and the return valves on the radiators require the minimum of adjustment. The layout of the mains is zig-zagged in order to take up expansion in the pipes, which are mounted on rollers ; rigid fixings for the pipes are provided at intervals, but between these the pipes can move. Calorifiers are provided for the hot water system in the central boiler house and the whole system is based on low pressure hot water. This scheme forms part of a larger scheme of five or six hundred houses to be built at a later date, group by group. The group method of heating and hot water supply is preferred in order to avoid too great an initial expenditure on a large boiler house which would not pay for itself for several years.

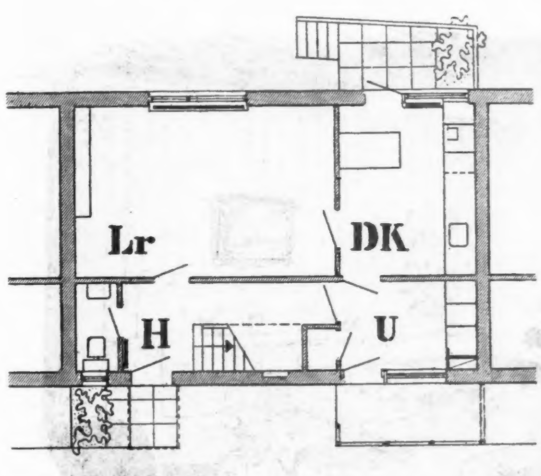


G SCHEME

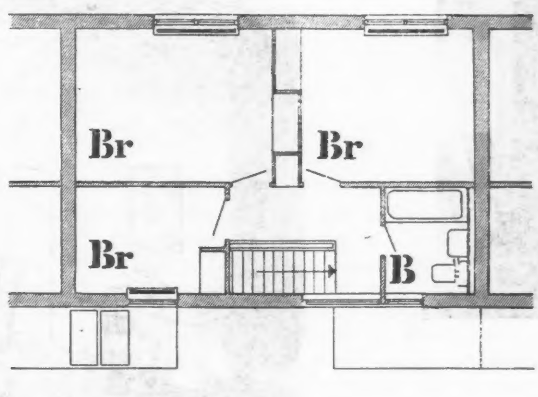
YORKE, ROSENBERG AND MARDALL : ARCHITECTS

J. VARMING & PARTNERS: HEATING CONSULTANTS





ground floor plan



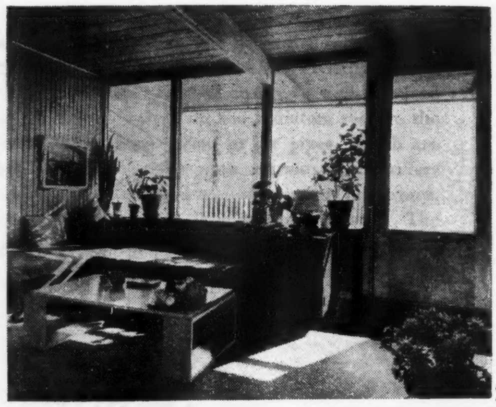
first floor plan

Top, an isometric drawing of a typical house in the scheme on the facing page with its system of heating and hot water distribution. Radiator-meters are fixed to each radiator and draw-off for hot water ; these meters are not very accurate, working as they do on the evaporation principle, but they serve to apportion the cost of heat and hot water equitably amongst the householders and are a deterrent to waste. There are no calorifiers in the house, one calorifier in the central boiler house being used. The heat loss through using calorifiers in each dwelling would be considerable, and their cost is fairly high. The houses are centrally heated throughout, thereby making the greatest use of the space available. It has been said that although, compared with standards in other civilised countries, the British home in summertime can be compared favourably with that of any other country, it is the smallest house in the world in the winter when only a few square feet in front of the open fire are usable. Only by methods such as complete central heating on a communal basis can full use be made of a house, the utmost fuel be conserved, and the smoke nuisance be eliminated. Other methods, which involve the use of additional appliances to top-up the heat, are a compromise.

THE SITTING ROOM WITHOUT A FIRE


3


2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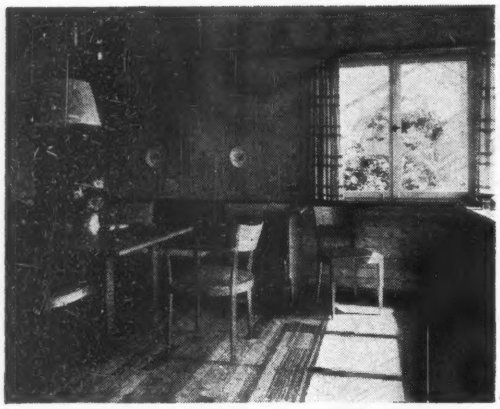
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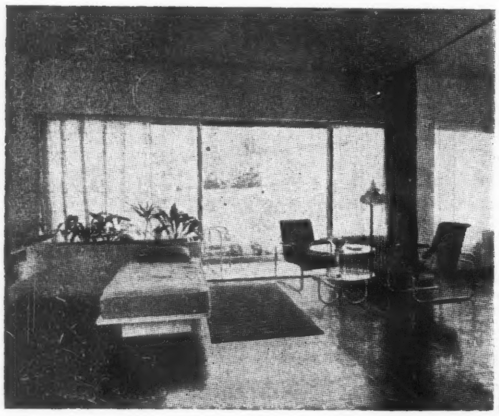
The fire, the natural focus of nearly every living room, library, sitting-room and parlour in the country, is so much a part of home life that the thought of being without it is somehow inconceivable. The photographs on this page show examples of living rooms from other countries where the principal sitting accommodation is not around the fireplace. The drawing below shows what might be a room in any English home without an open fire but with a definite focus in the low table taking teacups, books and papers, around which grouping in an informal circle seems a natural thing. Although the coal fire is unlikely to disappear altogether, with the development of modern systems of heating and ventilation, it will inevitably become a luxury. These illustrations show the possibilities and the advantages of furnishing a room without a fireplace. A feeling of cosiness can still be achieved mainly because this is not attributable solely to the fact of the fire, but also to the fact that a focal point is established within the outer confines of the room, throwing the area outside its influence into relative unimportance. An essentially movable or distributable form of heat should never be built in, or made into a feature of the room, for then one of its greatest advantages over the open fire, its movability, is lost and anyway, as a focal point, it is quite inadequate.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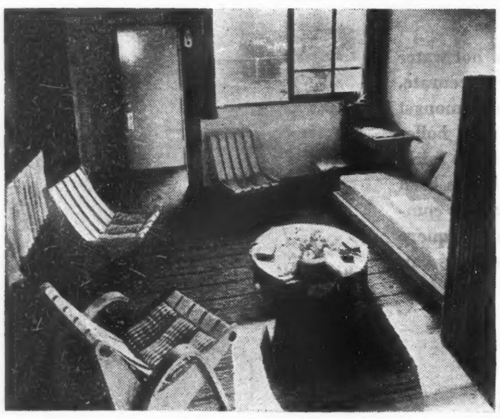
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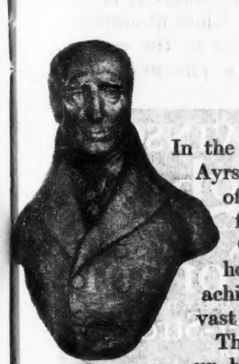
1, living room at Englewood, Colorado; L. Hornbein, architect. 2, living room in a Japanese house. 3, living room in the Maison Savoye at Poissy; Le Corbusier, architect. 4, living room in a house at Stuttgart; H. Volkart and P. Trodingen, architects. 5, living room in a house in France; André Lurçat, architect. 6, living room in a house at Los Angeles; R. J. Neutra, architect.

THE PAST

OF THE GAS INDUSTRY

by Compton Mackenzie



William Murdoch

In the year 1792 William Murdoch, an Ayrshire man representing the interests of the great Birmingham engineering firm of Messrs. Boulton & Watt in Cornwall, lighted his office and little house in Redruth with gas, and this achievement is the corner-stone of that vast edifice we call the Gas Industry.

The gas with which Murdoch lighted up his house and office was generated in an iron retort in the back yard and conveyed into the house by a pipe which passed through a hole in the frame of a window and led up to a point near the ceiling above the table. Later on he led it elsewhere about the house by means of tubes, which were lighted at apertures placed here and there. By 1794 Murdoch considered that his system of lighting was ripe for development, and he urged Boulton & Watt to take out a patent for what he believed would be a most lucrative invention. Boulton & Watt were too much worried by lawsuits over various of Watt's patents to welcome fresh adventures, and no patent was taken out. Four years later James Watt retired from the business. Boulton was no longer active. The sons of the original partners were more appreciative of Murdoch's ideas, and one of the departments in the big new works built at Soho was devoted to the manufacture of gas-making plant. In 1802 the first public exhibition of gas lighting was given when the Soho works were illuminated to celebrate the ill-fated Peace of Amiens.

In 1803 Murdoch erected a plant for supplying the whole of the Soho works with gas, and inquiries began to come in about the new light. The first business man to adopt it after Murdoch was George Lee of the firm of Phillips & Lee, cotton spinners of Manchester. In 1804 Murdoch installed gas apparatus to light George Lee's house from kitchen to drawing-room, with such success that in 1805 it was decided to light up what was probably the largest factory in the country at the time. This undertaking was finished by the autumn of 1807.

Murdoch was requested by the Royal Society to prepare a paper on his invention, and this was read to the Society on February 25, 1808, by the President, Sir Joseph Banks. Murdoch was rewarded with the Rumford Gold Medal. This was inscribed: "Ex Fumo dare Lucem. Presented to William Murdoch by the Royal Society of London in 1808 for a treatise on his application of illuminating properties of carburetted hydrogen gas for the purpose of furnishing a new and economical light."

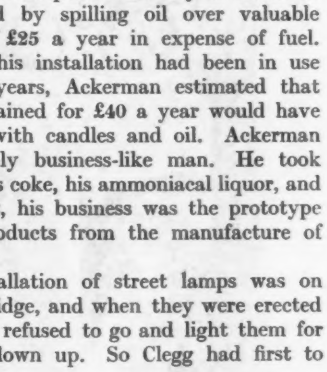
This medal of the Royal Society was intended to recognise Murdoch's claim to be the real inventor of gas lighting which was now being disputed by a Moravian called Winsor.

Winsor may have been a charlatan as an inventor, but he was a wonderful impresario, and he knew how to catch the public ear. On June 4, 1805, the first public exhibition of Mr. Winsor's gas lights took place in honour of His Majesty's birthday. Winsor had constructed two carbonising furnaces in his Pall Mall house and run from them a one-and-a-half inch pipe of tinned iron with soldered joints to the wall which separated the Mall in St. James's Park from Carlton House Gardens. To quote from the *Monthly Magazine*, "The inflammable gas, which is quite transparent or invisible, began to flow into the pipes soon after eight o'clock, and a lamplighter or person with a small wax taper (the evening being quite serene) appeared and lighted the gas issuing from each burner in succession. The light produced by these gas lamps was clear, bright and colourless, and from the success of this considerable experiment hopes may now be entertained that this long-talked-of mode of lighting our streets may at length be realised. The Mall continued crowded with spectators until nearly twelve o'clock, and they seemed much amused and delighted by this novel exhibition." By 1807 Winsor had offices where the Carlton Club now stands, and Pall Mall can claim that it was the first street in the world lighted by gas lamps.

There is still a third name of signal importance in the early history of gas to be recorded, and that is Samuel Clegg, who was born in Manchester in 1781, and after a good education was apprenticed to Boulton & Watt, where he had the advantage of working under what must have been the inspiring personality of William Murdoch. Clegg, wisely from the point of view of his own future renown, specialised from the start on gas, and he can be called the first of all the hundreds of gas engineers that succeeded him. It was Clegg who introduced the system of purifying gas by lime. It was Clegg who invented the first gas meter and the first self-acting governor. It was Clegg who adopted the principle of the Argand burner.

No doubt Clegg felt that his chance to make the most of his talents would not get full play at Boulton & Watt's, where gas apparatus was only a branch of the firm's engineering activities. Anyway, he came to London and installed gas for Ackerman, the famous Strand publisher. The success of Ackerman's experiment was a splendid advertisement for the new light, and it is interesting to note his estimate that the sixteen cockspur burners used by his printers instead of charcoal to heat their plates not only saved much expense incurred by spilling oil over valuable prints, but also £25 a year in expense of fuel. In 1815, when his installation had been in use for over three years, Ackerman estimated that the light he obtained for £40 a year would have cost him £350 with candles and oil. Ackerman was a thoroughly business-like man. He took care to sell off his coke, his ammoniacal liquor, and his tar. In fact, his business was the prototype of selling by-products from the manufacture of gas.

The first installation of street lamps was on Westminster Bridge, and when they were erected the lamplighters refused to go and light them for fear of being blown up. So Clegg had first to



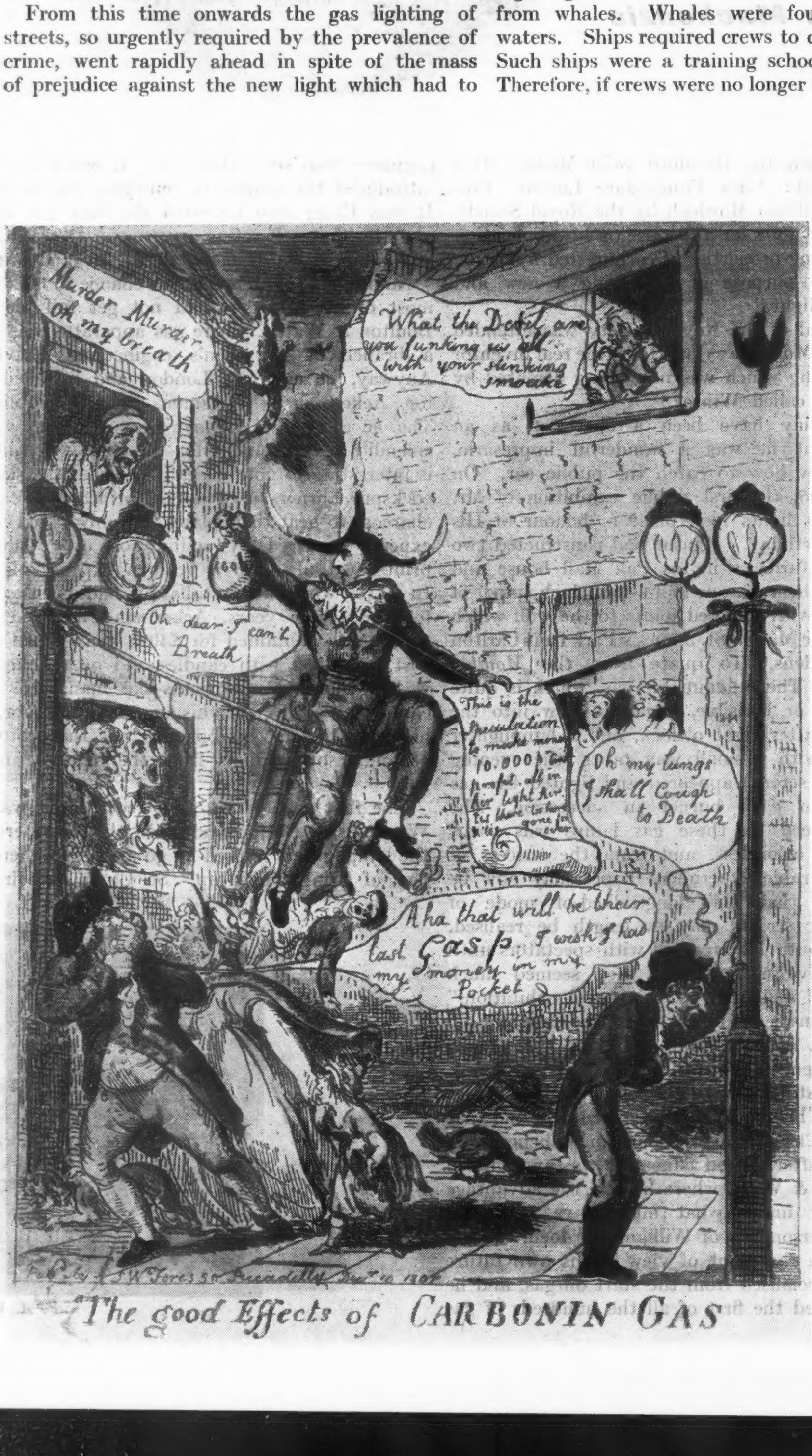
F. A. Winsor

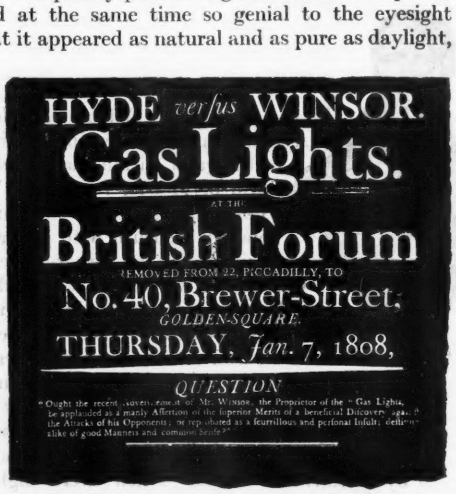
DEVELOPMENT OF THE GAS LAMP-STANDARD

demonstrate that they were harmless by going round with a ladder himself and lighting them. On April 1, 1814, the old oil lamps vanished from the parish of St. Margaret's, Westminster, and for the first time the streets of a whole parish were lighted by gas. At first the lamps were attached by brackets to the houses, and it was some time before the company could persuade the parish authorities to allow lamp columns to be erected. The first gasworks was erected in Great Peter Street, Westminster.

From this time onwards the gas lighting of streets, so urgently required by the prevalence of crime, went rapidly ahead in spite of the mass of prejudice against the new light which had to be overcome. The public could not get over its fear of explosions. One member of Parliament was much surprised to find that the pipes through which the gas flowed were not red hot. The coal owners set up a moan because they feared that the spread of gas to dwelling-houses and shops would affect their trade. Even the Admiralty was worried about the effect gas would have on the future of the British Navy. The logical process by which this apprehensiveness was reached is amusing. Light was obtained from oil. Oil was obtained from whales. Whales were found in deep sea waters. Ships required crews to catch the whales. Such ships were a training school for the Navy. Therefore, if crews were no longer required to catch whales, the seamanship of the Royal Navy would be seriously affected. It must be remembered that when the project of gas lighting was launched the country was still in the throes of the Napoleonic Wars and, therefore, suffering from the hysteria which war always induces. It is significant that with the arrival of peace gas lighting went rapidly ahead, helped by the advertisement given to it by the various illuminations demanded for the celebration of victory. The seal of approval was set over the banquet in a gas-lighted Guildhall, and the brilliance of the new lighting was praised as " completely penetrating the whole atmosphere, and at the same time so genial to the eyesight that it appeared as natural and as pure as daylight,

Left, right and below, three examples of the public reaction to gas in the first decade of the nineteenth century.




HYDE *versus* WINSOR.

Gas Lights.

AT THE

British Forum

REMOVED FROM 22, PICCADILLY, TO

No. 40, Brewer-Street,

GOLDEN-SQUARE.

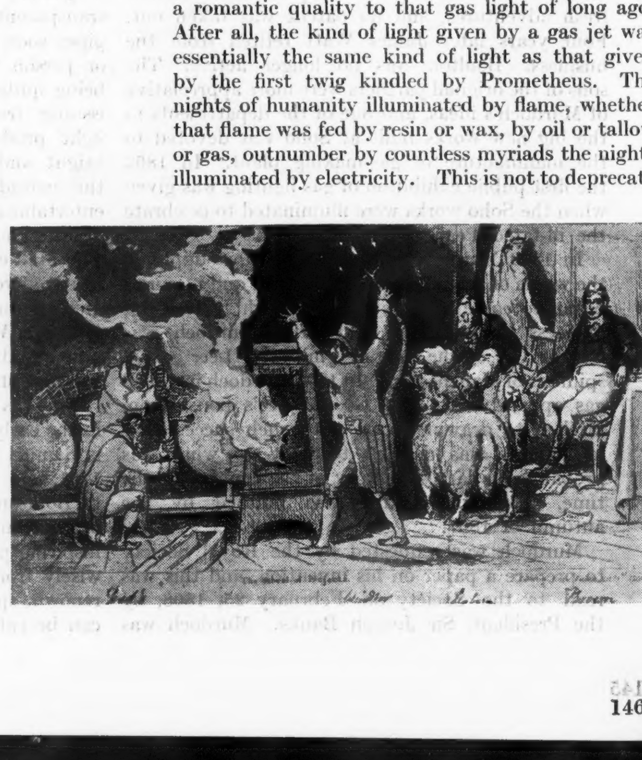
THURSDAY, *Jan.* 7, 1808,

QUESTION

" Ought the recent [illegible] of Mr. WINSOR, the Proprietor of the " Gas Lights, be applauded as a manly Affertion of the fuperior Merits of a beneficial Difcovery againft the Attacks of his Opponents; or reprobated as a fcurrillous and perfonal Infult; [illegible] alike of good Manners and common Senfe?"

shedding a warmth as purifying to the air as it was cheering to the spirits."

That may sound an extravagant description to-day, and yet those of us old enough to remember the effect of gas light before the introduction of the incandescent mantle cannot help attributing a romantic quality to that gas light of long ago. After all, the kind of light given by a gas jet was essentially the same kind of light as that given by the first twig kindled by Prometheus. The nights of humanity illuminated by flame, whether that flame was fed by resin or wax, by oil or tallow or gas, outnumber by countless myriads the nights illuminated by electricity. This is not to deprecate



Above, early gas lamp-standards in the streets before the Royal Exchange.

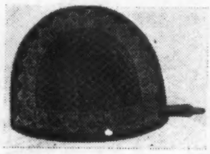
LAMP-STANDARD BAROQUE
an example of 1890 in Trafalgar Square

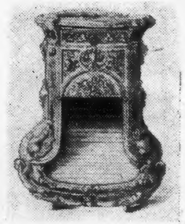
electric light, but when the first fizzing arc lamps shed their displeasing incandescence, the sickly whiteness of which was not relieved but faintly stained by lavender, the streets of London lost something. Children, too, lost something when the lamplighter's figure was no longer seen in the dusk and when one by one the street lamps came out like stars. As for the stage, it has hardly yet recovered from the disastrous effect on acting which the substitution of electricity for gas caused. The illusion of the old theatre will probably never be recaptured, and without doubt one of the chief contributory causes to that illusion was the golden light in which the stage was bathed. So I cannot bring myself to laugh at the enthusiasm of the reporter whose description of the Guildhall on that Lord Mayor's Day in 1815 is quoted above.

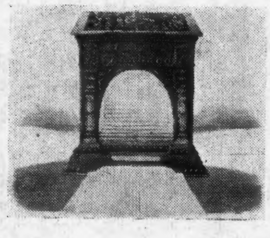
One of Clegg's greatest difficulties was to persuade everybody that the large cylindrical gasholder which he had invented was not a menace to the community. Even to this day some people believe that gasholders are liable at any moment to explode like paper bags. I merely remind my readers that ever since Clegg erected his first cylindrical gasholder no gasholder in this country has exploded. The original ones he erected for the Chartered Company were covered with buildings, and when in 1819 he erected uncovered gasholders in Birmingham and Chester, even expert opinion was convinced that they were at the mercy of any passing thunderstorm. The only real menace gasholders offered was to the surrounding architecture or landscape; but mercifully, the nature of gas involved placing the holders in the lowest part of any city or town, and thus secured for them a comparative inconspicuousness.

The insurance companies might oppose the erection of uncovered gasholders, but that did not prevent gas from going ahead, and within twenty years from the first charter granted to the Gas

THE GAS FIRE IN THE SEVENTIES







Light and Coke Company there were nearly a hundred statutory gas companies established by Act of Parliament and as many more private companies.

Cut-throat competition among the various coal-gas companies was persistent. During the 'forties Oxford Street and Tottenham Court Road were supplied by four different companies and from five distinct stations. As late as 1857, half a century after the first gas-lighted street lamps were erected by Winsor in Pall Mall, there were eighty gas joints and treble sets of mains in a sixteen-yard frontage in Cockspur Street.

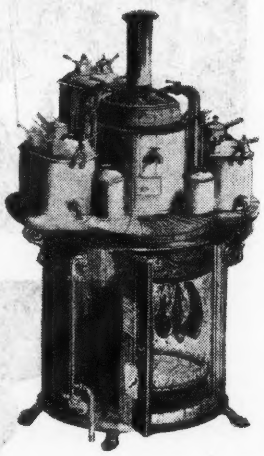
At that time the Gas Light and Coke Company was one of several undertakings which together supplied the requirements of Londoners, but before long it would be compelled to cease the manufacture of gas in small and obsolete works in the crowded environs of the City.

At first, plans were made to build a new works in the Hackney Marshes, but Parliament refused to sanction the manufacture of gas so near Victoria Park. As it was necessary to go farther afield, a site where coal could be most cheaply received was desirable, and in 1867 a huge area of marsh land was acquired at East Ham, more than six miles from the nearest point of the company's area of supply. The land was cheap, indeed to men of less vision it might well have seemed valueless, but it fronted on to the river at a point where seagoing vessels could be received and coal could be obtained direct from the north with none of the expenses of cartage on land or transhipment to barge. It was clear that if the capacity of the works were sufficiently great and the cost of manufacture sufficiently low, the company could offer to supply its neighbours at a price cheaper than the cost of their own manufacture. It required courage to take the decision to act on this reasoning, but the new works were planned to give a capacity that far exceeded that of any other gasworks ever built.

In 1868, a year after the purchase of the new site, Parliament decided that if the three companies supplying the City of London could come to no agreement to improve the supply, ownership by the Corporation might provide the solution.

With the threat of expropriation hanging over them the three companies, the Gas Light, the City of London Company, and the Great Central Company—the last named a consumers' company, or species of co-operative society—came to a working agreement, which was followed, in 1870, by complete amalgamation. In that year the new works, named Beckton in honour of the Governor, Simon Adams Beck, were opened, and contrary to the expectations of a great body of technical opinion, the gas flowed safely and without hindrance into London.

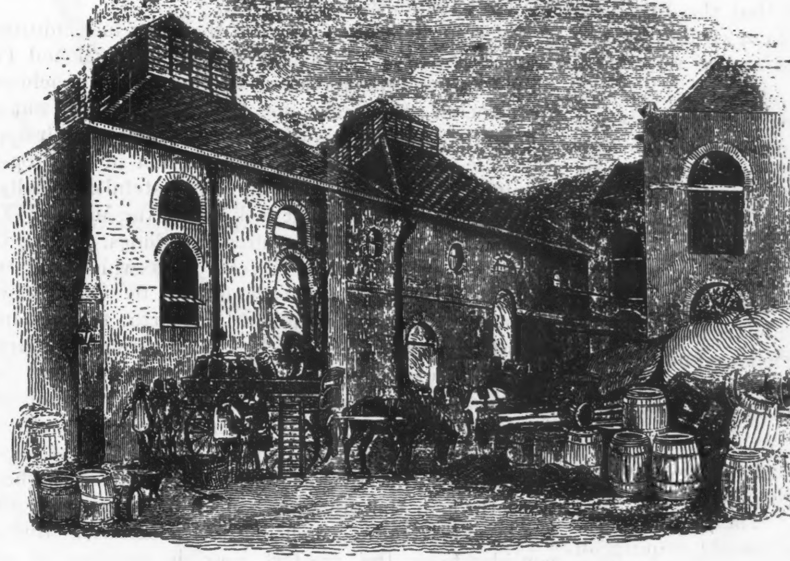
The idea of using gas for heating rooms goes back to 1833, when a patent was granted for a stove in which gas was burnt inside a series of tubes while the air to be heated flowed over the outside. By 1850 there were a fair number of gas fires in use consisting of lumps of pumice placed like coal in a grate and heated by a gas burner beneath the bars. The use of asbestos fibre was patented in 1856, and the invention of the Bunsen burner in 1855 was a great advance on convenience. The hollow ball fuel for gas fires was introduced in 1880. It is the fashion nowadays



Sharp's gas-cooking apparatus shown in operation at the special exhibition of the Gasfitters' Association, 1851.

Left, charging retorts at Beckton, 1878.

1, one of the earliest gasworks at Horseferry Road, Westminster. 2, a gasworks of 1820 on the Grand Union Canal near Regent's Park. 3, the Kensal Green Gasworks 1880 at Ladbroke Grove. 4, a gasworks completed in 1946 at Lincoln.



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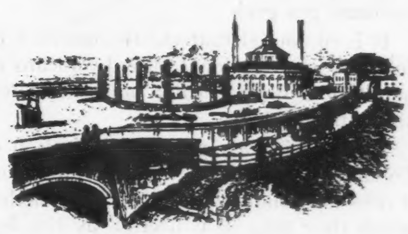

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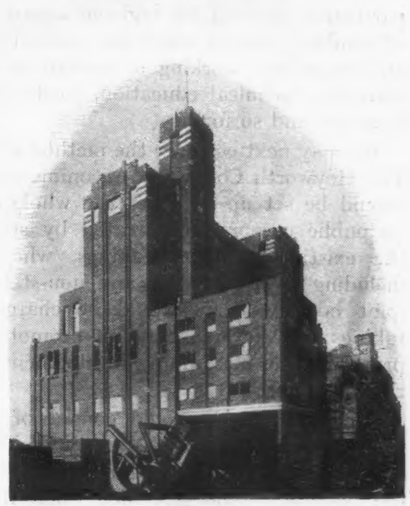

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to call those old gas fires smelly and dirty and stuffy, and I dare say they were. So many of my childish dreams were encouraged by those old gas fires that I cannot help regarding them with sentimental affection. They did provide those pictures in the fire which the empanelled and much more efficient gas fires of to-day cannot display. No fiery forests or deep glowing caverns are discoverable in their shallow trimness by the most imaginative child.

So much for gas in the past. I have had to omit a great deal in that brief survey which I should have liked to include, but it is so much more important to realise what gas is than what gas was, and to appreciate what gas can do than what gas could do that I must not linger any longer in what inevitably seems at present so very much more than usual the agreeable past.

The future of the gas industry

WILLIAM A. ROBSON

Two strong currents of policy are flowing swiftly in the stream of public affairs. One is the nationalisation of the industries associated with fuel, power and transport. The other is the expansion of the social services, particularly health, housing, town and country planning, education and social security.

The gas industry occupies an important place among the industries destined for public ownership alongside coal, electricity, railways, civil aviation and road transport, with iron and steel hovering uneasily in the background. It will also have a part to play in regard to health, housing and planning.

It is easy to take all this for granted, yet there are some surprising features about the situation. Thirty or forty years ago the question of the municipal ownership of public utilities was one of the burning political controversies of the day. Bernard Shaw's *Commonsense of Municipal Trading* shows the importance attached to the subject by one of the most influential thinkers of our time, and the early Fabians were derisively called "gas and water Socialists" because they insistently advocated municipal ownership of gas, water, electricity and tramway services.

For many years it seemed almost certain that the trend of events would lead towards the complete municipal ownership of public utilities. Actually there has been a movement in the opposite direction during the past 25 years so far as gas is concerned, since the local authorities' share of the industry has fallen from 40 per cent. to about 35 per cent., measured in output. But far more important than that is the probability that the Government will transfer the industry to a series of public corporations. They have already announced their intention of placing it under public ownership.

The Government have not disclosed the nature of the proposals which they will submit to Parliament, but municipal ownership is ruled out on any rational view by reason of the obsolete system of local government areas and authorities. The boundaries of even the biggest towns are totally inadequate for many of the large scale services; and, as the Heyworth Committee pointed out, local patriotism often prevents municipal undertakings from co-operating with neighbouring undertakings in establishing joint schemes, even where they would be economically sound. Local authorities are often equally reluctant to extend their supplies to areas outside their own boundaries, especially where an initial loss would be incurred. Furthermore, many of the existing boroughs and urban districts are far too small and poor to provide efficient public utility services; and the county areas would be quite unsuitable for the purpose.

The Heyworth Committee contend that centralised operation of the gas industry would be equally unsound on the ground that there are no important problems which require to be dealt with on a national scale. " It is not economically possible for gas to be provided everywhere; a national grid is not practicable; nor can selling prices usefully be determined on a national basis." The Report therefore rejects centralisation as inappropriate.

Informed opinion is by no means unanimous in thinking that production and distribution of gas on a national scale may not be practicable in the not too remote future. Some critics feel that the Heyworth Committee was unduly conservative and timid in regarding regional organisation of the gas industry as the last word and in rejecting a national gas grid.

It is rumoured that the Government is proposing to organise the gas industry on a national basis by means of a National Gas Board, thus adopting a diametrically opposed view to the Heyworth Report on this vital matter.

In proposing a regional organisation of the industry the Heyworth Committee was, in the writer's opinion, adopting a wiser course, though it does not follow that the division of the country into 10 great regions which they propose is necessarily the best that can be devised. This particular demand for regional organisation is only part of a series of similar demands which have arisen from technicians, administrators and executives working in various fields, such as town and country planning, technical education, electricity distribution, main drainage, hospitals and so forth.

We may next consider the method of administering the gas industry. The Heyworth Committee recommends that 10 Regional Gas Boards should be set up to cover the whole of Britain. The Boards would be public corporations created by statute. They would acquire all the existing gas undertakings, whether municipal or commercial, including both statutory and non-statutory companies, and also the joint boards. They would be charged with managing the undertakings in their areas, and of promoting "on progressive commercial principles the maximum development of the Gas Industry within their Regions."

Each Gas Board would consist of a Chairman and six Directors to be appointed by the Minister of Fuel and Power after consulting a small Gas Personnel Advisory Panel. The Chairman and three of the Directors would give their whole time to the service of the Board. The latter would consist of the Chief Production Engineer, the Chief Distribution Engineer and the Director in charge of Sales and Service—a narrowly conceived triad which takes no account of labour management, public relations or research and development.

It will be seen that the Committee proposes to place the gas industry in a water-tight compartment which separates it on the one hand from the other fuel industries, and on the other from the municipal and social services. This type of approach is usually favoured by technicians, executives or politicians intent upon improving the organisation of a particular service or industry without regard to its wider implications. It enables the maximum degree of concentration and specialisation to be brought to bear on a given task. There are, however, serious disadvantages in setting up public bodies to administer only one service without regard to related functions. A great part of the confusion, despoliation and sporadic development in the London area is due to the existence of separate statutory organs such as the London Passenger Transport Board, the Metropolitan Water Board, the Port of London Authority and several others.

In the nineteenth century there were separate Boards of Guardians, School Boards, Boards of Health, Highway Authorities, Improvement Commissioners and so forth. The result was overlapping, extravagance and lack of co-ordination. If now we set up separate Regional Gas Boards, Electricity Boards, Hospital Boards, Traffic Commissioners, Planning Councils, etc., we shall be in danger of repeating these mistakes on a larger scale.

It may be argued that the public utilities have assumed such vast proportions that they transcend not only local government but also any form of all-purpose regional government which could be devised; and that it is, therefore, necessary to organise them independently by means of *ad hoc* Boards. I do not share this view, but in the absence of any attempt to deal with the regional problem in general terms, there is no other way of organising the gas industry on a regional basis. It cannot be too strongly emphasised, however, that an appointed Board is far less democratic than an elected local authority, and that to hand over municipal gas undertakings to politically irresponsible Gas Boards is a reactionary step from a political standpoint. If anyone thinks that the gas supply is a purely technical matter in which public opinion is not interested, he should remember the situation in London this winter.

If Regional Gas Boards are established (whether or not under the ægis of a National Gas Board), an immediate task will be to build bridges between them and the planning and housing authorities in their regions. This could be done either by appointing key men in those fields as part-time members of the Gas Boards or by providing for joint Committees.

The co-ordination of gas with the other fuel industries at the regional level is a matter which the Minister of Fuel and Power must bring about through the creation of appropriate machinery. We should, nevertheless, take care not to "co-ordinate" out of existence the competitive advantages of the several fuels in their appropriate spheres. The due encouragement of competition in its proper sphere and its elimination where it is economically wasteful or socially disadvantageous is by far the most difficult task before the Minister of Fuel and Power. Its successful discharge requires two things. First, the determination of price policies for the several fuels which will truly reflect their differential costs in the various uses to which they can be put by different classes of consumer. Hitherto, the gas industry has been placed at a great disadvantage in adjusting its charges to the cost of supply compared with both electricity and coal by the statutory methods of price regulation imposed by Parliament. Second, considerations of public health, amenity and the conservation and utilisation of our coal resources should rule out, or at least discourage, the use of certain fuels for specific purposes. Whether this should be done through the price mechanism or by positive methods of control is not a matter on which one can generalise. But apart from these considerations the greatest possible freedom of choice should be allowed to the consumer.

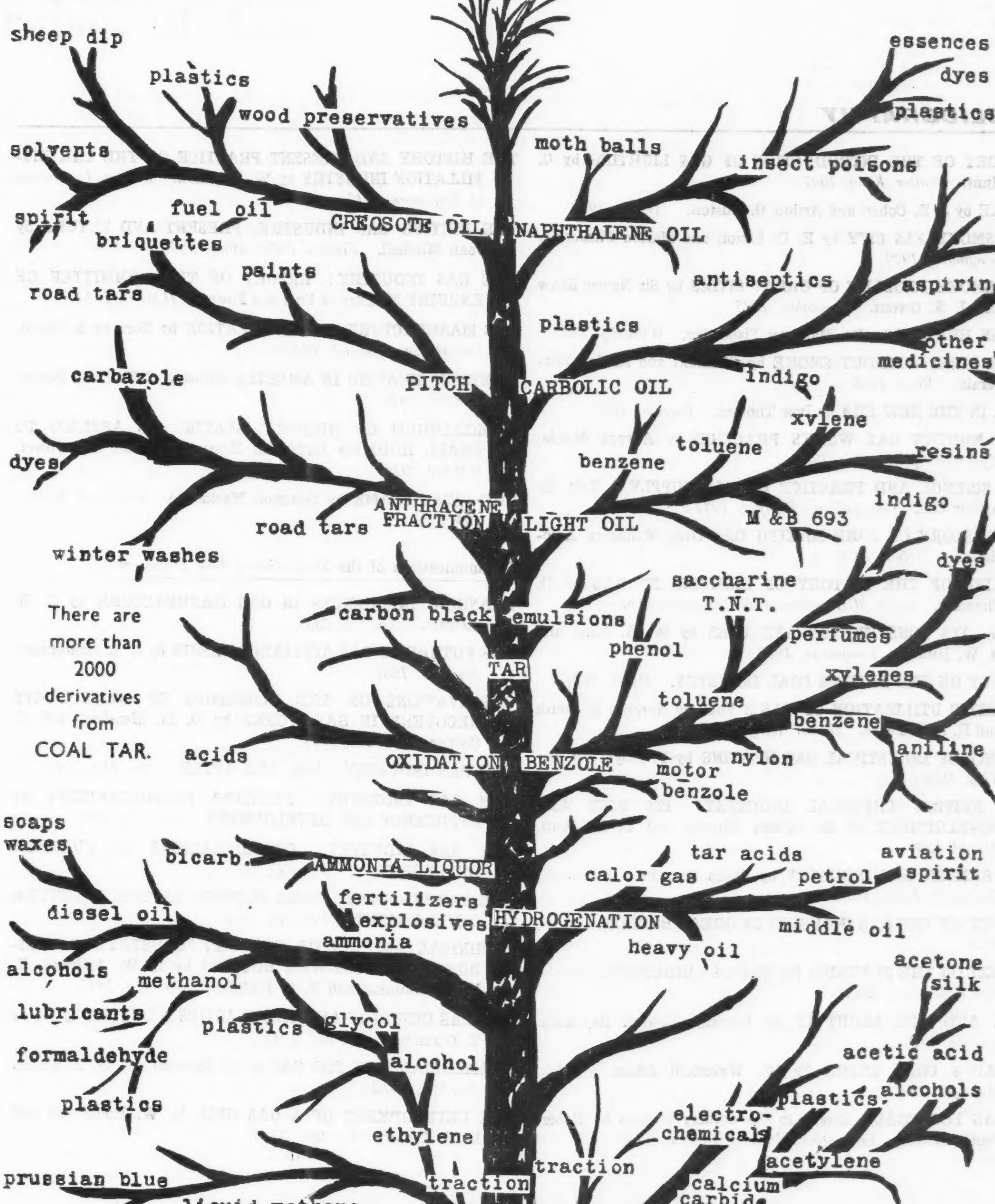
Only by this means can the Regional Gas Boards be made to feel that there is substantial scope for enterprise and initiative on their part. Without this incentive the industry will not make the necessary progress which is expected of it under public ownership. At this point we confront the most important of all the advantages which a regional organisation can afford: namely, the possibility of comparing the relative efficiency of the various Gas Boards. This is an overwhelming advantage which a series of Regional Gas Boards would enjoy over a single national monopoly.

Scientific measurement of the performance of public corporations has so far scarcely been attempted. Yet it is an essential instrument of social control over undertakings operating in the general interest under conditions in which the profit motive has been eliminated. The fact that conditions will vary in the several regions, that the price of coal will be much higher at some gasworks than at others, and so forth, should by no means prevent suitable yardsticks from being devised which, while allowing for these diverse factors, will accurately measure the relative efficiencies of the undertakings in regard to a whole series of significant aspects of gas supply. This is a matter calling for statistical ability and expert knowledge of the highest quality.

In order to encourage the fullest possible amount of freedom to experiment and initiate, the Minister should avoid setting up any intermediate organisation between his Department and the Regional Gas Boards. A national gas organ or association representing all the Regional Boards will inevitably tend to produce uniform practices, uniform attitudes, decreased flexibility, lack of mobility among personnel and other rigid characteristics. Any common action which is required on a national scale should be brought about by the Minister through his Department. Central institutions for research or training do not require any intermediate organs of a general character between the Department and the Regional Boards, though *ad hoc* bodies will of course be needed for this and other purposes. Mutual co-operation for many technical, legal and business matters can be effected in a satisfactory way through similar specialised machinery.

The gas industry has from its earliest days been a significant focusing point of contemporary views on social, economic and political questions. It is an industry which has experienced continuous public control for more than 130 years. It has been subjected to competition and monopoly; to private enterprise and municipal ownership; to the regulation of prices and profits. It has been handicapped in some respects and privileged in others. During its long career it has shown a remarkable capacity for growth and improvement. There is reason to believe that its ability to expand and to progress both technically and economically are very great. Those who are engaged in the industry, no less than the vast body of citizens who consume its products, may look forward to the impending reforms with hope and optimism.

THE BY-PRODUCTS OF COAL



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ANTHOLOGY

In Praise of Gas

When gas first spread along a city, mapping it forth about evenfall for the eye of observant birds, a new age had begun for sociality and corporate pleasure-seeking, and begun with proper circumstance, becoming its own birthright. The work of Prometheus had advanced by another stride. Mankind and its supper parties were no longer at the mercy of a few miles of sea-fog; sundown no longer emptied the promenade; and the day was lengthened out to every man's fancy. The city-folk had stars of their own; biddable, domesticated stars.

It is true that these were not so steady, nor yet so clear, as their originals; nor indeed was their lustre so elegant as that of the best wax candles. But then the gas stars, being nearer at hand, were more practically efficacious than Jupiter himself. It is true, again, that they did not unfold their rays with the appropriate spontaneity of the planets, coming out along the firmament one after another, as the need arises. But the lamplighters took to their heels every evening, and ran with a good heart. It was pretty to see man thus emulating the punctuality of heaven's orbs; and though perfection was not absolutely reached, and now and then an individual may have been knocked on the head by the ladder of the flying functionary, yet people commended his zeal in a proverb, and taught their children to say, "God bless the lamplighter!" And since his passage was a piece of the day's programme, the children were well pleased to repeat the benediction, not, of course, in so many words, which would have been improper, but in some chaste circumlocution, suitable for infant lips.

God bless him, indeed! For the term of his twilight diligence is near at hand; and for not much longer shall we watch him speeding up the street and, at measured intervals, knocking another luminous hole into the dusk. The Greeks would have made a noble myth of such a one; how he distributed starlight, and, as soon as the need was over, re-collected it; and the little bull's-eye, which was his instrument, and held enough fire to kindle a whole parish, would have been fitly commemorated in the legend. Now, like all heroic tasks, his labours draw towards apotheosis, and in the light of victory himself shall disappear. For another advance has been effected. Our tame stars are to come out in future, not one by one, but all in a body and at once. A sedate electrician somewhere in a back office touches a spring—and behold! from one end to another of the city, from east to west, from the Alexandra to the Crystal Palace, there is light! *Fiat Lux*, says the sedate electrician. What a spectacle, on some clear, dark nightfall, from the edge of Hampstead Hill, when in a moment, in the twinkling of an eye, the design of the monstrous city flashes into vision—a glittering hieroglyph many square miles in extent; and when, to borrow and debase an image, all the evening street-lamps burst together into song! Such is the spectacle of the future, preluded the other day by the experiment in Pall Mall. Star-rise by electricity, the most romantic flight of civilisation; the compensatory benefit for an innumerable array of factories and bankers' clerks. To the artistic spirit exercised about Thirlmere, here is a crumb of consolation; consolatory, at least, to such of them as look out upon the world through seeing eyes, and contentedly accept beauty where it comes.

But the conservative, while lauding progress, is ever timid of innovation; his is the hand upheld to counsel pause; his is the signal advising slow advance. The word *electricity* now sounds the note of danger. In Paris, at the mouth of the Passage des Princes, in the place before the Opera portico, and in the Rue Drouot at the *Figaro* office, a new sort of urban star now shines out nightly, horrible, unearthly, obnoxious to the human eye; a lamp for a nightmare! Such a light as this should shine only on murders and public crime, or along the corridors of lunatic asylums, a horror to heighten horror. To look at it only once is to fall in love with gas, which gives a warm domestic radiance fit to eat by. Mankind, you would have thought, might have remained content with what Prometheus stole for them and not gone fishing the profound heaven with kites to catch and domesticate the wildfire of the storm. Yet here we have the levin brand at our doors, and it is proposed that we should henceforward take our walks abroad in the glare of permanent lightning. A man need not be very superstitious if he scruple to follow his pleasures by the light of the Terror that Flieth, nor very epicurean if he prefer to see the face of beauty more becomingly displayed. That ugly blinding glare may not improperly advertise the home of slanderous *Figaro*, which is a back-shop to the infernal regions; but where soft joys prevail, where people are convoked to pleasure and the philosopher looks on smiling and silent, where love and laughter and deifying wine abound, there, at least, let the old mild lustre shine upon the ways of man.

ROBERT LOUIS STEVENSON (*Virginibus Puerisque and Other Papers*, 1887).

MARGINALIA

The 1951 Exhibition

The Royal Society of Arts (which, it will be remembered, promoted the Great Exhibition of 1851) recently called a conference to discuss the advisability of holding an international exhibition in 1951, together with the question of its site. 165 organizations were invited to send delegates to the conference, and 135 did so. Speakers numbered nearly thirty. Of these, Sir Robert Robertson, for the Royal Society, was in favour of an exhibition in 1951 in Hyde Park, as was also A. C. Bossom, M.P.; Colonel C. K. Mason, for the Metropolitan Public Gardens Association, and Mr. W. Jacobs, for the London Trades Council, were against the whole scheme; Mr. H. S. Hydes, for the Travel Association, approved it in general but pointed to the difficulty of accommodating the vast crowds of visitors; Mr. Walker, for the United Nations Association, thought that 1951 was too early and that the exhibition might be held outside London. T. A. Fennemore, of the Central Institute of Art and Design, favoured the south bank, and W. R. Davidge, of the Town Planning Institute, suggested the south bank as an alternative to the Crystal Palace site or Duke's Meadows, Chiswick. Mr. Davidge said that the exhibition might be extended from the south bank over the water on thousands of landing craft moored three deep along the embankment—an idea which G. Athoe, for the Incorporated Association of Architects and Surveyors, described as "unthinkable and ridiculous."

National Theatre Architects

E. Brian O'Rorke and Cecil Masey have been appointed architects for the National Theatre, which is to be built, it will be remembered, on a site allotted by the L.C.C. on the south bank between Waterloo and Charing Cross bridges. Mr. Masey was Sir Edwin Lutyens's collaborator on the South Kensington project.

R. Barry Parker

With the death of Richard Barry Parker, which occurred at Letchworth on February 21, one of the last links with the heroic age of the garden city movement was broken. Born at Buxton in October, 1867, Barry Parker's first major work in this field, undertaken in collaboration with Raymond Unwin (who was his brother-in-law), was the carrying out of Joseph Rowntree's scheme for a model village at New Earswick, York. An article by him which attracted the notice of Sir Ebenezer Howard led to his appointment, with Unwin again, as architect for Letchworth, and he held a consultant position there for forty years. Among the towns with whose housing or town planning schemes he was at one time or another associated were Bolton, Bridport, Hampstead, Loughborough, Newark, St. Neots and Wakefield in this country and, abroad, Oporto, Portugal and São Paulo, Brazil. He had been lecturer in town planning to the Architectural Association and to Birmingham University. In 1941 he was awarded the Howard Memorial Medal of the Town and Country Planning Association.

The Arts in Swindon

Swindon has about 65,000 inhabitants. Its industrial centre is the Great Western repair works. There has never been much unemployment. Prosperity, however, is not very patent. The town is far from attractive—the nucleus of pre-Great Western buildings is tucked away out of sight, and the nineteenth and twentieth centuries have not produced a town hall, a church, a chapel, or a theatre to be specially proud of.

Yet at the moment Swindon is taking a more active and more organised interest in the visual arts than any other town of its size in England. The initiative seems to have come from the Public Library and its governing committee. The library's responsibilities were extended in 1944 to include art exhibitions, and discussions on art and other subjects. One year later the establishment of a municipal art gallery was moved and carried. Sir William Rothenstein and Michael Rothenstein, Lord Methuen and Jankel Adler are represented in it. Then the corporation bought Lydiard Tregoze, the neglected seat of the St. Johns. It is to be used as a conference centre or for some similar purpose.

And now the publication of a municipal art magazine has begun. Two numbers of *The Swindon Review* are out. The first started with a foreword by Sir Kenneth Clark followed by an article by G. M. Young, one by John Rothenstein, and many others. The second number has a message from Sir Stafford Cripps, and the results of a poetry competition judged by John

Betjeman (crossing the Berkshire-Wiltshire border for the purpose), and of a short story competition (adjudicator: G. M. Young). Amongst illustrations Edward James Buttar and the young local artists of Wiltshire appear side by side with Picasso and a large number of good photographs of scenery and buildings. A nostalgic poem by Mr. Betjeman stands in the centre of number 2: *St. Saviour's, Aberdeen Park, Highbury, London, N.* ("a great Victorian church, tall unbroken and bright, In a sun that's setting in Willesden and saturating us here.")

A most commendable enterprise of Swindon and its Libraries, Museum, Arts and Music Committee.

Fountains Abbey

A recent letter to *The Times* from the Duke of Norfolk described the present position with regard to the Fountains Abbey restoration scheme, discussed in *Marginalia* in October and November last. In it the Duke says:—

"An agreement for sale, under conditional contract, has been entered into by our committee to acquire from the present owner an area of some 60 acres within the old Abbey enclosure wall, which includes the Abbey ruins, Fountains Hall, and other buildings, for the sum of £150,000. Through the generosity and practical interest of many people here, in the Dominions, and in the United States we have made a most promising beginning. Local committees have already been formed in all these countries, and it is hoped to complete the purchase at an early date.

"In view of the economic crisis we have thought it right to withdraw our application to the Minister of Works for sanction to undertake any work of restoration. Such work would involve, as the purchase does not involve, labour and material which are urgently required elsewhere for compelling human needs for a purpose which would not be justified at the present time. We have accordingly told the Minister that we should like to leave the future quite open, fully understanding that official sanction would be required if and when at any future date it is found practicable and thought desirable to put forward a plan.

"This decision does not affect our purpose in pursuing the spiritual aims which from the first have been the inspiration of this project: that a great historic Abbey should be brought back to the use of religion and devoted again to the worship of God, and become a place of prayer for all those who died in the war and of pilgrimage for all Christians in an age which has drifted so perilously far from the Faith which first built Fountains. We are confident that with the use of Fountains Hall and other buildings for conferences and retreats a practical start can be made this year. It is one of the conditions made by the owner, and one which we have gladly accepted, that the general public shall continue to enjoy access to the Abbey ruins."

T.P.I. Annual Country Meeting

The Council of the Town Planning Institute announces that, owing to difficulty in reserving the necessary accommodation, it is not possible to proceed with the proposal to hold the Country Meeting at Rothesay in 1947, but hopes it will be possible for Scotland to be the venue in 1948. It has therefore been arranged to hold the twenty-first Annual Country Meeting for 1947 at Torquay from Thursday evening, May 29, to Saturday, May 31, inclusive, under the chairmanship of the President, H. W. J. Heck. The Mayor and Corporation of Torquay will hold a reception on Thursday evening, May 29, and the Institute dinner will take place at the Grand Hotel, Torquay, at the conclusion of the programme on Saturday evening, May 31.

War Damage in Germany

A note has been received from Professor K. Gerstenberg stating that the celebrated staircase of the Episcopal Palace at Bruchsal (discussed and illustrated in Mr. Pevsner's *European Architecture*) is "largely destroyed." The dome above it collapsed when the burning timbers of the roof came down on it. The walls are still standing with part of the stucco decoration. An emergency roof is now being put up. The Sala Terrena and the two curved arms of the staircase are preserved.

The following information is also based on reports from Professor Gerstenberg:

WÜRZBURG.—The chief damage was done by the British raid of March 16, 1945. CATHEDRAL: roof burnt; the subsidiary buildings by Neumann surrounding the chancel burnt; south choir aisle destroyed; the chancel lost all its fitments. The damage has revealed the eleventh century wall treatment with demi-columns. North wall of nave collapsed 1946 owing to weather damage during 1945.

NEUMÜNSTER.—Chancel and west part burnt out. ST. MARY'S CHAPEL, Market Place: roof burned, vaults preserved. Interior burnt out and piers seriously damaged. STIFT HAUGER CHURCH: burnt out; tops of the towers burnt; the lack of the fitments reveals the grandeur of Petrini's original conception, especially inside the dome. FRANCISCAN CHURCH: burnt out. DOMINICAN CHURCH: burnt out. CARMELITE CHURCH: burnt out. ST. STEPHEN'S: burnt out. ST. MICHAEL'S: burnt out. UNIVERSITY CHURCH: burnt out. ST. PETER'S: half the front destroyed uncovering the romanesque towers behind. Vaults mostly preserved. DEUTSCHHAUS CHURCH: hardly damaged. SCHOTTEN CHURCH: only the outer walls standing. ST. BURSCHARD'S: choir intact, nave destroyed. EPISCOPAL PALACE: Staircase, Kaisersaal, Sala Terrena and Chapel have been saved, all the other interiors destroyed. UNIVERSITY and UNIVERSITY LIBRARY: burnt. ST. JULIUS HOSPITAL: burnt out. MARIENBURG: burnt out. TOWN HALL: Eckard Tower and main storey survive.

Danish Domestic Design

An exhibition of Danish domestic design, brought to England under the auspices of the Council of Industrial Design and the Arts Council, was shown at the R.I.B.A. last month. Previously it had been on tour and shown at the Geffrye Museum, at Blackpool and Manchester, when it was limited to illustrate the furnishings of a home belonging to someone in the £400—£500 income range, but for the R.I.B.A. showing it was enlarged to include more costly articles. The exhibits were chosen by the Society of Danish Handicraft and Industrial Art (now, be it noted, forty years old), and the layout was designed by Sten Moller in collaboration with the R.I.B.A. exhibition committee. The catalogue asked the visitor to bear in mind that all the exhibits were war-time products,

[continued on page 156

1928
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continued from page 154]

and did not "fully represent the standards of workmanship and design which the Danes hope to recover within the next few years." Nevertheless, many of them were in a quiet way really excellent. A possible criticism is that justice was hardly done to the cabinet-makers, most of the furniture shown being on the thin side.

A Bibliography for Planners

A useful bibliography of Northumberland and Tyneside has been published (at 2s.) by H.M. Stationery Office on behalf of the Ministry of Town and Country Planning. Its purpose is to assist planners and anyone else interested in the future use and development of land in the area by listing and locating the more important works on the physical, economic and social conditions and resources of the area. The work of compilation was undertaken for the Ministry by W. C. Donkin and E. F. Patterson, both on the staff of the King's College Library at Newcastle-on-Tyne, and Heads of Faculty of the College advised on the final selection. The resources of the local libraries were examined for material, and a feature of the bibliography is the inclusion of location symbols indicating at which library in the area a copy of each book may be consulted. Each subject group is followed by a maps section. Most of the maps included were compiled by the Ministry of Town and Country Planning for the specific use of planners, and no other published list of these is as yet in existence. The bibliography, which lists 475 items, is supplemented by detailed author and subject indexes.

Techniques et Architecture

Subscriptions for the French periodical *Techniques et Architecture* can now be placed in London, with Anglo-French Periodicals and Publicity, 25, Villiers Street, W.C.2. (Telephone: Temple Bar 1801).

Correction

On page 28 of the January issue, figure 5 should have been described as the garden of Vicomte Charles de Noailles at Hyères, which was designed by Gabriel Guevrekian in 1926.

CORRESPONDENCE

Fifty Years

The Editors,
THE ARCHITECTURAL REVIEW

DEAR SIRS,—May I add my congratulations to those of the many, I am sure, who found your statement of policy in the January number an encouraging clarification of their own thoughts on the matter of visual re-education. Your diffidence in presenting it was unwarranted. The call for new richness, visual objectives and a positive architecture has been too long delayed.

But, gentlemen, are you aware that you are treading FORBIDDEN PATHS? The Revolution that you speak of brought with it a philosophy of puritanism in art which will make our Restoration difficult. Visual re-education is not easy for a generation which has been taught to appreciate only "simple, clean lines and masses," and to prefer barns to palaces. This generation (my own) has been brought up to believe in architecture which is "good for people"; which we know is right for the masses whether they like it or not. That ordinary people might actually prefer palaces, or at least an architecture of visual luxury has not been within the bounds of our comprehension.

As one who has ventured in the last two years to lecture on the place of beauty and variety in architecture and town planning, I therefore warn you that to some your policy as it appears in print will seem outrageous. But I can add from experience that you will make many more friends than you will lose. The new generation, especially, is hungry for that for which we have been starved. They can understand Oscar Wilde's admonition: "Nothing is more dangerous than being too modern. One can grow old-fashioned quite suddenly." Many are able now to agree with Ruskin that "we want no new style of architecture—but we want *some* style." They see, more clearly than those whom the Revolution established, that the search for the eternally new can lead nowhere, that a revolution cannot be continued indefinitely, and that "the pursuit of differences," as you so aptly put it, is the only way to get them out of their present isolationism. But they will need all the leadership that you can provide. Many of us here believe that the REVIEW is the only architectural publication in England or America capable of this leadership. That is why it is so gratifying to see you taking another forward step.

Yours, etc.,
CHRISTOPHER TUNNARD.

Yale University.

The above letter is representative of many received. The Editors of THE ARCHITECTURAL REVIEW *would like to take this opportunity of expressing their thanks to all who have written.*