THE ARCHITECTURAL REVIEW

APRIL 1945

ELECTRICITY

IN ITS REGIONAL SETTING

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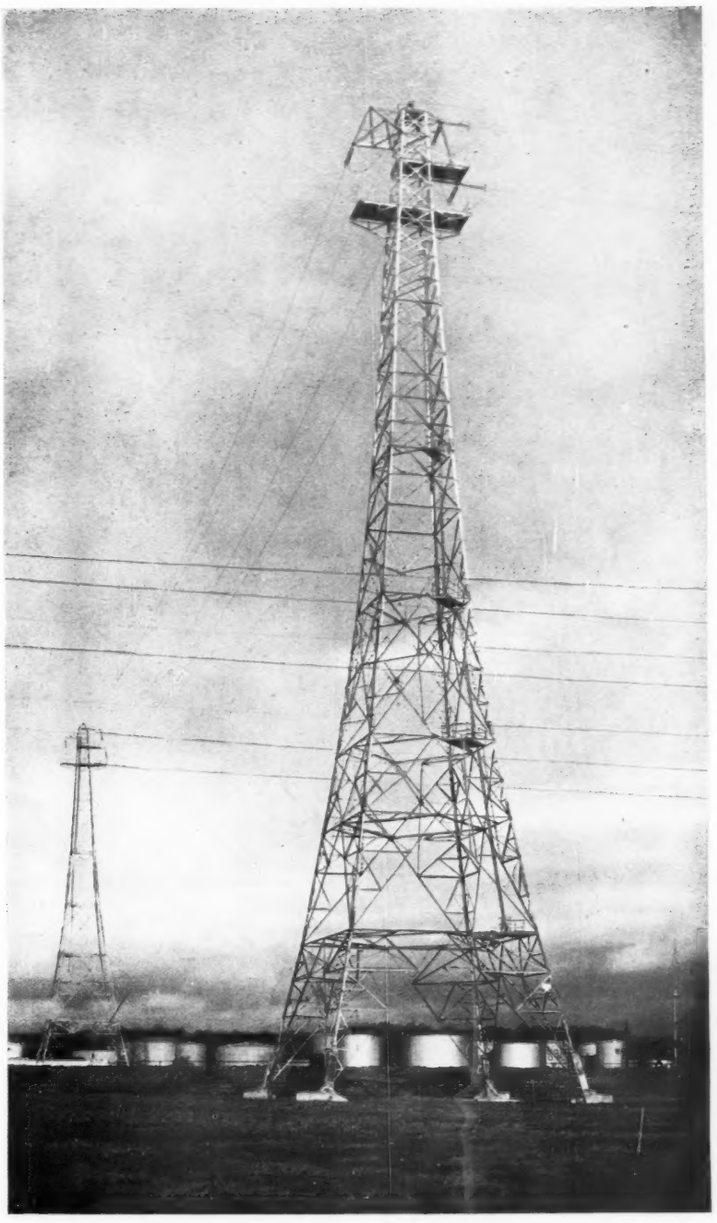
PREPARED FOR THE ARCHITECTURAL REVIEW BY THE ASSOCIATION FOR PLANNING AND REGIONAL RECONSTRUCTION



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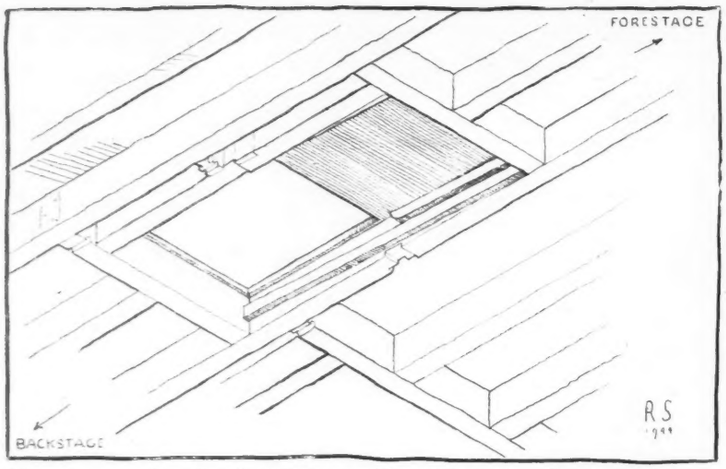
THREE SHILLINGS AND SIXPENCE



The trap groove of the Georgian Theatre at Richmond, Yorkshire. See note on this page.

continued from page liii]

as the editor of the Wren Society's volumes, the twentieth and last of which came out before his death. The work was largely due to his perseverance—a proud achievement unparalleled anywhere abroad. Bolton had as a young man worked under Edis, Ewan Christian and studied under Phené Spiers. In 1917 he was elected Curator of the Soane Museum and set out on a series of publications on Soane's life and work. They will form a helpful foundation for anybody who may now embark on research into Soane's drawings and the character and style of his architecture.

Two Richmonds

Although the article by Mr. Southern in the January number was on the Georgian Theatre at Richmond, *Yorkshire*, the last picture illustrated the Theatre at Richmond, *Surrey*, a building long destroyed but of importance as showing in old prints certain points of arrangement which make it possible to understand what remains of the Richmond, Yorkshire, Theatre.

What started Mr. Southern on one of his most interesting discoveries at Richmond, Yorkshire, was the survival of the trap groove under the stage floor. It proved the existence of an earlier lower floor of the theatre. As Mr. Southern's drawing has been given some prominence in the British Drama League Exhibition of English stage and theatre history held in January at the Royal Academy, it is shown on this page as a postscript to the January article.

The exhibition contained a good deal of picture recording of London's theatres from the Middle Ages to the nineteenth century, a model of Lutyens's depressingly uninspired National Theatre and another one of C.E.M.A.'s proposed regional Art Centres, an excellent modern and pleasingly informal design with concert and exhibition halls, restaurant, etc.

The Georgian Group

The show of photographs of eighteenth- and early nineteenth-century architecture which the Georgian Group arranged at Heal's in Tottenham Court Road and which is now touring the country is a delight to see, large pictures of individual buildings, squares and terraces well photographed and well, if modestly, displayed. From the pamphlets of the Group which are on sale at the exhibition one learns that a change has taken place or is taking place in its policy towards the contemporary style. The Group had rightly or wrongly been identified with the Neo-Georgians who think that harmony with old buildings can only be achieved by an imitation of the old.

Now we read amongst the objects of the Group "to ensure . . . that the new buildings harmonize (*though they may contrast*) with the old; the italics, needless to say, are ours. Another leaflet available at the exhibition is the Farjeon song of the happy demolition man (from *Nine Sharp*) in a montage frame of buildings in London destroyed, mutilated or endangered by the Londoners themselves. There is a grave danger that more Georgian houses and ensembles will be pulled down all over the country under the pretext of replanning.

COMPETITION FOR DESIGNS FOR CONCRETE FENCES

The Cement and Concrete Association offers premiums for designs for Open Type Concrete Fences.

The Royal Society of Arts desiring to promote good design in industry have undertaken to conduct the competition.

The Assessors are :—

Mr. Oswald P. Milne, F.R.I.B.A., Royal Society of Arts.
Mr. Charles Holden, F.R.I.B.A., R.D.I., Faculty of Royal Designers for Industry.
Mr. A. G. Bray, F.R.I.B.A., Cement and Concrete Association.

Designs are invited for two types of fences.

Premiums to the value of £170 are offered, viz. :—

First	£50	For designs of each type
Second	£25	
Third	£10	

Last date for submitting designs—30th April, 1945.

Conditions of the competition may be obtained from the Acting Secretary, Royal Society of Arts, 6-8, John Adam Street, Adelphi, London, W.C.2.

An exhibition will be held of the winning and commended designs.

ELECTRICITY IN ITS REGIONAL SETTING

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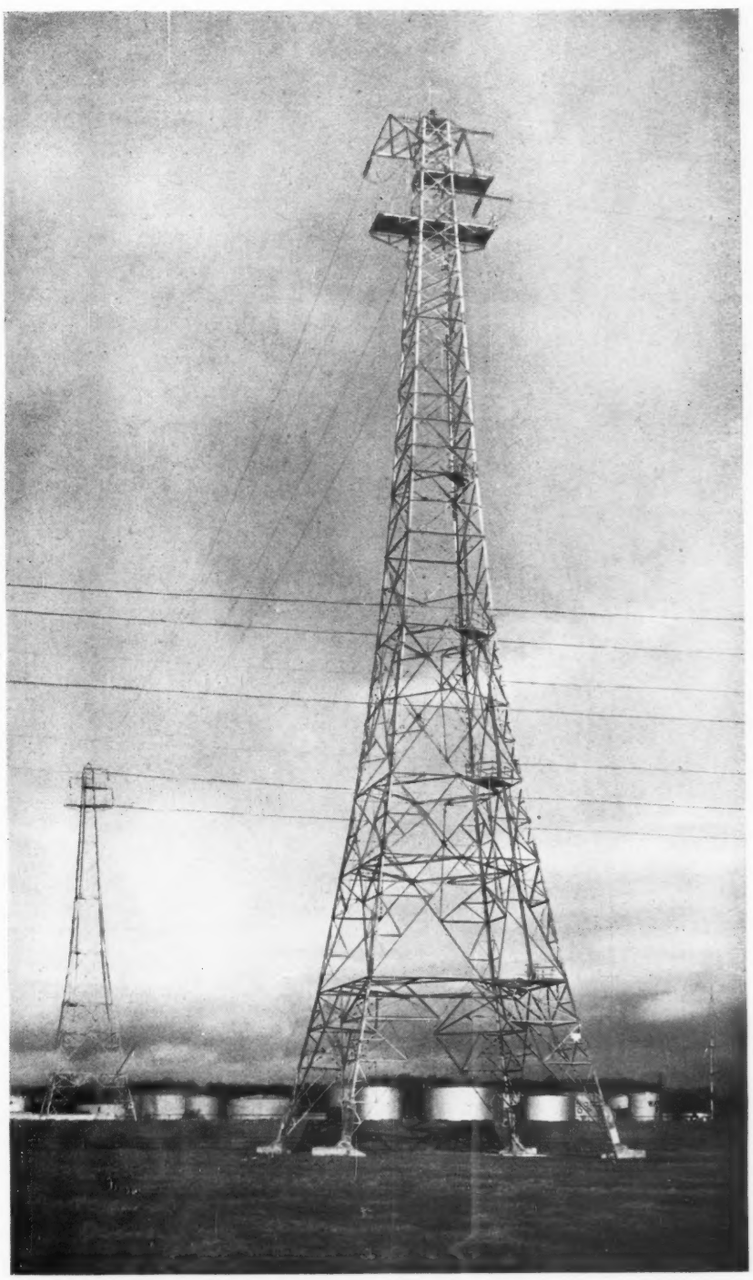

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Boulder Dam Power House

House

1 INTRODUCTION

"The physical achievements that science and technology now make possible may bring no benefits, may indeed be evil, unless they have a moral purpose, unless they are conceived and carried out for the benefit of the people themselves. Without such a purpose, advances in technology may be disastrous to the human spirit; the industrialization of a raw material area may bring to the average man only a new kind of slavery and the destruction of democratic institutions. . . . The physical job is going to be done; of that I think we can be sure. But if, in the doing, the unity of nature's resources is disregarded, the price will be paid in exhausted land, butchered forests, polluted streams, and industrial ugliness. And, if the people are denied an active part in this great task, they may be poor or they may be prosperous but they will not be free. Is it inescapable that such a task of resource development be carried on only by highly centralized government direction? Must it inevitably be run by a privileged elite of managers or experts or politicians? Yes, say the defeatists about democracy, the cynics, the disillusioned and frustrated liberals, the believers in force, the disbelievers in men. Can it be done in no other way than by gutting the resources of nature, by making the country-side hideous, by maiming the forests, fouling the streams, ignoring the unity of land and water and men? Yes, that is 'the way things are' say the greedy, the short-sighted, the unperceptive."

Dr. LILIENTHAL, CHAIRMAN TENNESSEE VALLEY AUTHORITY, U.S.A.

THE industrial future of Britain, her health, wealth and happiness, depend on our ability or otherwise to obtain supplies of cheap and abundant power. Our resources are limited; until atomic energy can be released, power in quantity can only be won by making use of energy stored up in our diminishing resources of indigenous minerals, by taming the falling waters, or by harnessing the tides and the winds.

Skilled manpower alone is no longer enough. Lilienthal, for example, has stated that as much electricity goes into one big bomber as the average household would consume in four hundred years. The economic and strategic importance of the issue is fundamental; if we fail to solve the problem, posterity may have no alternative but to buy outside—coal and oil from lands more abundantly endowed, electricity perhaps by some improved type of submarine power cable from Scandinavia.

In its basic elements and in its technical interpretation, the problem is one capable of solution; it affects every aspect of human life closely, therefore it must be studied exhaustively and experimentally by men equipped with the most sensitive and skilled minds, men representative of many fields of thought and activity and yet working together in co-ordinated teams or groups. Of such is the modern technique of Survey followed by Plan.

Planning may be defined as the intelligent use by a free community of its environment, for the common good of its neighbours, its successors and itself. Planning today is at the crossroads. It is bitterly significant that Britain has never yet had a fuel policy based on the national resources and the common need, a policy built up by and through the scientific approach (as has been the war policy of the Ministry of Food). The absence of planning in the past development of our coalfields is comprehensible; the apparent lack of planning (other than purely technical integration) in the development of our electrical resources is tragic.

Electricity, the essentially fluid form of power, can be made available anywhere, could be generated almost everywhere. Electricity is altering and will alter the whole industrial face of Britain; manifested as heat, as chemical or as mechanical energy, its possibilities for good are boundless; it is the key to the rehabilitation of the uneconomic farm as well as the reconstruction of the derelict industrial area. Its very versatility demands that it be developed with all its wider applications in mind, and not purely *ad hoc*. It is apparent that neither the Electricity Commissioners nor the Central Electricity Board, nor the newly formed North of Scotland Hydro-Electric Board, have yet understood these wider responsibilities, nor even their opportunities.

First there has been no published survey, on the national and on the regional scale, of existing facilities and resources. Survey must precede plan. Technically the Electricity "Grid" saved Britain in her darkest hour by its invulnerability; administratively, economically and socially there is no evidence that its development has been anything but piece-meal.

Secondly, there has been no published plan, whether for one, ten or fifty years, in which a conscious attempt has been made to link together the ascertained physical facts—mineral resources, rainfall, communications and transport, population, consumption, etc.—with the proposed extensions and developments. The reason is simple; the outlook of the engineer has never been teamed up with the trained minds of the other consultants involved, whatever their professions; the one-track technician has been happy to follow his one-track way.

Thirdly, and apart from the national and regional aspects, the siting of both thermal and hydro-electric power stations, their location, design and appearance, has consistently been unintelligent. A tremendous opportunity for good has been lost and is in danger of being lost again; the engineer has no knowledge of or training in the wider problems of industrial location, town and country planning, architecture or æsthetics. The results are visible wherever electric power is generated in this country today. Battersea, badly sited but architecturally camouflaged, **1**, is no more worthy than the flagrant utilitarianism of Barking, **4**, or Darlington.

Lastly, and most important of all, schemes are prepared in secret and issued by instalments; such procedure is not planning, it amounts almost to a deliberate misleading of the public. Of the promised one hundred and two Scottish schemes, details of only three or four have been published as yet; the maps that accompany them are sketchy in the extreme and unworthy even of a junior draughtsman. No man studying the proposals so far made available by the North of Scotland Hydro-Electric Board could form any coherent impression of them, let alone of the information that led up to them or the manner in which they may or may not be integrated with a wider plan for the rehabilitation of the Highlands. The Highlands need power in measure, but above all they need more and better groups of housing, better communications, economic industries to balance those they have already, and an integrated plan.

The writers of articles in this issue put the case for a plan for electricity in its wider regional setting and from many viewpoints, some of them perhaps conflicting. They are, however, unanimous in demanding a social and economic assessment of all the implications; they insist on the need for clear-headed thought on the pros and cons of establishing extractive industries in the Highlands, as well as power stations alongside cathedrals; they do not oppose electricity as such, on the contrary they demand that its development shall be planned openly and coherently. Open and coherent development demands facts—what is the national coal position, are the electro-metallurgical and electro-chemical industries really more suitable for the Highlands than for the existing coalfields, will the manufacture of aluminium continue in the Highlands after the war (with Canadian metal at £56 a ton), must water be diverted from one watershed to another, and why? If the production of aluminium ingot at Kinlochleven and Fort William were to be discontinued (and all the bauxite has to be imported, four shiploads of ore to make one of metal), would there not be 500,000,000 units of electricity per annum to spare from the existing hydro-electric schemes at these two places, sufficient to supply most of the immediate needs of Scotland?

What are the capital and running costs of all these industries and on what basis are the published costs calculated? At what load factor can these proposed hydro-electric plants operate, highland rivers fluctuating as they do?

The present position is profoundly unsatisfactory. The citizen has the right and the duty to know what development is proposed for his locality; he has the right and the duty to attend any Public Enquiry concerning these matters, whether his interest be local or national. The procedure of these Enquiries is complicated, and hardly disinterested; at Durham, for instance, two of the three Commissioners (including the Chairman) came from the side of the promoters. The citizen, even if he briefs Counsel, and technical Counsel at that, begins at a disadvantage—information is hard to come by, procedure is strange and unaccustomed, the disinterestedness of the tribunal is in doubt, the Government Department concerned is not bound by the Report of the tribunal and then the only course is the complicated mechanism of appeal to Parliament.

These happenings in England and Scotland, particularly in Scotland, have nothing in common with the ideas and the methods of procedure that inspired the T.V.A., although it is sometimes claimed that they have. The T.V.A. was first and foremost a scheme, planned as a whole, to stop flooding on mighty rivers; then it set out to bring about the total rehabilitation of an area the size of Scotland and England together; thirdly, it provided for the generation and supply of cheaper electricity, as the means to the end; fourthly all this was to be done and was done with the co-operation of the people.

2 THE GRID & SITING OF POWER STATIONS

Hugh Quigley

The Central Electricity Board is a monopoly undertaking. The dangers and opportunities inherent in its structure and the lessons of its ten years of operation are here pitilessly and yet constructively criticised.

IT is unnecessary at this time to describe in any detail the make-up of electricity production and distribution in this country, but some knowledge of it is necessary if one is to assess the function which the industry would play in any national scheme of town and country planning. It is as well also to dispense with some of the assertions made by those who advocate nationalisation or the reverse. A few indisputable facts must, however, be stated at the outset. They are :—

1. Technically, the electricity supply industry is reasonably efficient. It stood up to the strain of war production with marked success and was the most dependable public service even at the worst time of German bombing. It served to make good many of the national deficiencies, particularly in coal supply and allowed a large section of the population to enjoy a modicum of heat where otherwise it would have had none.
2. This standard of efficiency has almost no relationship to the size of the undertaking and any assumption based on size has no validity in practice.
3. Being an extremely simple industry, producing one standard and invariable commodity on standard lines, it is not affected by type of administration and ownership to any serious degree. A good power company can be paralleled by a good municipal supply. The one exception is the joint undertaking, which requires drastic modification as a rule before it can be regarded as efficient.
4. It follows that purely technical staff are in control of the industry and the standard both of personnel and administrative policy is regrettably low—from the Central Electricity Board downwards. There is no strain of competition, or of necessity to develop new markets at home and abroad, to keep up initiative and to develop special ability.

Legislation has conferred on the industry all the powers inherent in the most extreme forms of industrial monopoly with practically no safeguards against exploitation.

It is possible to adduce other facts but the above are sufficient. With these in mind, let us see how the industry would fit into a scheme of national planning. Superficially it would appear to fit in very easily. With the entire national production of electricity concentrated in the Central Electricity Board, it would seem easy to link this institution with any other national body and to achieve co-ordination at once. But there are serious obstacles. The C.E.B. does not own the means of production but only the means of technical co-ordination. It may concentrate the national output in perhaps 30 generating stations but it may have to keep in existence a further 150 stations and make it advantageous for the owners of the remaining stations to keep them closed. Since it has no ownership and only extremely circumscribed powers of expropriation, it must carry out a policy of balanced interests in the design and location of new generating stations. If, for example, a power company is granted a new power station, a municipality must have one to balance. As salaries increase with increase in output, one can envisage a thoroughly unpleasant mess of intrigue as between engineer and engineer, undertaking and undertaking.

From the rigidly technical point of view, it does not matter who builds and operates the station provided the C.E.B. gets its electricity at a low cost. From the national point of view it matters a great deal, and when the C.E.B. was created in 1926 it was assumed that this body would keep the national interest paramount. To those who look back over the interval of eighteen years, aware now of the complete failure of the semi-public board to take any but the narrowest view of its functions, this appears the most pathetic of beliefs ; but the new form of administration should have been, if machinery could do it, a great contributory factor in national, economic and social reconstruction. An enlightened and determined body (compare the record of the T.V.A.), led by enlightened and determined men, would have postulated four things :—

1. Created to perform a great public service, it would keep above intrigue and narrow partisanship and insist on a national approach to every major problem in policy. In other words it would guide and lead the industry and inform public opinion at the same time.
2. Through intensive research and development, it would keep the industry at a high level of achievement and contribute materially to the national wealth and well-being.
3. It would observe a high standard of amenity and design, not only in its own physical construction but in those over which it had control, particularly generating stations.
4. It would insist on the widest possible distribution of electrical service, even in rural areas, and—if necessary—subsidise it.

The C.E.B. was not created—and it is essential to stress this point—to interconnect generating stations ; it was created to universalise and cheapen the cost of electrical energy through the use of this interconnected system. Otherwise, there was no justification for its existence. The industry could do perfectly well without it. What, in effect, did the Board do ?

1. It took almost at once the line of least resistance, formulated a grotesque theory of co-operation (" we follow the industry " slogan) and gave the varied interests their head. It tried to balance one interest against another, with no line of policy or principle of its own, with the result that the best energies of the industry were devoted to lobbying. At the other end of the chain, the Board was most unyielding to the smallest and weakest supply undertakings, with the result that the most powerful undertakings, whether company or municipal, derived the greatest financial advantage from the system, and the cost of electrical energy to the public was not reduced or the service markedly extended as a result of the Board's operation.
2. It carried out no research or development work of its own and relied exclusively on the electrical manufacturing industry, with results apparent to anyone—over-elaborate, over-equipped, excessively costly plant and apparatus. It handed over the design and planning of its machinery to consulting engineers.
3. As a result it exercised no control over location, siting and elevation of generating stations and in its own transmitting and switching stations observed no æsthetic or architectural standards whatever.

When we look over the map of Britain, at the beginning of the third decade after the issue of " Coal and Power," we find not a single generating station that is anything but an architectural atrocity—slum stations built mainly of corrugated iron, chimney extravaganzas occasionally simplified to erections even worse, gross blocks of masonry like Fulham or Reading with no life and no character, decorative curiosities like Battersea or Ironbridge and an appalling series of erections down the Thames—Deptford East and West, Stepney, Woolwich, Barking, Battersea Borough Council, Greenwich and Lots Road. We do not find a power station fitted into the landscape as it should be fitted, witness Hams Hall near Birmingham or Kirkstall near Leeds. There is no transmission or distribution station which is not marred either by misapplied design or by applied elaboration in brick or stone ; the design of transmission towers shows no tendency towards simplicity or a more direct functional beauty.

There has been no real progress in the design and use of generating stations for the last twenty-five years. There has been no answer to the arguments :

A modern generating station with standardised units should have no walls or cover at all. But there are stations with tens of thousands of tons of steel merely keeping the rain off machinery not affected by it.

A modern generating station should have no chimneys. The smoke, cleansed and purified by compulsory grit removal systems, is a most valuable industrial raw material ejected into the air.

A modern generating station should have no cooling towers. The waste heat, as in Manchester or at Treforest, could go into district heating systems or industrial processes.

Neither structural design nor heat economy, outside of the bare generating units, has been studied in this country.

One can understand why the provision of new generating plant capacity in this country should have degenerated into a series of local fights and local intrigues round one or several power stations. The agitation at Durham, Lincoln and in the Highlands of Scotland should have been impossible in an industry which was properly led and had a full sense of its public responsibilities.

The failure of the Central Electricity Board to work out any national power plan and to fit this into national economic and social requirements is paralleled only by its failure to extend electricity into rural areas. The C.E.B. is confronted with a situation of its own making : leadership from behind produces its own Nemesis. The situation cannot be left unchanged. No public utility should be allowed to neglect research and development and at the same time destroy, with unsuitable and technically obsolescent structures, the very form and design of our landscape. I am not interested in questions of public or private ownership but only in the maintenance of some standard of decency in our public buildings, The electricity supply industry can make directly a great contribution to the reshaping of our industrial civilization : its power stations and transmission stations can be things of beauty as well as efficient in themselves, a fit representation of the ennobling force which it is their privilege to distribute. The public must see that it makes that contribution.

Certain possibilities of reform suggest themselves :

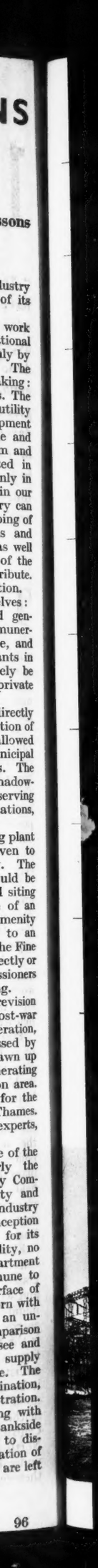
The control and administration of selected generating stations should bear with it a uniform remuneration, no matter how large the station may be, and the use of power station engineers as consultants in the extension of their own stations must surely be contrary to public interest. Any suggestion of private advantage should be removed.

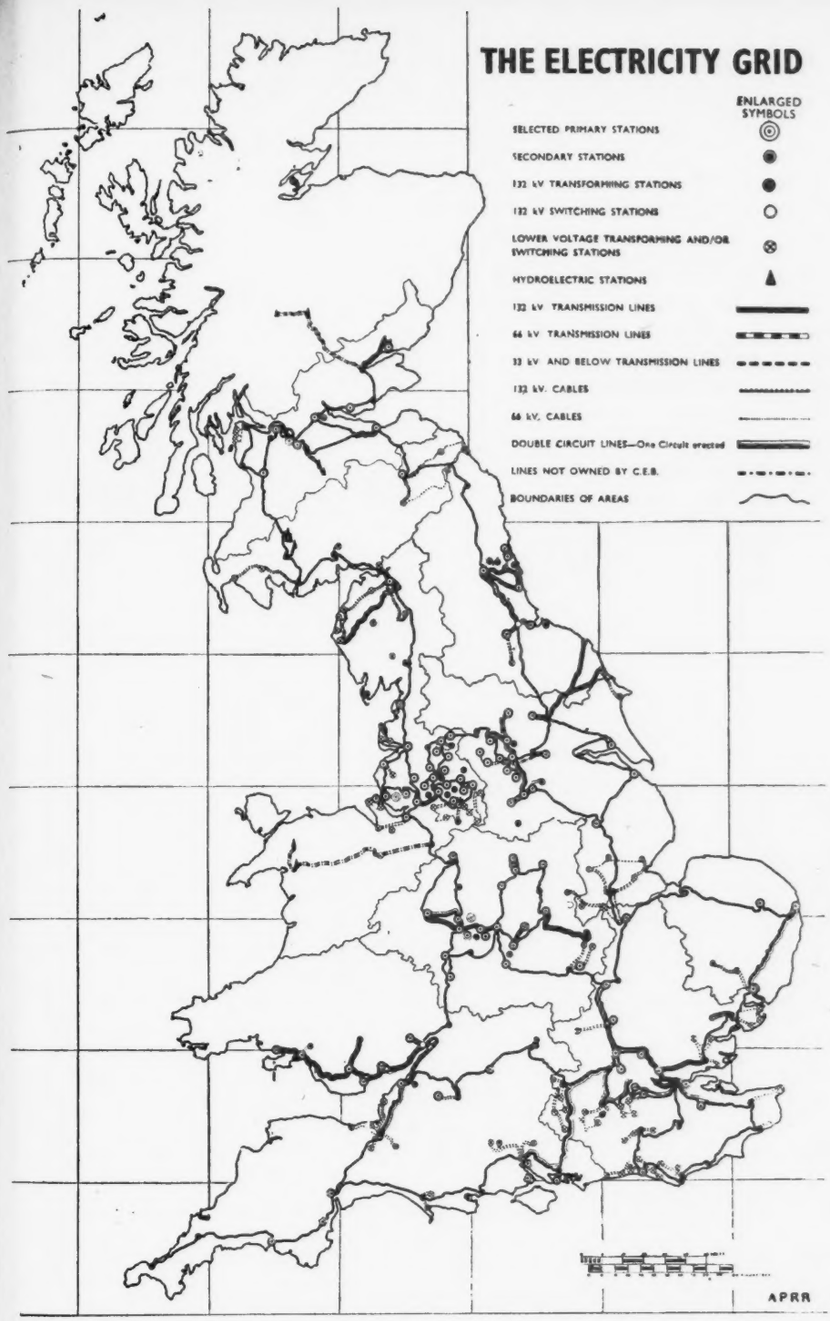
The Central Electricity Board must be made directly responsible for the design, location and construction of all new generating stations. It must not be allowed any longer to delegate responsibility to municipal electricity committees or power company boards. The contests at Durham and Lincoln were only shadow-boxing, while the C.E.B., responsible for serving directions for extensions of stations and new stations, escaped criticism.

The proposals of the C.E.B. for new generating plant should be published and, before assent is given to them, they should be subject to public inquiry. The Ministry of Town and Country Planning should be responsible for approval, as far as location and siting are concerned, but it should have the advice of an expert panel representing architects and amenity experts. There should be a right of appeal to an independent tribunal, similar in composition to the Fine Art Commission, with no member appointed directly or indirectly by the C.E.B., the Electricity Commissioners or the Ministry of Town and Country Planning.

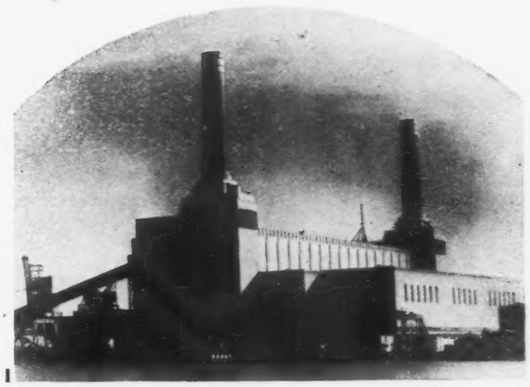
The entire conception of the Grid requires revision to make it more applicable to a plan of post-war reconstruction. The complete apparatus of generation, transmission and distribution must be reassessed by an independent expert body and a scheme drawn up for the next ten years. Meantime no new generating stations should be permitted within the London area. On the contrary a scheme should be drawn for the gradual extinction of those already on the Thames. The Chief Architect for the L.C.C., assisted by experts, could carry out this work without difficulty.

It will be readily appreciated that the failure of the electricity supply industry, and particularly the Central Electricity Board and the Electricity Commissioners, to understand public responsibility and assess to the full the great contribution the industry could make to a new architecture and a new conception of landscape amenity, has forced the public, for its own protection, to intervene. No public utility, no industry and certainly no Government Department should be under any illusion that it is immune to criticism or can be permitted to use the surface of Britain without restriction. No engineer is born with a gift for heaven-inspired administration or an unerring eye for beauty. The most superficial comparison between what Lilienthal achieved in Tennessee and what the C.E.B. (and with it the electricity supply industry) failed to achieve should be conclusive. The C.E.B. had several years' advantage but imagination, culture and vision were lacking in its administration. That is why the educated public is following with anxiety developments at Durham, Lincoln, Bankside and the Highlands. They have no evidence to disprove their belief that misplanning and desecration of beauty may result, if the experts and engineers are left alone to do their will.





Details of extensions to the Grid, completed during the war, have not yet been made public. The system shown above is dated before 1939.



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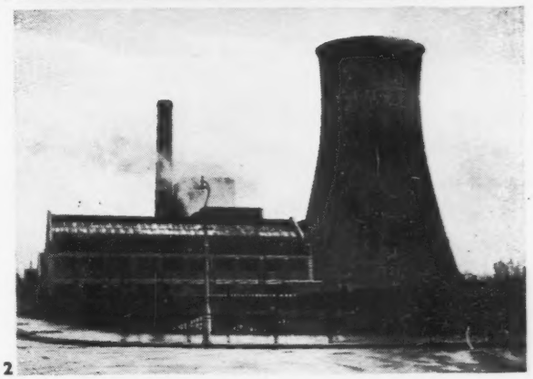

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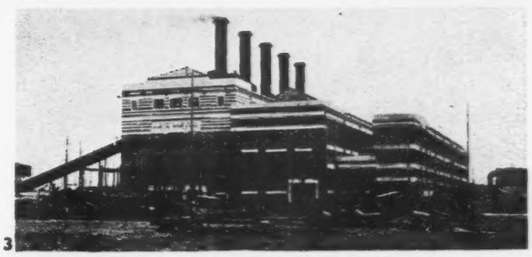

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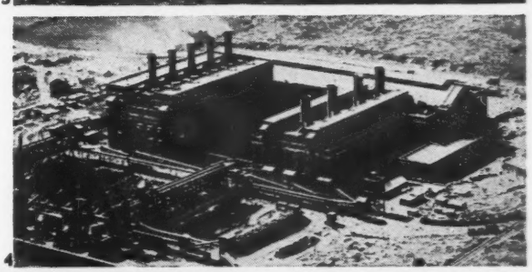

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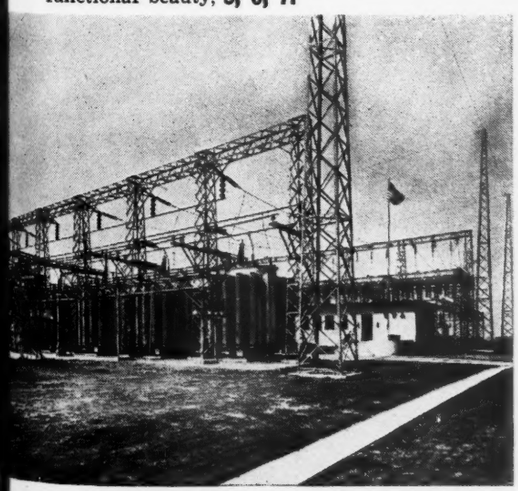
There is no generating station on the Electricity Grid that is not marred by misapplied design or by irrelevant elaboration in brick or stone. **1,** Battersea; **2,** Croydon; **3,** Hams Hall; and **4,** Barking; each tells a story which is typical. By contrast, the T.V.A. shows a tendency towards simplicity and a more direct functional beauty, **5, 6, 7.**



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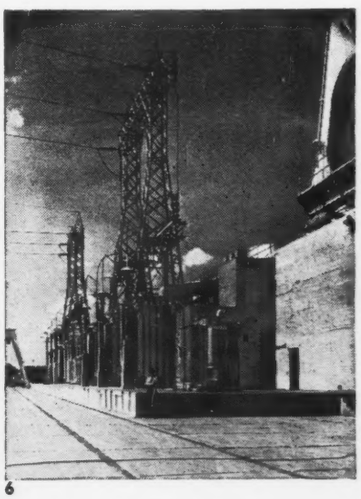

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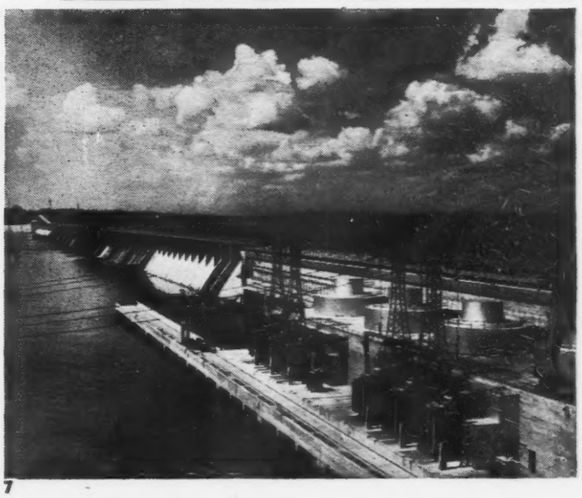

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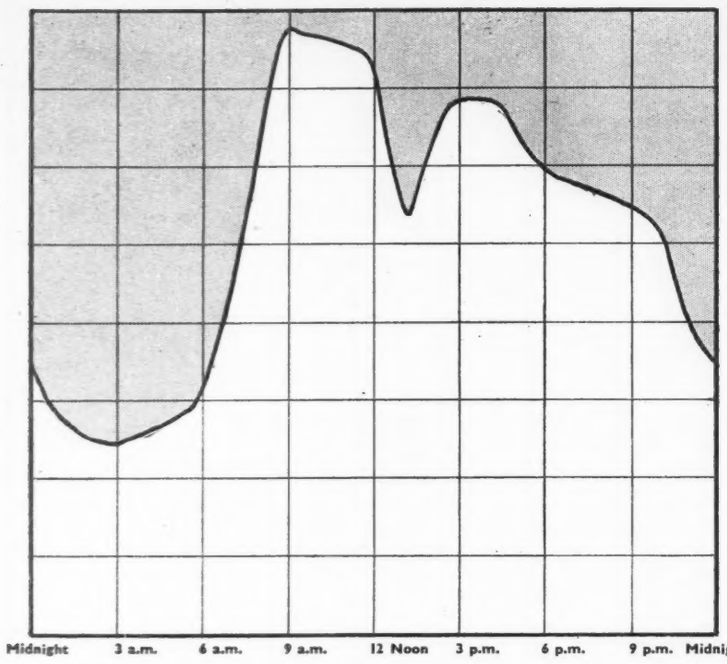
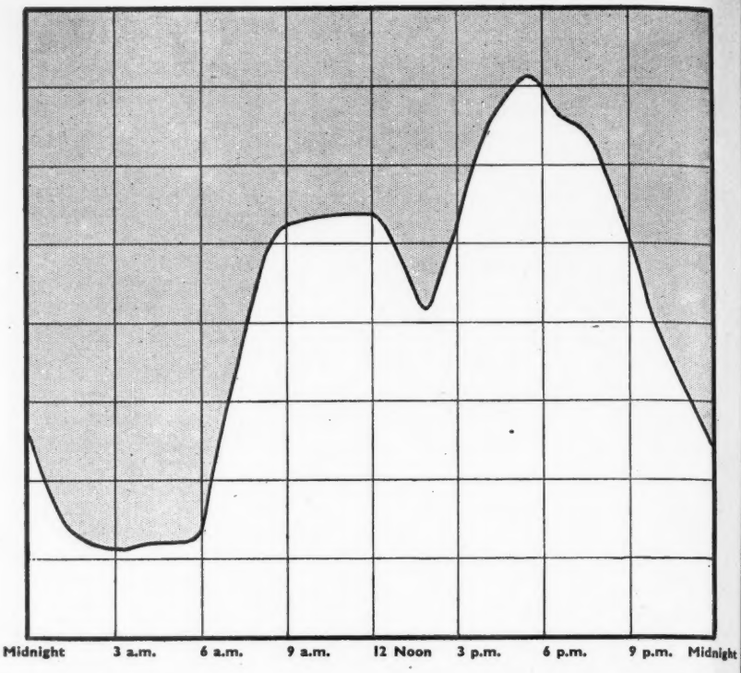


TYPICAL LOAD CURVE OF ELECTRICITY SUPPLY UNDERTAKING ON WINTER'S DAY

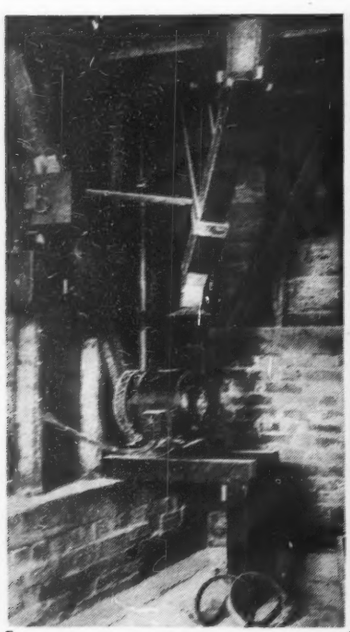
War Conditions *(main peak has shifted to the 8 a.m.—12 noon period)*



TYPICAL LOAD CURVE OF ELECTRICITY SUPPLY UNDERTAKING ON WINTER'S DAY

Pre-war Conditions

Electrical energy cannot be stored in bulk, therefore generating plant must be capable of meeting peak load demands. The supply engineer is concerned to develop and encourage uses of electricity which will fill in the valleys of his load curve, without accentuating the peaks. The urgent call for electricity in rural areas (whose maximum and minimum demands occur at different hours from those of urban and industrial areas) provides one of the opportunities for balanced development. Unfortunately the capital costs of rural transmission are high and the load factor poor. **8,** electric drive in a country mill. **9,** threshing by steam power. **10,** cutter-blower delivering silage.



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ITY

DAY

3 THE LOAD FACTOR

Anon.

The load factor is related to the way in which people use electricity rather than to the actual siting of power stations, but it is an important and basic matter which should be made clear to those outside the electricity supply industry.

TO the electricity supply engineer the term "load factor" is significant and important. It shows the degree to which his supplying capacity is loaded or used.

This capacity means very high capital investment whether in the form of generating stations, transforming and switching stations, cables, overhead lines, or combinations of these things.

Electrical energy cannot be stored in anticipation of demands, so that generating plant, transmission system and distribution network must be capable of meeting the maximum demand of all consumers at any moment at which they care to use electricity. The operating conditions of this public service are that it shall meet any demand instantaneously; there is no possibility of storing up calls on the service for later answer as in the telephone service. There is, then, a need for large producing units, for adequate reserve capacity and for a substantial distribution network.

Evidently, a very large investment in plant is needed to give an efficient service, and the consumer pays part of his bill—the fixed charge—to contribute towards the capital costs of equipment which provide immediate use of electricity on demand. Further, unlike the manufacturer who has an unlimited market, the supply undertaking is limited to distributing and selling electricity within a restricted market, a specific area of supply. These operating conditions, clearly, make the extent of usage of electricity important, for both capital and running costs have to be covered by the revenue received from the various consumers available within the area.

So, generally speaking, the greater the number of consumers connected, and the more units of electricity they use, the better will be the situation for both supplier and those he supplies. But a great deal depends on how these consumers use electricity. Consider a typical position. The public has been told of the strain on the generating resources of the country at certain hours of the working day—from 8 a.m. to noon. This is when the greatest demand is made today, although in pre-war conditions, the biggest peak demand came between 4.30 p.m. and 6 p.m., the secondary peak period being between 9 a.m. and noon. Now, the intense manufacturing activity, added to increased domestic cooking and heating and office heating, has shifted the peak. The former heavy shop and street lighting loads of a winter's evening have been greatly cut down.

The load decreases steadily after about 5 p.m., has a slight plateau around 9 p.m. and then drops more steeply to midnight. The pre-war load curve generally started its rapid drop about 7 p.m. and did not pause on the way down. But, on both pre-war and war-period representative curves, the slackest period is between midnight and 6 a.m. Such periods of low load are inevitable and are, of course, relatively uneconomic in use of plant compared with an ideal 24-hour load which keeps steady at the maximum demand figure, and has no valleys.

If the plant were working at its maximum demand throughout the year, i.e., for $24 \times 7 \times 52 = 8{,}760$ hours, there would be a condition of 100 per cent. load factor. In practice, no such theoretical condition can be attained because the chief demands for electrical energy have their own characteristics of time and amount. Consumers have their habits.

The matter is more clearly seen on a typical load curve. To illustrate the point and to show what has happened during the war, two characteristic load curves of a supply undertaking are shown on the facing page. These are both representative of winter conditions, since it is during a winter's working day that the peak of the year occurs. If a line is drawn across a load curve at the point of maximum demand, the large areas which indicate unused capacity are evident between this line and the curve. The load factor is expressed by supply engineers in the following way:—

$$\text{Load Factor} = \frac{\text{Actual units used in year (kilowatt-hours)} \times 100.}{\text{Maximum Demand (in kilowatts)} \times 8{,}760 \text{ hrs.}}$$

From what has preceded, it follows that to improve load factor is a prime concern of the electricity supply engineer who wants to run his undertaking efficiently. In his development policy he must always be seeking ways and means of cultivating and encouraging uses of electricity which will use idle capacity during slack hours, which will fill up the valleys of his load curve.

Conversely, he is bound to regard with mixed emotions all new demands which come on top of his maximum peak. He will, therefore, tend to encourage certain types of load and classes of consumer within his supply area. But it is evident that he cannot control people's habits of using electricity. Every kilowatt of equipment connected may be switched on at some time and will use so many units. The engineer's job is to get the most units out of the consumers' connected load, and within reason to get these demands at the hours when consumption can make its most economic use of the supply network.

Among those loads which are helpful in this respect are such equipments as electric thermal storage plants and battery charging. Since the electric thermal storage plant is using electrical energy mainly at night, during the times of slackest demand, it is welcomed by the engineer and he quotes special "off-peak" night rates for this class of load. It is improving his load factor. Similarly the charging of batteries is generally arranged to take place at night and at other off-peak periods, so we would expect the engineer to encourage this work. It is bound up with the use of batteries at telephone exchanges and with battery vehicles. In a rural area generally the number of consumers per mile of line is small, their average consumption is moderate, the service costs of maintenance, meter reading and "paper work" are relatively high, and the revenue is moderate. But rural areas differ widely and much depends on the way in which population is distributed and on the prosperity (or otherwise) of local or regional agriculture. Since the mechanisation of farming is accelerating, electrical methods are extending more deeply into farm processes, and the problem of load factor has been studied by research engineers.

The now well-known Essex Mill was developed through research into the improvement of load factor in barn machinery. Corn grinding was being done by a certain type of mill, the plate mill, manually operated and driven by an electric motor of from 5 to 15 h.p. Research produced a new, smaller type, the hammer mill, with automatic control for night running and driven by a motor of about 3 h.p. This mill runs for a longer time, but at night, and can be set to run for a given number of hours to grind a given quantity of corn. The night tariff for electricity is lower than the day tariff: the connected load has been reduced: the load factor has been much improved—and the labour formerly occupied in attending to the heavier plate mill during the day is available for other farm work. This is an instance of a practical solution to a particular problem of improving load factor.

During the war, although there have been restrictions on extension of electricity supply to rural consumers, the electrification of farm processes has continued. The majority of rural supply undertakings in Great Britain are now showing load factors of just over 40 per cent. which is a very satisfactory figure. Even on farms, difficulties of maximum demand conditions arise. For instance, an electric sterilizer may be as heavy in connected load as 20 kilowatts in rating. In such matters, the supply undertaking should be able to point out its technical difficulty to the farmer and ask him to use this heavy duty appliance at times clear of the supply system's peak. There is, in addition, the factor of diversity of farm loads. Not every farm will be using the same appliances at the same time, so that the incidence of loading will be different. This factor of diversity is, of course, present in all circumstances and depends on habits of use and variations in consumers' methods of living and working. For example, if there are 100 farms each having a cooker of 5 kilowatts rating, the supply undertaking will not expect to have 500 kilowatts of demand thrust upon it at any moment. The diversity factor may be 10 : 1, so that the sum of maximum demands of these farms at any moment may not exceed 50 kilowatts. A high diversity factor, like a high load factor, is a helpful condition of development.

The problems of balancing load economically are seldom easy. For example, in the north of Scotland there arises the difficulty of balancing up the demands on steam power generating stations and water power stations.

These stations have different characteristics. Where a water-power station has ample storage capacity behind it in the form of reservoirs which can be used to apply power quickly, the position is "flexible," for sudden demands at various times of the day can be met. But where a water-power station is supplied by a river without adequate storage dams, the power available (kilowatts) is not constant and may not be available at the moment it is required. In these circumstances the station resembles certain types of tidal power stations, which can produce enormous quantities of units of electricity at certain times but not at all times. They need the balancing "flywheel" of storage dams, involving large expenditures of capital. So the economics of a large and complex regional power system are peculiar and must be bound up with the region's capacity to use power and develop its uses. As noted, there are always the two basic factors of a demand for power in the sense of kilowatts or horse-power, and demand for the units generated and made available by that power. Sound development means more and more units per kilowatt of demand.

Load factor is the criterion of the utilisation of capacity and the electrical engineer's dream is of consumers who have high load factors, keep away from his peak demand for power and conscientiously fill up all the valleys in the load curve. His task in a nicely balanced urban community is relatively easy in comparison with his task in a vast rural region. But planning of the development of the resources of such a region can do much to make the most of electricity supply. It is a job for co-ordinated planning. The industries derived from agriculture and fishing, the small local industries of rural communities and the specific industries which migrate to rural sites because power is there, together with the industry of electricity supply, make up one economic unit.

4 ELECTROCHEMISTRY AND ELECTROMETALLURGY

E. F. Armstrong

What are the electrochemical and electrometallurgical industries and what are their requirements in materials and power?

IT is a commonplace that factories large or small require increasing amounts of electricity for power purposes; some industries use power in very large quantities relative to their output as, for example, the cement industry which needs power for grinding into very fine particles both the rock and the sintered clinker. These factories utilise power mainly for turning wheels, but there is another group of industries in which the electric current plays a part as such in the manufacturing process and consequently extremely large quantities are required. These industries are the electrometallurgical, making in particular aluminium and magnesium, and the electrochemical typified by calcium carbide but including also electrodeposition and other "last word" activities in the chemical application of the electric current.

It is desirable to discuss aluminium, magnesium and carbide in somewhat greater detail in order to realise their impact both on the national welfare and on national defence. The two metals named have the property in common that they are very greedy for oxygen which means that they revert to oxides if exposed to the atmosphere under the right conditions. Their preparation is thus outside the range of ordinary metallurgical operations such as produce iron or copper by smelting, and consequently their manufacture in quantity has had to wait until suitable electrometallurgical methods were developed which involve the separation of the metals by electrolysis.

The manifold uses of aluminium in peace time were well understood before the war; they were continually and rapidly being extended as the price grew less and knowledge of what could be done with the metal and its alloys extended. Aluminium is a light metal in weight, hence its use in the aeroplane industry and its importance in war both in planes and in innumerable other pieces of war equipment.

No first-class power can afford for a moment to be out of the aluminium industry. The favoured raw material is a clay bauxite, of which there are deposits varying in magnitude and in purity in many countries, particularly in France, British Guiana and elsewhere.

To prepare metallic aluminium, the oxide made from bauxite is dissolved in fused cryolite and subjected to electrolysis in iron pots lined with carbon. Large quantities of power are required per ton; this must be as low as possible in cost and hence the association of the aluminium industry with water power: the factory should be adjacent to the power station. The earlier factories were at the falls of the Rhine at Schaffhausen, Niagara, and Kinlochleven in Argyllshire. The largest American-owned factory to-day is in Northern Quebec where water power is particularly abundant at very low cost.

Magnesium is the younger brother of aluminium and may be described as a war baby. It is made by the electrolysis of the fused chloride using direct current; the magnesium droplets rise to the surface and float, they are then dipped out periodically with perforated ladles. The design of the cells has given the inventors many a headache and there are to-day several competitive processes.

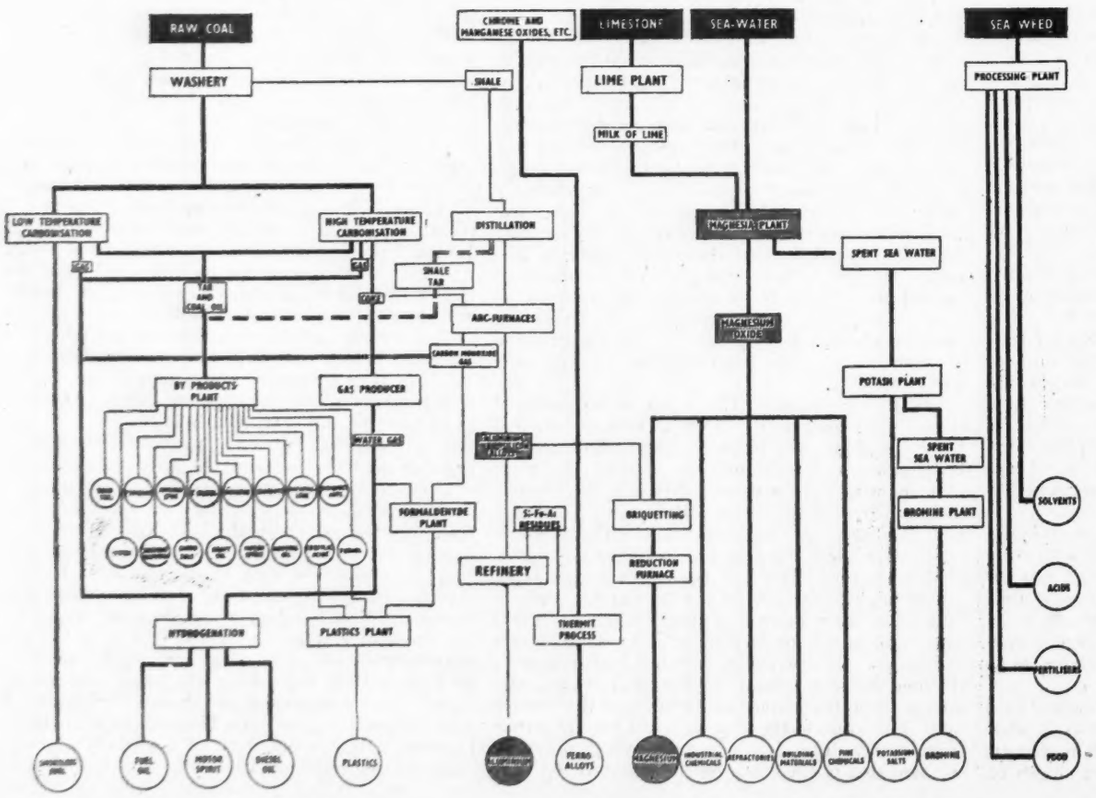
Whereas the use of aluminium instead of iron or steel saves 60 per cent. dead weight, the use of magnesium increases the saving to 75 per cent. Hence the enormous demand which has arisen for magnesium, used—it should be said—in the form of alloys in aircraft. Its properties should make it equally valuable in peace, in the transport field and elsewhere where lightness is important, as in household appliances.

The magnesium industry began during the last war, languished during the peace years and has been taken up again with tremendous vigour since 1939. The main developments are in the U.S.A. and possibly in Germany. But this country also was early in the field, and we possess our own magnesium plants. An interesting point about magnesium production is the source of the ore. The best material, magnesite, is not widely available and a search was instituted for suitable magnesium minerals: at an early state both here and in America resource was had to the sea, and successful large-scale processes have been developed to recover magnesium salts from sea water.

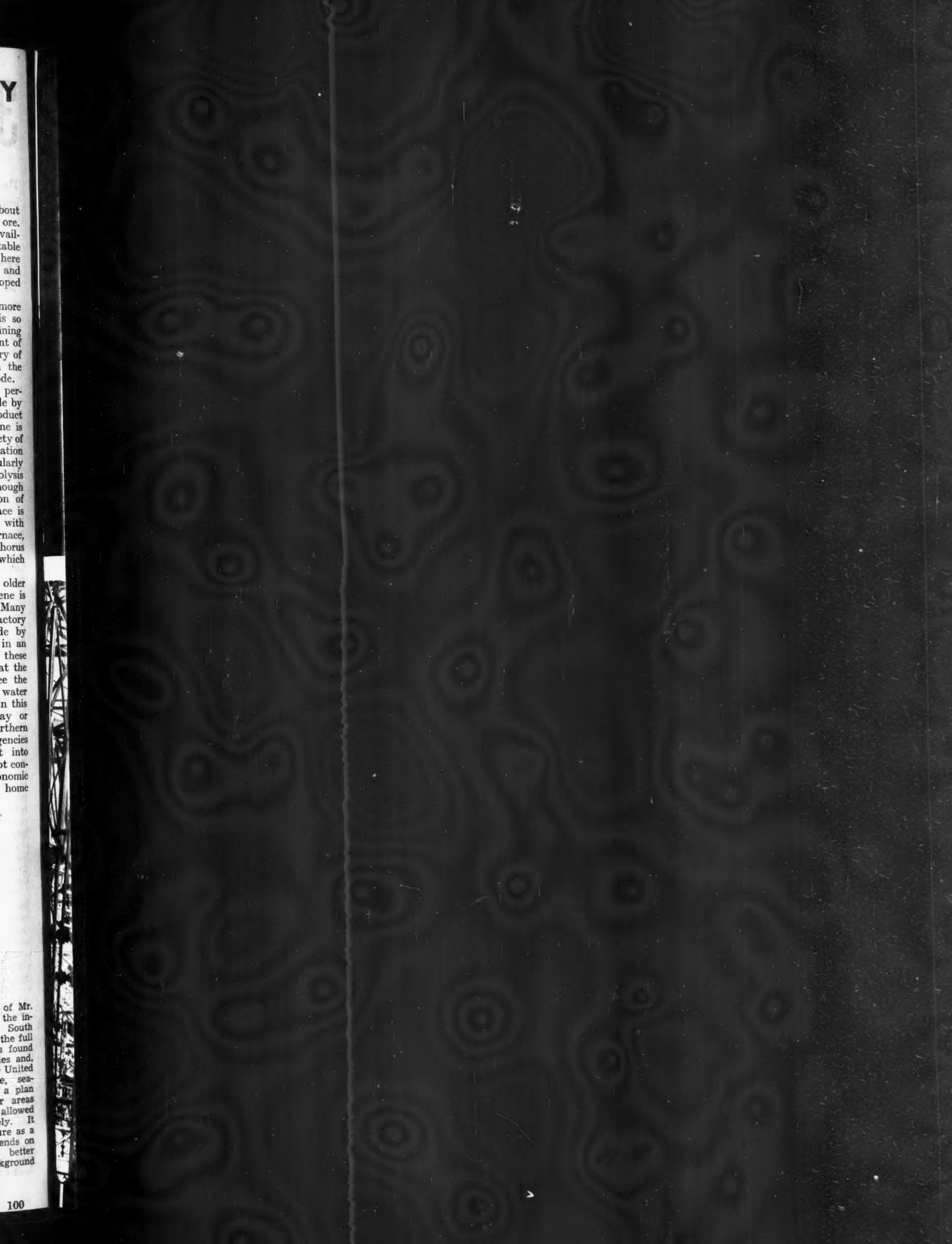
The electric refining of metals is becoming more and more common. Nearly half the zinc is so treated, whilst with copper the result of refining is an increase in conductivity, an improvement of rolling and drawing qualities, and the recovery of the gold and silver present as impurity in the copper, which collect in the sludge at the anode.

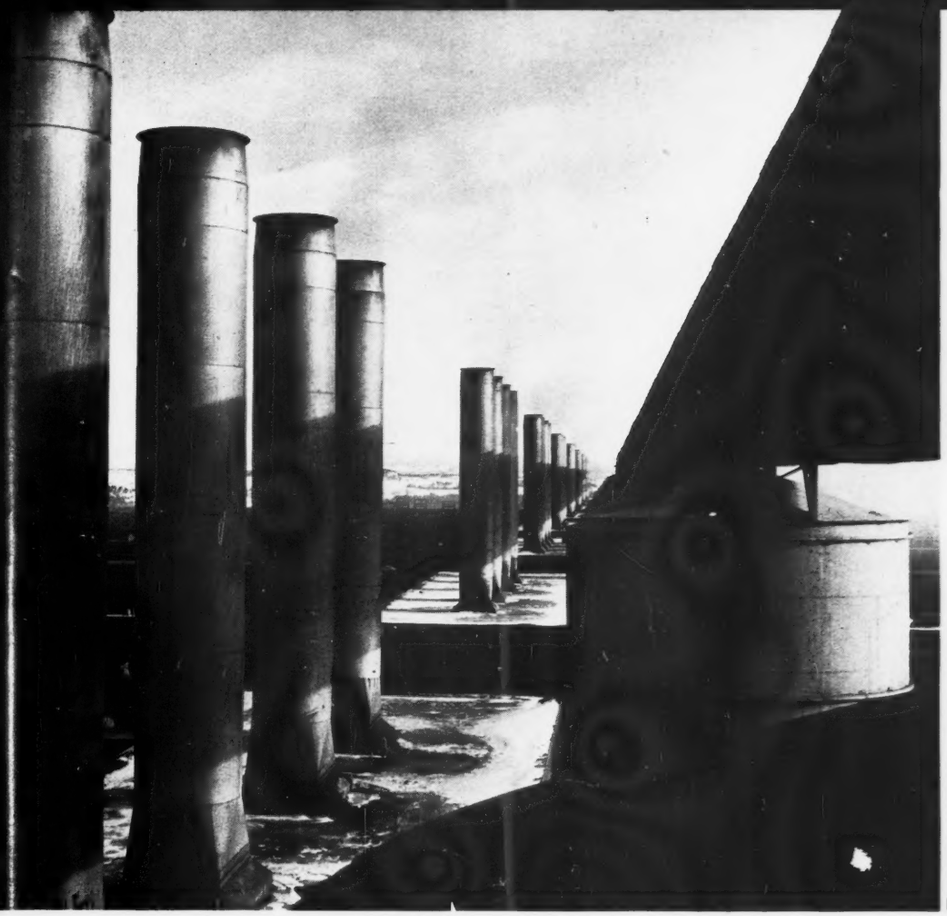
Coming to the electrotechnical industries, perhaps the outstanding product is chlorine made by the electrolysis of common salt: the other product is caustic soda. Most of the world's chlorine is made in this way. Hydrogen, used for a variety of purposes, including the large-scale hydrogenation of mineral oils and vegetable fats (particularly when purity is essential), is made by electrolysis of water. The other product is oxygen, though this is made more cheaply by fractionation of liquid air. A product of the electric furnace is phosphorus, made by fusing phosphate rock with carbon and silica in a closed electric furnace, fitted with a condenser up which the phosphorus vapour and carbon monoxide pass and in which the former condenses.

Carbide is a material well known to the older motorist. By dropping water on it acetylene is produced, which gives a brilliant light. Many isolated country houses still have satisfactory acetylene lighting plants. Carbide is made by strongly heating lime and carbon together in an electric furnace at about 3,000°C. As both these ingredients are low priced it is essential that the cost of electricity shall be very low, hence the association of carbide plants with large water power schemes. Most of the carbide used in this country came from Norway or from Shawinigan in Northern Canada; to meet war urgencies plants have been brought into production here but it is not considered that they will be economic when peace comes, with home costs of electricity.



The diagram outlines part of Mr. W. C. Devereux's Plan for the industrial rehabilitation of South Wales, which was based on the full utilisation of raw materials found in abundance in South Wales and, indeed, in many parts of the United Kingdom: coal, limestone, seawater and seaweed. Such a plan could be applied to other areas where industries have been allowed to develop indiscriminately. It indicates that Britain's future as a great industrial nation depends on increased efficiency and better organisation, against a background of Research.





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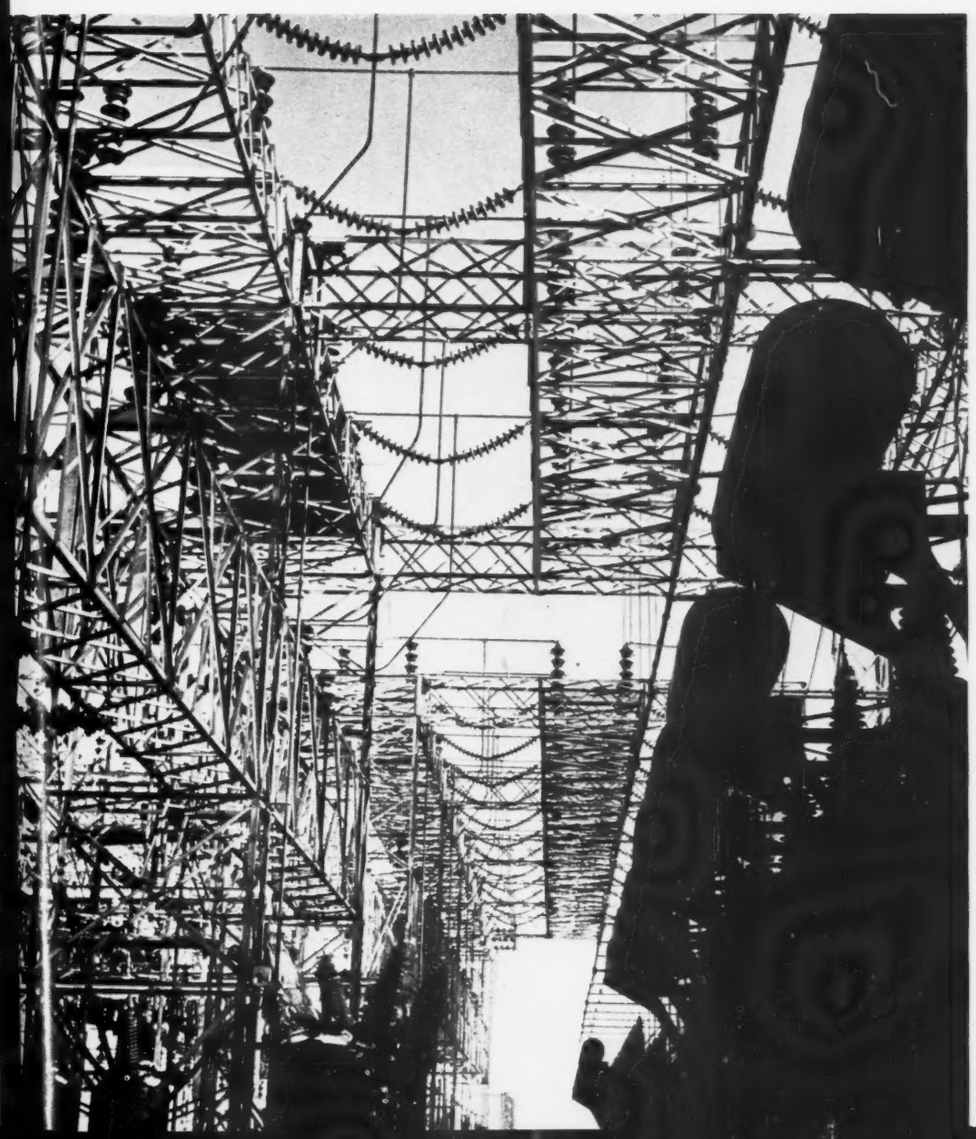

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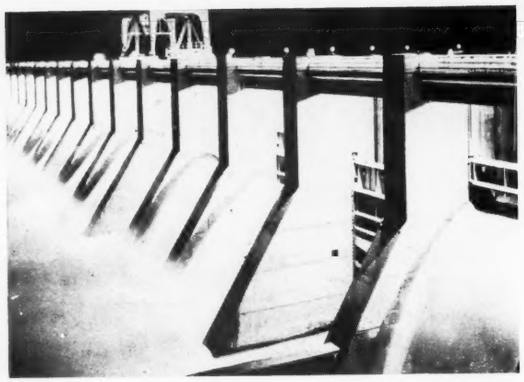
One metric ton of aluminium requires three to four horse-power-years of electric energy to produce it, four to five tons of bauxite and four to five tons of coal, in addition to sundry other materials. The giant plant at Arvida, Canada, **11,** situated close to the mighty hydro-electric generators of Shipshaw, is said to refine sufficient aluminium to supply the whole of the present needs of the British Empire. The banks of transformers and the switchgear at Arvida, **12,** control one million horsepower every hour —for comparison the two small existing aluminium refining plants in Scotland between them barely generate and consume as much power in a whole month. **13** and **14,** part of an inland magnesium plant near the Grand Coulee Dam, U.S.A.: the magnesium hydroxide sludge is concentrated in immense tanks, eight feet deep and 250 feet in diameter, before extraction of the metal in special plant.



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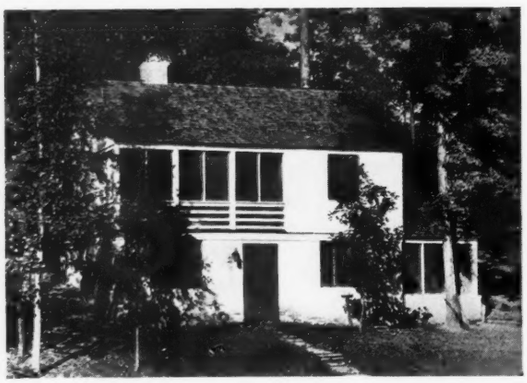

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The great United States and little Switzerland have both planned for electricity in its regional setting. By their care they have created, not only a new supply of power which has brought new prosperity to the people of the region, but also a new beauty in the landscape. The United States: **15,** Flood disaster. **16,** Flood waters harnessed. **17,** Soil erosion. **18,** Erosion checked. **19,** Human poverty. **20,** Prosperous homes. Switzerland: **21,** The valley of the Sihl near Einsiedeln. **22,** The beauty of a new lake.

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5 ELECTROTECHNICAL INDUSTRY AND HIGHLANDS

R. Gilmour

The Cooper Report on Hydro-Electric Development in Scotland held out great hopes for the establishment of electrochemical and electrometallurgical industries in the Highlands. How far are these hopes justified?

IN recent years the future of electrochemical and electrometallurgical industries in this country has been actively discussed—mainly in connection with the hoped-for development of cheap hydro-electric power in the Highlands of Scotland.

The chances of cheap power from this source are remote. Already most of the favourable sites have been developed, and even they do not produce cheap power as it is known in Canada and the U.S.A., i.e. power of the order of one-tenth of a penny per unit.

Of the remaining possible sites, it can be said that no single watershed is capable of developing sufficient power to supply a modern carbide factory of reasonable size. Consequently the expedient is resorted to of diverting rivers from other watersheds by means of aqueducts and tunnels, which is entirely against the best civil engineering practice. Ignoring the question of the value of amenities these diversions are extremely costly. For instance, the recently published scheme for Loch Sloy in Dumbartonshire is to cost £4,000,000 and the maximum power which can be produced 24 hours per day is 12,000 kilowatts, which is barely sufficient to run one modern carbide furnace, let alone a carbide factory. The corresponding cost for a steam-power station to produce 12,000 kilowatts continuously would be about £360,000—£400,000. Before the war, the cost of power from steam and from water were nearly equal, and it was estimated that the cost of carbide made from water-power in the Highlands and from steam-power in Wales differed by only a few shillings per ton.

Calcium carbide imports from Norway ceased during the war, and Wales now supplies our requirements. The cost of production is of course higher than it would have been pre-war—coal and coke are much dearer—and the suggestion appears to be that production should be transferred North, where it is hoped to get cheap hydro-electric power. Wales is ideally situated for carbide—it has both coke and the necessary quality of limestone, and pre-war could produce electric power from steam at practically the same price as the best water power stations in the Highlands, where there is no coke and the limestone is of poor quality. The price of coal must, however, come down again, otherwise we shall lose our position as a manufacturing and exporting country.

For some electrotechnical industries, proximity to raw materials is just as important a point as cheap power. For instance, the manufacture of chlorine and caustic soda, which are made from salt brine, can only be carried out at or near the brine wells. Aluminium is made in Scotland from water power, but as the raw material, bauxite, has to be imported, and the water power is much dearer than in Canada or U.S.A., it cannot compete in cost of production with those countries. Incidentally, their production of aluminium is now ten times their pre-war requirements and magnesium fifty times. There is therefore likely to be a slump in post-war prices.

Ferro-alloys are made in this country and also imported, but as their manufacture requires the importation of manganese, chromium and tungsten it does not appear to be important, from the point of view of self-sufficiency, whether the raw materials or the finished products are imported.

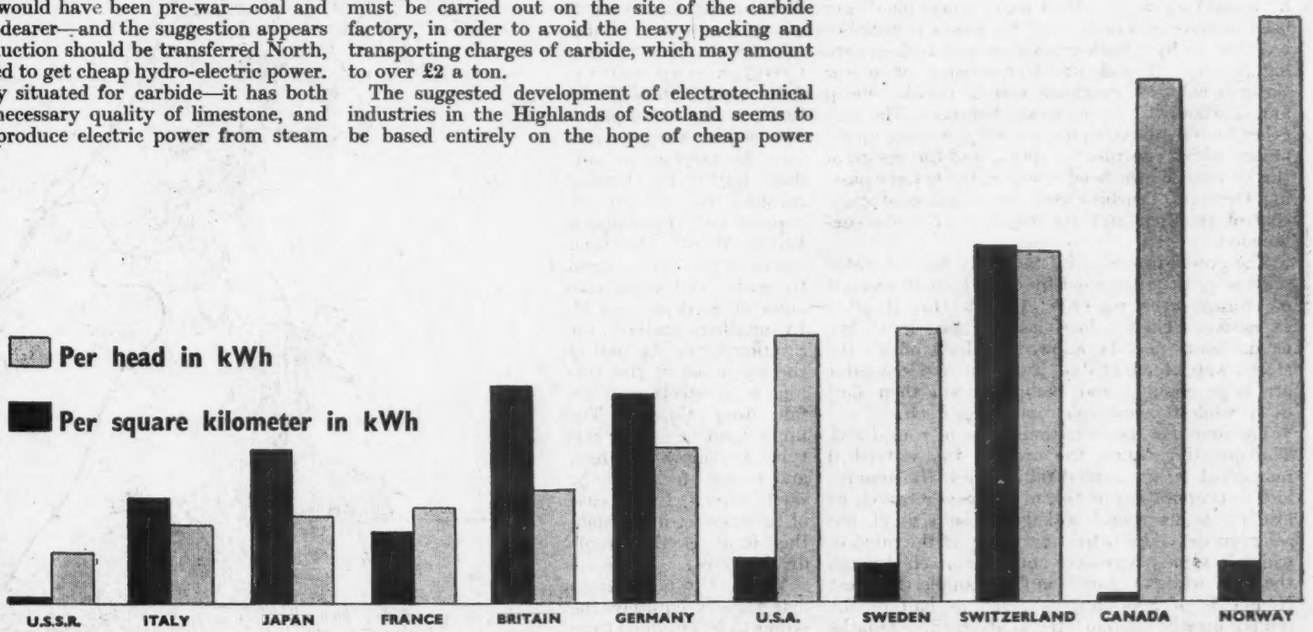
It has been suggested that calcium carbide is an important material for the manufacture of organic chemicals. So far as this country is concerned this is a fallacy. An examination of the cost of production from carbide of such things as acetic acid, butanol, acetone, etc., shows that this would not be economic, in face of competition from an alternative raw material, namely, the by-product gases from oil cracking in the U.S.A. For one or two high priced products only can carbide reasonably be employed.

The manufacture of chemicals from carbide must be carried out on the site of the carbide factory, in order to avoid the heavy packing and transporting charges of carbide, which may amount to over £2 a ton.

The suggested development of electrotechnical industries in the Highlands of Scotland seems to be based entirely on the hope of cheap power which cannot be available, owing to the difficulties, unless it is heavily subsidised. Raw materials would have to be transported to out-of-the-way districts. The industries employ relatively few people, and the type of labour available in the North is not suited to this type of work.

Small electric generating schemes, such as those proposed for Loch Morar and Loch Alsh in the Highlands, might provide light and power for local consumers, but would be useless for electrochemical industries as they demand a constant supply of power. The Loch Sloy scheme is, however, only intended to feed electricity direct into the Grid in order to assist the peak load demands—and most of the projected schemes seem to be of this type.

The future of the electrotechnical industries would seem to lie in the Midlands rather than in the far North. Transport is better, raw materials more accessible and power from steam can be developed anywhere, at a much lower capital cost than water power, and at a similar cost per unit, provided the cost of coal comes down and, as it must come down if we are to survive, we may assume that it will.



Before the war Britain lagged behind several other countries in the amount of electricity generated per head of the population but occupied a position second only to Switzerland in respect of electricity generated per unit of national land area.

ELECTRICAL ENERGY GENERATED IN 1937

6 SMALL HYDRO-ELECTRIC STATIONS

Francis Baily

Certain grandiose hydro-electric schemes, proposed for the Scottish Highlands, divert water from many streams in order to obtain sufficient power to run large-scale generating stations. The electricity produced would be in excess of local demand but insufficient for electro-technical industry. It would be generated at considerable cost and exported via the Grid system to feed the main industrial areas of Britain. The Highlands need electric power to develop industries based on their natural resources : timber, fish, seaweed and above all agriculture. This can readily and economically be supplied by small-scale hydro-electric stations.

FOR the provision of power for electro-chemical or metallurgical purposes the small station is useless. These industries require large amounts of power, of the order of 30,000 kilowatts per hour and upwards, for 24 hours per day, and in this country it is hardly possible to generate such amounts of power at one particular point without robbing neighbouring districts of their natural water supplies, and this invariably involves excessively high capital costs.

On the other hand small schemes can be of considerable benefit to a locality : they can provide light and heating for a village, and probably power for a small sawmill or a motor repairing shop or nearby farms. The distances from the generating station being small, the cost of transmission lines is moderate and the cost to the consumer per unit need not exceed that of large schemes distributing through the grid system—indeed it may be less, provided the scheme is not a mere toy.

Such small water power stations can economically range from five kilowatts, suitable for the electric lighting of a single moderate sized house to some two thousand. The design depends less on the size than on the character of the river or stream from which power is obtained, and it may almost be said that no two schemes are alike. Many rivers run slowly with a fairly uniform fall of only a few feet per mile, while others fall rapidly ; these again may show a uniform slope or may consist of flattish lengths with rapids at intervals. The power is proportional to the volume of the water together with the difference of level between intake and turbine (called head of water).

The machinery of generating stations varies little, except in respect to the pressure or head of water by which they work. Most water power plants are used to drive generators and the power is distributed electrically. Both generators and turbines are highly efficient and the transmission of power through cable or overhead wire is equally cheap and satisfactory over moderate distances. The only other item in the equipment is the governor mechanism, which controls the speed, and the design of this depends on the head of water, the volume passing, the type of turbine used, the closeness of speed control required and the rapidity of action demanded.

The power provided by the daily flow of water may be greatly increased by quite a small amount of storage in a reservoir, though this is often expensive. Thus a load lasting only some five or six hours may be allowed to draw off all the stored water for that day, if turbine and generator are large enough, and the plant will then shut down while the reservoir replenishes itself.

The source of the water must now be considered. The quantity equals the area of the watershed multiplied by the annual rainfall, less the amount lost in evaporation or taken up by vegetation, or lost by underground leakage. The size of the reservoir depends on the uniformity of the rainfall, which in some places does not differ much through the year, while in others (as for example the West Highlands of Scotland) as much as half of the rainfall may be concentrated in about three months of winter. In such cases the reservoir will seldom be large enough to carry all the water in a wet year, for it is seldom economic to make a reservoir so large that it will carry the water from a wet year over to a dry one.

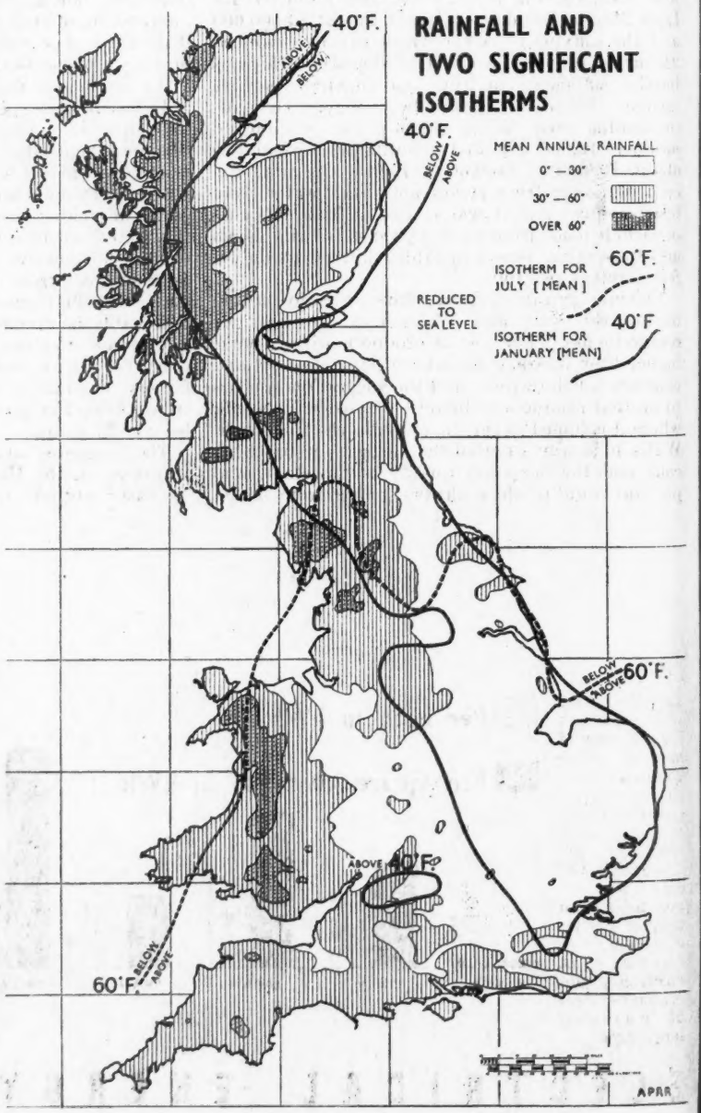
The pipe, lade (open ditch), or tunnel from the reservoir to the turbine house may be a considerable expense. Tunnels are the most expensive and open lades are the cheapest if they can be conveniently arranged. Obviously a lade can only follow the contours of the ground and must give place to a tunnel or be carried over a bridge where hill or valley intervene.

In considering the layout of a power station there are two extremes of conditions ; first a dam across the river, giving a few feet fall, the turbines taking up the full flow of water; secondly a high fall with a considerable length of pipe or lade. Between these limits the head of water and the flow may vary indefinitely, the output of power being the product of the two less some twenty or thirty per cent. of unavoidable loss.

A simple arrangement consists of a dam across the river which itself contains the turbines and generators. The water passes through openings in the dam straight to the turbines and out on the lower side. No lade or pipe is required.

The most usual arrangement of a power station consists of a reservoir and a lade, or pipes, or a tunnel finishing with one or more pipes, laid at as steep an angle as possible down to the station itself, where the water is distributed to the turbines through stop-valves. After passing through the turbines the water passes out, still at a high speed, into the tail-race or outflow, but if the turbine consists of a ring of cups or buckets—called a Pelton Wheel—the head ceases at the turbine and the water at the tail-race flows at moderate speed. In another pattern, the reaction type, the pull of the water below the turbine is as effective as the fall from above. The upper limit of fall for this type is thirty-five feet, and twenty feet may be safely used. In the case of turbines set in the dam this head is the whole driving force.

While it is not easy to determine accurately the power to be obtained from a river, its approximate value depends on a few simple quantities : the area of collection, the average rainfall per year and the head of water at the turbine. This gives the formula 0.0064 A.R.H: kilowatts, where A is the area of collection in square miles, R is the annual rainfall in inches, and H is the head in feet. R is the gross rainfall and must be reduced by 0.5 in dry areas such as the east coast of Scotland south of the Tay, and 0.9 on the wet west coast. The figure 0.8 is suitable for fairly moist places, and 0.6 for fairly dry ones. The annual rainfall over the British Isles ranges from 25 inches on parts of the east coast to 150 inches in a few places on the west. Between one year and another there is a total variation of some 16 per cent.

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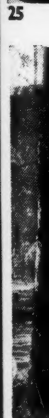
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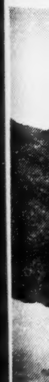
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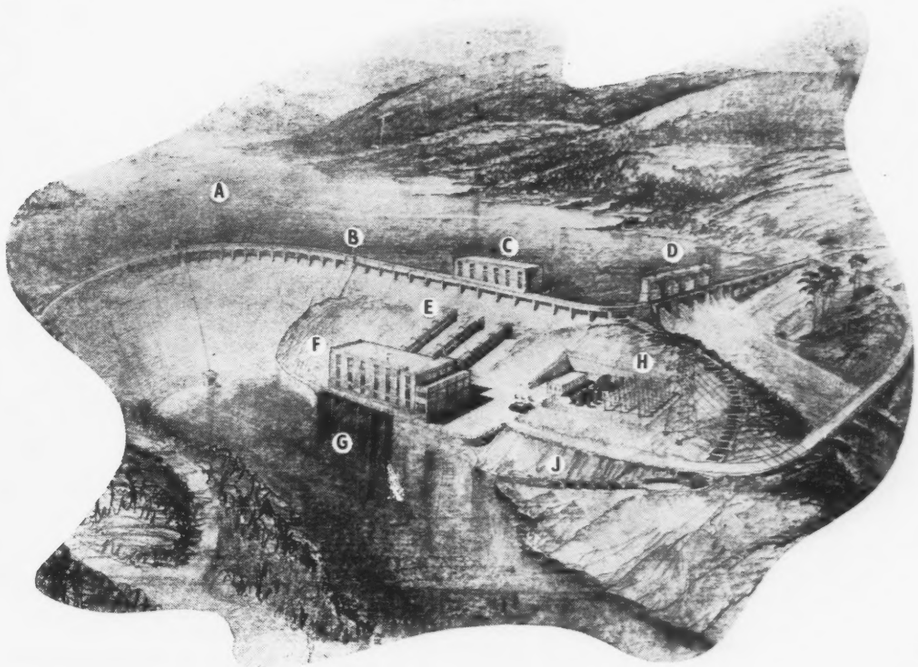

Diagrammatic layout of a Hydro-Electric Power Station.

KEY: **A** Reservoir, **B** Dam, **C** Valve House, **D** Flood Gates, **E** Pipe Lines, **F** Power House, **G** Tail Race, **H** Sub-station, **J** Fish Ladder.

A study of the water-resources of a region must begin with a detailed survey of most of its physical and social aspects going back over many years. Small hydro-electric plants could be installed on highland streams and rivers and economically provide light, heat and power for local use, without harm to the river valley and without damage to amenity. **23** to **27** are typical glimpses of Scottish river scenery: **23,** flood waters, **24,** Glen Tilt, **25,** River Lyon, **26,** River Dee, **27,** Glen Trool.

All hydro-electric plants should return the water used to the river-bed from which it was taken, otherwise the damage done may be irreparable. A hydro-electric generating plant needs either a substantial flow with a small head, or a large head with a smaller flow; in the latter case high-pressure pipe-lines must cut their way down the shortest slope. This calls for careful consideration of æsthetic values. **28** and **29** are Norwegian examples.

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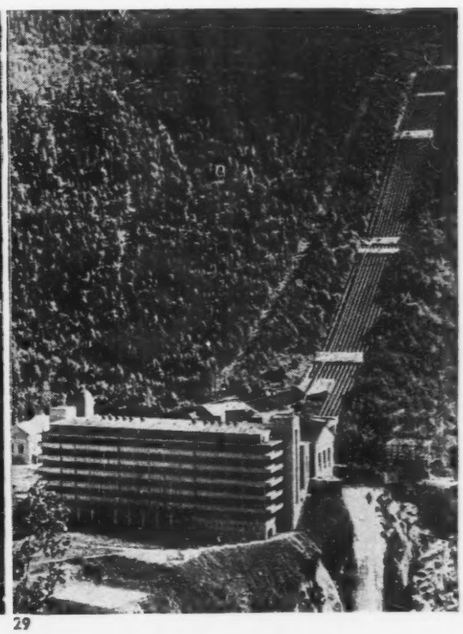

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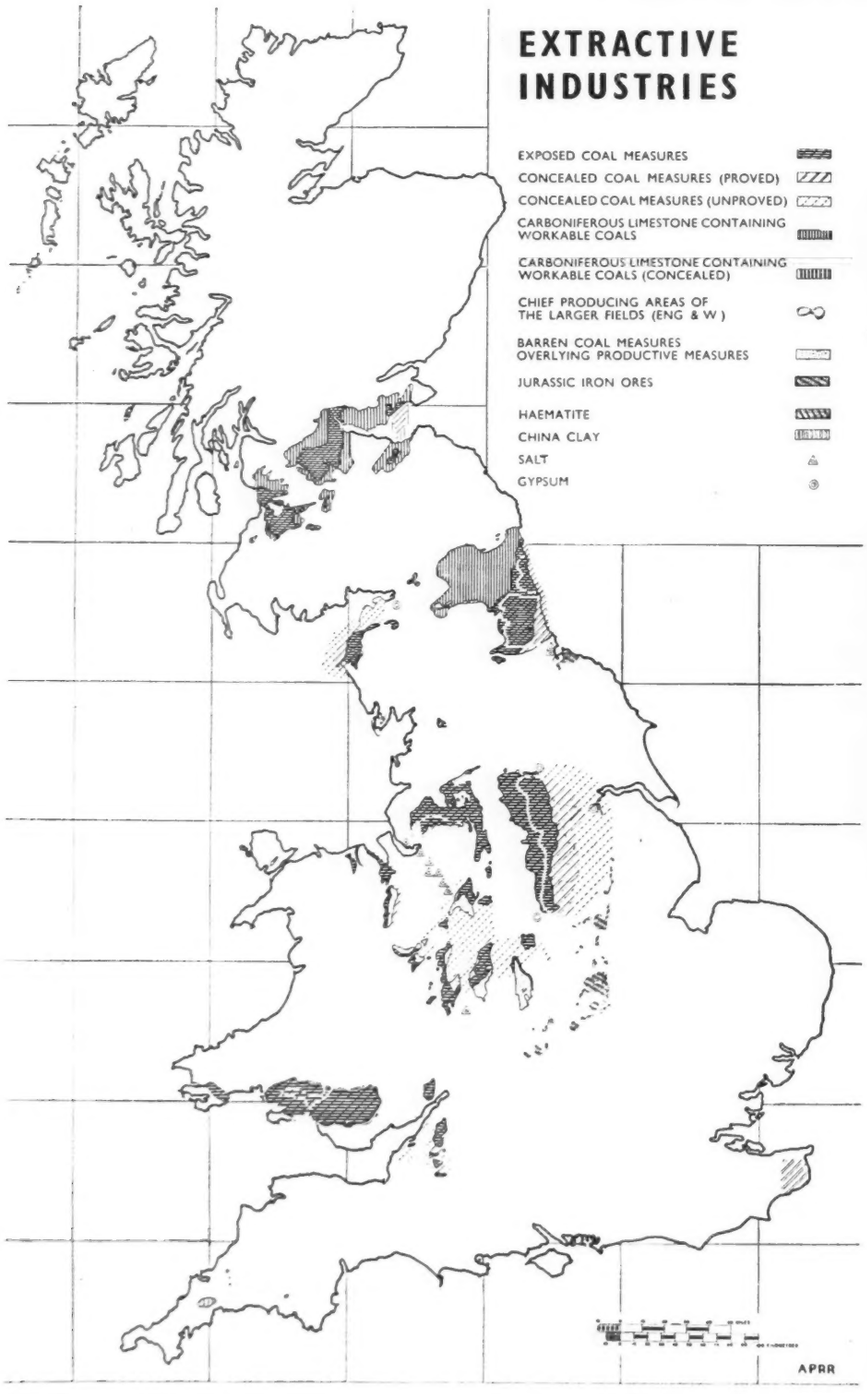
THE PROBLEM OF DERELICT AREAS *The Mining Districts*

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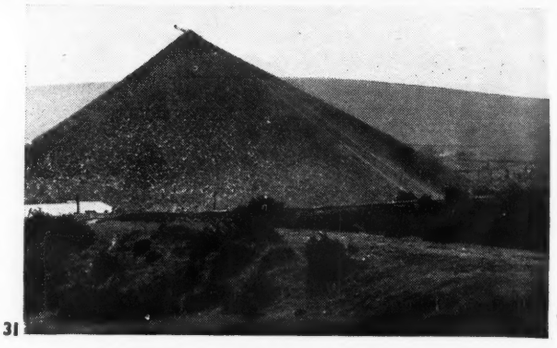
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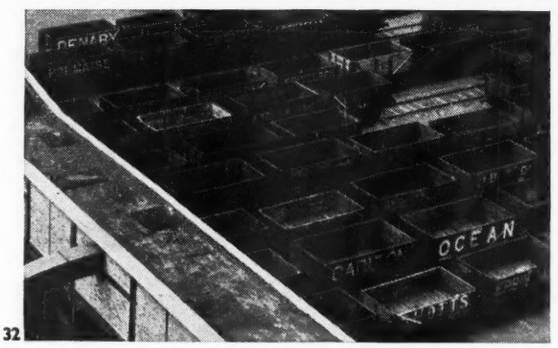

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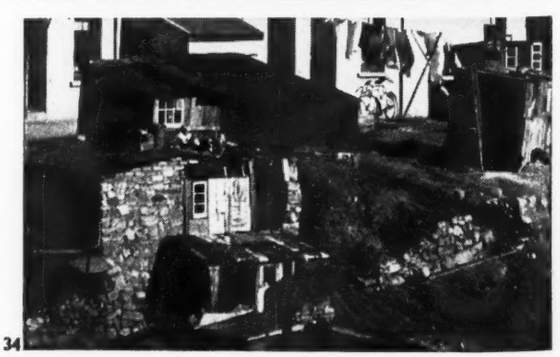
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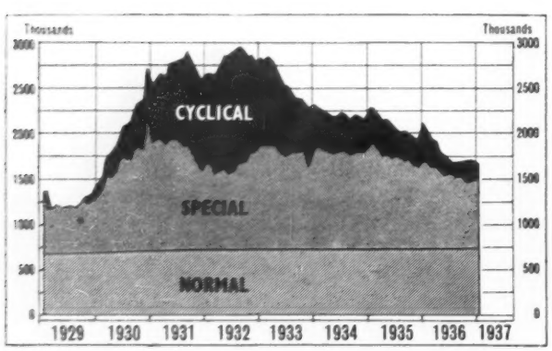
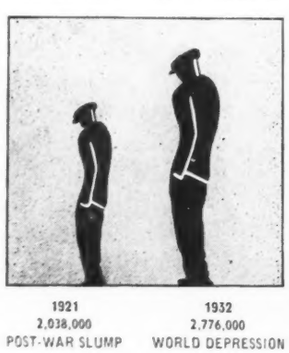
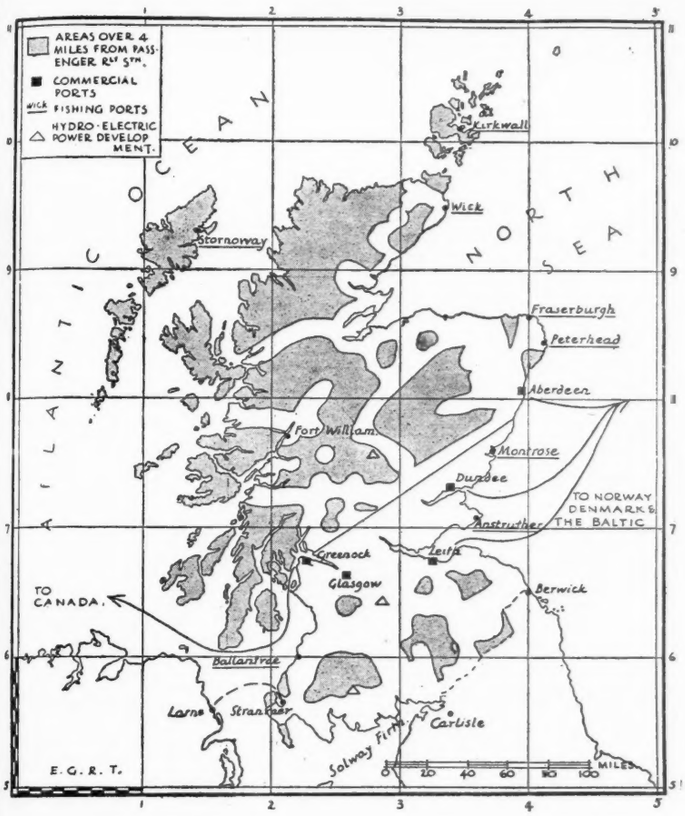


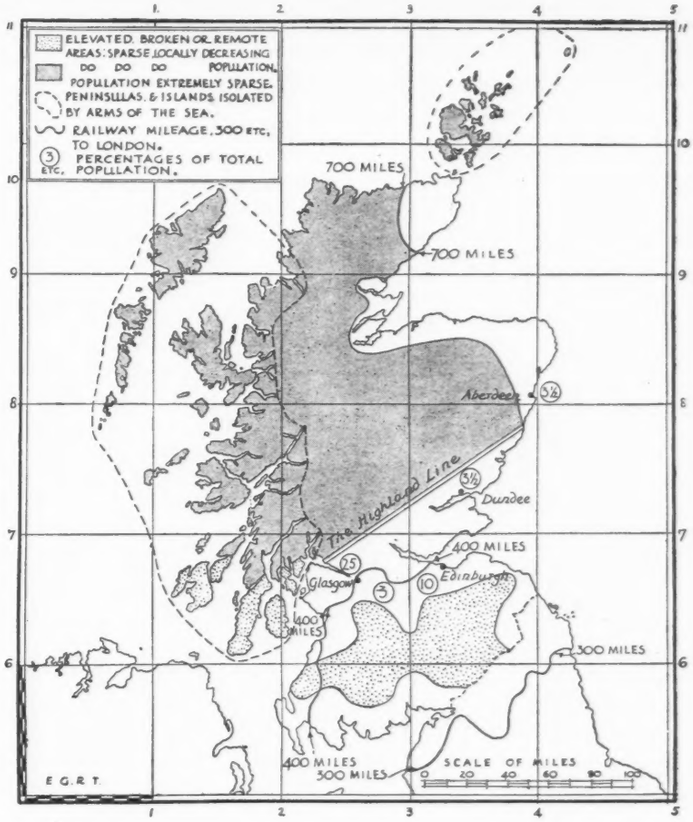


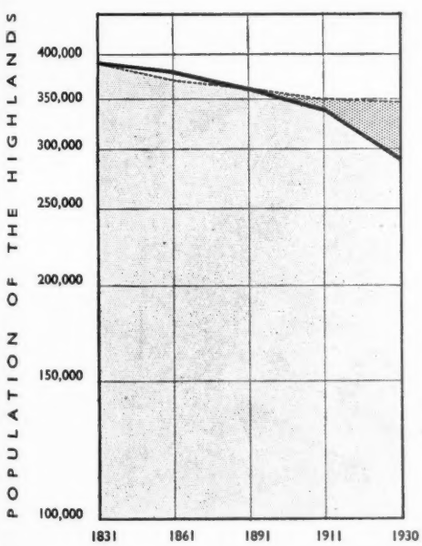
Extractive industry, after one hundred years or more of boom and slump, has left its mark. Landscape, communications, housing, towns and villages, people—all have been allowed to become decrepit. The single-industry town or village has no balance of employment and suffers accordingly. Reconstruction must follow comprehensive regional survey and plan. **30** pithead gear, **31** tip, **32** idle transport, **33** idle hands, **34** derelict houses. The two diagrams, bottom left, show the growth of unemployment between the wars.

THE PROBLEM OF DERELICT AREAS

The Highland Zone



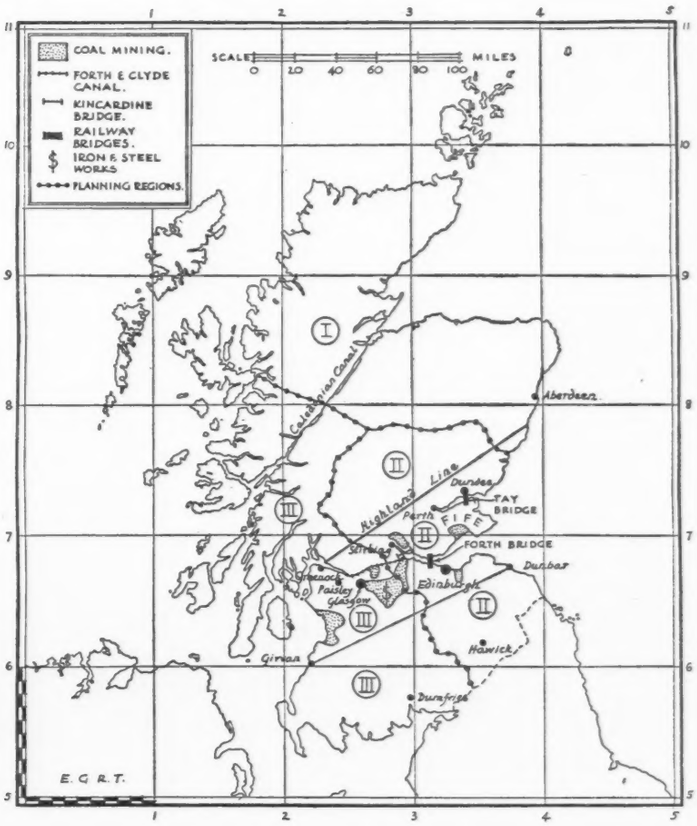




RURAL DEPOPULATION OVER ONE HUNDRED YEARS

The Highlands

Comparable curve for all Rural areas in Britain



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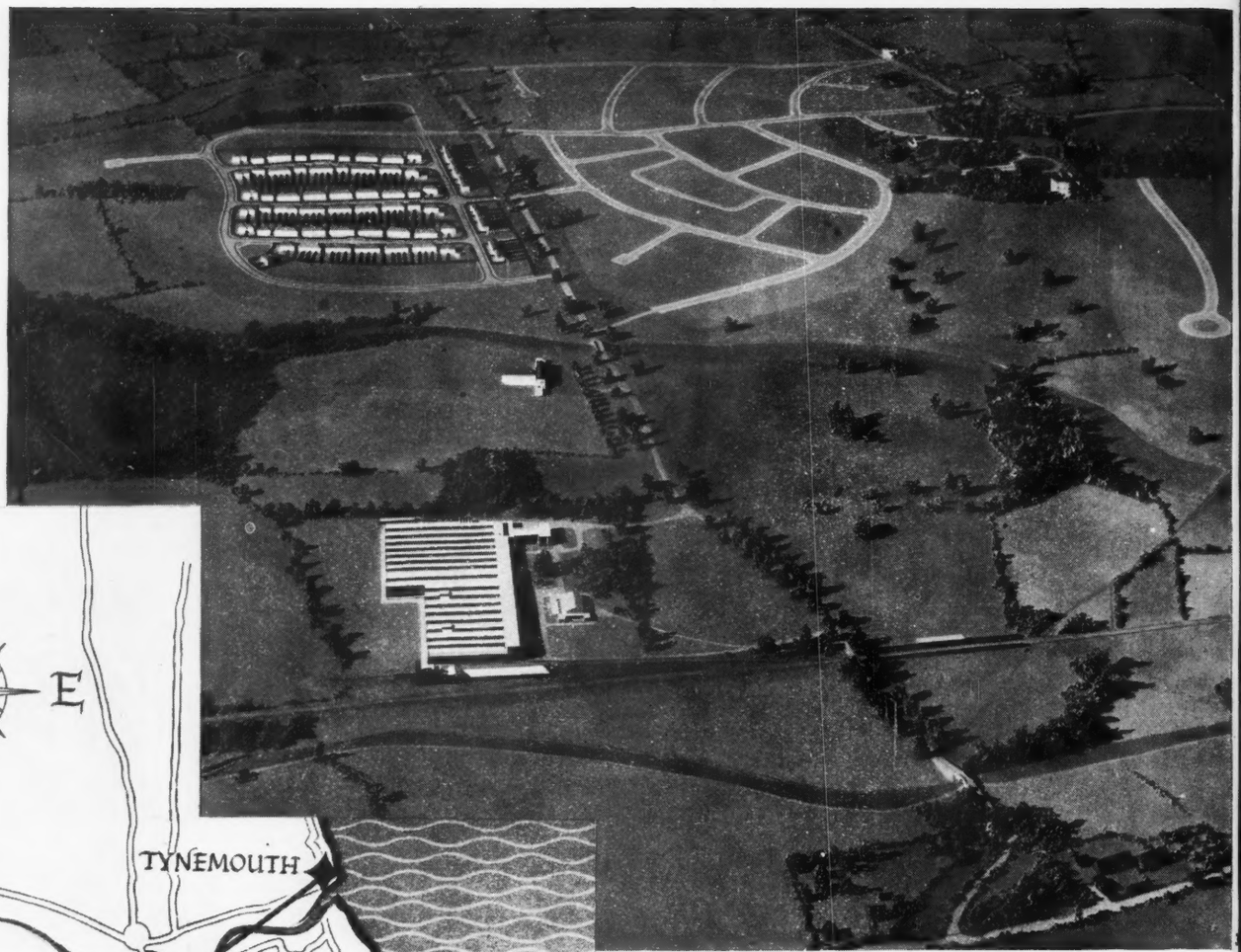
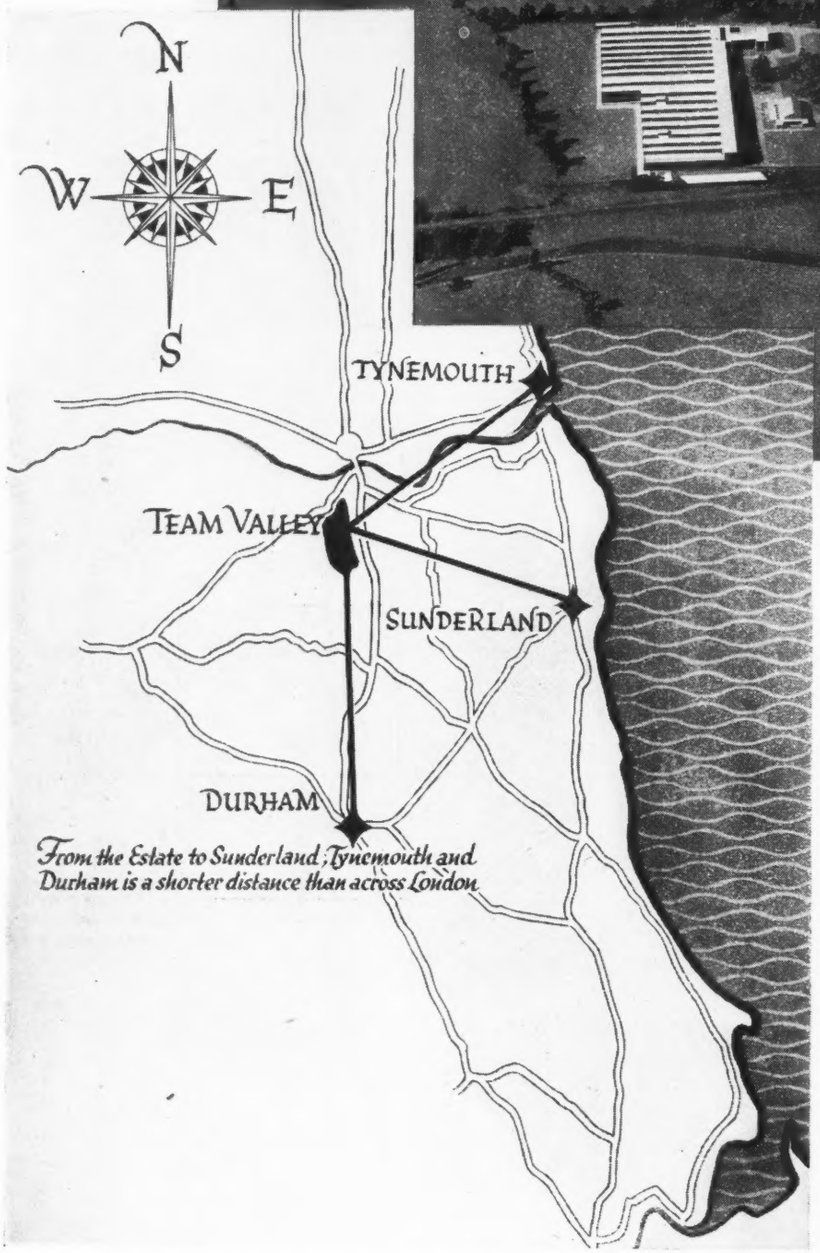
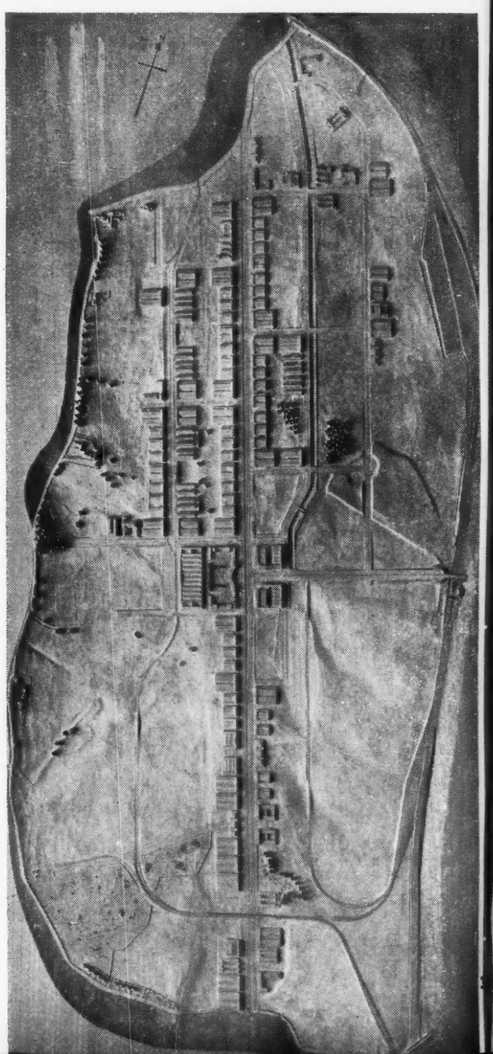
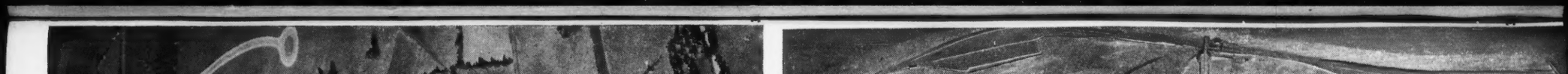
The circumstances of the Scottish Highlands are not dissimilar, except only that the peerless landscape is still almost without blemish. Communications are poor, housing is critical, the drift of population away from the highlands has been continuous, there is no variety of employment. Reconstruction must follow comprehensive regional survey and plan. **35** and **36** show crofts and crofters.







The new Wedgwood factory at Barlaston, Staffordshire, **37**, adjoins the main line railway and the Trent and Mersey Canal. The village school is placed halfway between the factory and a new village, as yet only partially completed. The Team Valley Industrial Estate, outside Newcastle, **38**, comprises a number of leasehold factories, each equipped with services and all facilities. The central siting of the estate comes out clearly in the map above. Barlaston and Team Valley represent two different experiments in the intelligent siting of industry.



7 SITING OF INDUSTRY—THE REGIONAL APPROACH

G. H. J. Daysh

The responsibilities and problems of siting industry are so great that they require a regional approach to ensure maximum benefits to a locality with a minimum of disturbance to its traditional character. To this end regional surveys, followed by regional planning—integrated on the national and on the local planes—will be necessary.

THE conception of the Region is no new thing but, as a land unit for sound and practical planning schemes, the Region is infrequently used. Many planning schemes are applicable to component parts of a Region, and are frequently weakened by two facts. The first that the boundaries have to be those of Local Authorities, and as a result do not necessarily embrace a coherent unit of the Region. The second that many of these schemes are evolved independently of those for adjoining individual or grouped local authority areas. Many of the resultant difficulties would be eliminated with the adoption of a Regional approach to planning. Through this approach there is the means of determining a guiding skeleton scheme which should represent the policy applicable to the Region.

The significance of the word "skeleton" must be stressed. For our present purpose we think in terms of a strong framework, capable of movement and adjustment with changing circumstances and needs. Man is not static, and our skeleton must not have a fixed rigidity. The siting of industry is one of the most vital elements in planning. The responsibilities and problems of siting industry are so great that attention must be given to the sum total of influencing circumstances—physical, economic and social—and to the fact that those circumstances are subject to change.

In this country, with its varied evidences of uneven adjustment to the environment, the production of the Regional skeleton plan presents particular problems, but it is imperative that certain guiding principles should be ascertained and that they should be linked up for the country as a whole.

Measures adopted in respect of the Special Areas demonstrated the need for the Regional approach to the problem of siting industry. The Special Areas displayed a marked absence of industrial balance, and one of the primary objectives was to secure a greater balance of industry through the introduction of new industries. At the present this policy is being resumed in the Development Areas.

The former Special Areas, now renamed (with adjustments) the Development Areas, are not necessarily economic and social entities. They are components of larger regions. The circumstances of a Development Area are reflected in the Region as a whole. Expediency may require the delimitation of those parts in greatest need, but pre-war experience would suggest that, in any rejuvenation of the economic and social life, conditions throughout the whole Region, and not simply in the specified portion, should be taken into account.

The ascertainment of the essential character of a Region involves an investigation and assessment of a wide range of facts. It demands an examination of the effects of exploitation of varied mineral resources and the establishment of basic industries—the growth of communities, their character, functional status and social conditions. All that is implied by these facts must be considered against the physical background embracing structure, topography, soils and climate. The process makes it possible to assess the particular needs of any one Region whilst accumulating material of special significance in the siting of industry. Localities whose circumstances justify priority consideration can be determined.

It is a diagnosis that must precede remedial treatment. The form of diagnosis may be standardised, but the nature of the remedial treatment in Development Areas will not necessarily be that applicable to regions in the Midlands or south-east England, but in all Regions, whatever their character, some form of remedial action will prove essential, and it is an inescapable fact that such action will be bound up with the problem of industrial siting.

Areas such as south-west Durham, the iron-ore mining area round Arlecdon and Cleator Moor in Cumberland and the Highland zone, north of the Caledonian Canal, show how necessary it is for the analyses of the problems of siting of industry to be comprehensive. It is evident, in each case, that the facts of the physical background are the keys to the economic and social circumstances. In the mining areas, analyses of mineral resources and their exploitation throw light on the causes of early expansion and later decay. Distinctive types of communities have developed and housing and services have been provided. With the depletion of the basic resources these remain as evidence of the former era of prosperity whilst also representing some degree of social capital. Examination of population and employment statistics shows only too markedly that all three are areas within their respective Regions where there is need for other opportunities of employment. Immediately, however, this point is reached, many questions arise.

Are these areas in fact those to which new industry should be encouraged? What types of industry are most desired with a view to ensuring maximum benefit to the present communities? Can the needs of the new industries be met in terms, not only of labour, but of materials and essential services? Is it possible to find sites, individual or collective, having regard to the present forms of land use? Should sites be found, of what dimensions should they be, having regard to a reasonable estimate of the degree of employment required? Should advantage be taken in introducing new industry to regroup scattered communities lacking, at the moment, an adequacy of social services and amenities? In that event, which centre or centres should be the focus of this new economic and social life? Should these centres be in the area concerned or in an adjoining area? What will be the consequences of any regrouping of scattered communities and their concentration on a new centre?

The answer to these and many other questions can only be given following careful and comprehensive examination. Much of the information must be based on statistics, but much non-statistical material must be associated with the statistical analysis. The examination of the relevant facts must be carried out on the ground, with an intimacy of knowledge of the area and its people.

A decision should not be made until there is some assessment of the consequences of the proposed action both on the area and upon adjoining areas. Action taken in respect of adjoining localities may seriously handicap the fulfilment of progressive regrouping schemes linked up with the establishment of new industries in such areas as those instanced. It is easy for the line of least resistance to be taken and industry encouraged to the more attractive parts of a Region. The tendency is the greater if War has led to the construction of factory premises in places where, in the normal course of proper planning, they would have been discouraged. There is the possibility of a relative scarcity of new industry to be established in Development and other comparable Areas, and this the more emphasises the necessity for selecting sites on a Regional basis, combining priority of need with suitability of locality and with a view to securing maximum benefits. A surgical operation on a finger is by no means confined in its effects, nor is the siting of an industry of purely localised influence.

Derelict areas are not exclusively those resultant from the mining industry. Some industries have been badly sited in the past, leaving on their decline isolated communities with no hope of a sound economic future. On the other hand, it is demonstrable that many were soundly located, but when, for a variety of reasons, operations ceased, ruins and waste remained on the sites. The former chemical industry of the south bank of the Tyne has left extensive areas of waste of no use for industry or housing or for conversion into amenities without special measures being taken. Thus, in a part of a Region where new industry is needed, there may well be a marked tendency to select new sites on new land, leading to an extension of housing and services and an uneconomic and undesirable use of the land.

It is obvious that, in all Regions, as one type or another of development occurs it has to be superimposed upon an older background. Common sense adjustment between the genuine old and the genuine new is nearly always feasible, but it can be made the more easy and straightforward if, in the siting of new industry, or the creation of supplementary facilities for industry, a comprehensive rather than restricted assessment of needs and consequences is made. The Regional approach leads to the appreciation of function as well as character of localities. In giving guidance as to the wisdom of additional expenditure on services for localities whose function may have changed or whose future should be on lines different from those of the past, it should suggest how and where any supplementary action should be taken with a view to ensuring maximum benefits with a minimum of disturbance to the character of a locality.

Regional analysis and the evolution of the guiding skeleton plan demand teamwork. The work of specialists in particular fields must be co-ordinated to produce balanced guiding material for the administrator and the planner. The fact must be accepted that existing and new industries are fundamentals in the process of adjustment to the natural environment. It is imperative that the requirements of industry in any Region be fully assessed and related to the legitimate needs of the people whose welfare depends upon the success of these industries.

The building up of the Regional skeleton plan must prove of value to the planning authority operating over a part of a total Region. The balancing of industry implies proper siting and the adoption of a clear-cut policy in its turn implies the ability of the planning authority to plan, not in isolation but with certain essential facts to hand. Determination of the scale of need over a reasonable period ahead should give the guide to the types of industry most suited to the particular localities, to the extent and character of the areas and services required in their siting. Much research material necessary for the purposes of assessing the full character of a Region and the successful siting of industry within it, is of value to individual planning authorities who will be concerned with the adding of flesh to the bones of the skeleton scheme.

Since industry is subject to change, and its demands vary, it is quite definite that elasticity in the skeleton scheme is essential. There is no finality to the maintenance work. The aim should be to foresee particular needs. In the past we have awaited the development of the worst features of industrial siting and decay, but in the future the planning system must make it possible to take action in advance.

8 INDUSTRY AND ITS ENVIRONMENT

Lord Forrester

Industry must become conscious of its effect upon its environment—not least the electric industry. Britain is a small country—the further destruction of our valleys or rivers by the careless siting of industry would be criminal.

INDUSTRY—whether represented by one factory or by a "trading estate"—can directly affect the environment in which it finds itself, for better or worse, on the physical, the human and the social and economic planes.

Physically the siting of a factory is a matter of increasing importance. From the point of view of internal efficiency there are at least two hundred factors that the far-seeing concern should weigh up before finally selecting a site; these factors vary from the temporary hardness of the local water supply to the nature of the subsoil, from the possibilities of transport to and from the works, to the age-grouping and sex-grouping of the adjoining centres of population. Such points are generally overlooked.

For years the location of new industry has been dependent either on chance or on the arbitrary decisions of one or two individuals, generally untrained in this specialist field and often with no similar previous experience; such individuals tend to be guided in their deliberations by the proximity of the Managing Director's home to a given site, by the blandishments of an enthusiastic town clerk, or by some worthy but hardly disinterested estate agent. The time has now come when the old arguments of "cheap labour" and "cheap and abundant services" must disappear. This will happen if "full employment" has any meaning, because labour will become equally expensive and services consistently available on equal terms throughout the country.

The appearance of industry is no less important than its siting; the flamboyant, the vulgar, the monumental and the "pseudo" have had their day—they have marred the face of the land far more than the honest factory or mill of the last century, albeit dark and satanic. Industry need never pretend to be what it is not; rightly sited, honestly constructed, intelligently managed, industry need never pretend to be anything else but itself. The epithet "industrial," applied to town or countryside, must never again be in effect a slur, a warning to men of means to make their homes and spend their earnings elsewhere, whilst depending for their livelihood on the thing they shun.

Industry must cultivate a new standard of behaviour towards its surroundings and towards the land, especially in the disposal of scrap and waste. The tipping of slag and shale, the dumping of scrap, the working of minerals, the disposal of refuse, all can be carried out today without offence, many indeed can be so organised that new ground can be reclaimed where past activities have already destroyed the original land surface, for example in areas of subsidence and in open-cast workings, whether of coal or stone or clay or gravel. The cost of such planned disposal is not only the first cost of more careful dumping, it is that cost less the savings in erosion prevented, in land surface remade, over the next hundred years.

The same standards of behaviour must apply, where liquid effluent, gas and air-borne dust are the problems involved. Whether the works concerned be a coal washery, a textile factory or a thermal power-station, the prevention of waste must be a first care, and then—if total elimination is not yet practical—siting must be so arranged that neither human life nor amenity nor animal and vegetable life are imperilled thereby.

Britain is heavily industrialised, over-populated and poor in available land surface; as pioneers, and in particular as pioneers in the use of coal, we have had to pay the price. That we should continue to pay that price in the period of reconstruction that lies ahead, by perpetrating new crimes against land and people, and by repeating old ones, is unthinkable. To undo the mistakes of the past, so far as they can be undone, will take many years; it could not be otherwise. During those years this country has the opportunity before it to lead the world in the economic and the sane siting of industry.

And, if we still have to establish industries that no known technique can render physically harmless to their environment, then we have already an abundance of derelict sites on which they can be placed, and an abundance of derelict rivers into which their effluent can flow. The destruction of a river, whether by means of effluent or by taking its head-waters to another valley, is a crime only to be contemplated after careful consideration of all the facts, not least the ecological; the valleys of the Taff and the Spean are dreadful examples of unthinking exploitation of these two kinds. The pottery towns in the Black Country, and Llandore in South Wales, are examples of reckless destruction of capital assets by ill-managed industry.

Physical considerations are not, however, by any means alone in their importance. A man must live under healthy conditions, within easy reach, not so much of his work, but of a diversity of healthy work. The free choice of job or career or profession should be the right of every man and woman. A diversity of work means a diversity of employment, in industry and agriculture; diversity of employment means diversity of interest and outlook in the population. The dire effects of monotony of employment are to be seen in Durham, in Cumberland, in Lanark, in South Wales, and in the Highlands; in each case it has meant greater exposure to economic stress and a consequent rotting of the fibre of the very best of our human stock, during long years of depression.

There can be only one answer to these facts; we must plan to provide consciously and intelligently in each region, sub-region and community, a balance of industry sited so as to give a diversity of work. From the human point of view, as well as the social and economic, this is essential; it is tragic that this truth should first now be realised only on account of strategic necessity and the Barlow Report. The mobility of modern industry, or a great part of it, is already proved by the 1940-1941 Dispersal, and by recent events in Russia and Germany. It is easier and wiser to move machines than people, in peace as well as war.

The immediate answer to these problems is closely linked with the intelligent development of the electrical resources of the country. Electricity—the essentially mobile form of power and heat—makes possible a wide dispersal of industry; the electric motor and the electric furnace, both still developing in their form and in their applications, have freed the light and medium industries from the tyranny of coal, whilst increasingly they have made it possible for heavy industries to be sited in the most favourable location. Electricity, developed with vision and with the most advanced methods of application, has enabled Switzerland and Sweden to become industrial powers (in the front rank as far as technique is concerned) without depressed and derelict areas. Electricity, applied intensively to the needs of agriculture in Sweden, has meant that almost every farm is a consumer. Switzerland, with a population of 4,000,000, was able to state at Zurich in 1939 "Today Switzerland is the most completely electrified country in the world; over 99 per cent of the population is supplied with electricity, consuming an annual average of 7,000,000,000 kilowatt hours provided by 110 hydro-electric stations."

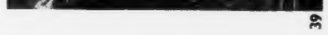
It is essential that every practical and economic source of power in Britain shall be developed to the highest point of efficiency, but not without detailed consideration of the interlinked problems of industrial location. The main sources of power at present are coal, a diminishing asset but the only abundantly available source; water power, limited in its possibilities; tidal power, still untapped but a potential source of the greatest importance, as evidenced in the recent report on the Severn Barrage; and small wind-power, now a tried possibility (especially in America and Finland) but suitable only for exposed sites and generally for isolated areas of small consumption, islands and highlands.

The power stations of Great Britain, thermal and hydro-electric, have hitherto been singularly unfortunate in their siting and in their outward design. The possibilities and the requirements were not at first appreciated; existing plants within the city boundaries were expanded and extended, without thought for the wider issues of modern town-planning; conversely, existing cities expanded to engulf existing power stations, because the need for forethought was not obvious, and the requirements of human health could until recently be overlooked with impunity.

Hydro-electric stations, such as Fort William, Kinlochleven and Tummel Bridge, were built for one purpose only and without such wider vision. The first desecrated with its works the flank of our highest mountain; the second gave rise to an industrial settlement of such dismal mien that even the most hardened must shudder that such a monstrosity should have been created in the good name of electrical development; and the third (before camouflage helped it to disappear amongst its surroundings) glistened conspicuously in the midst of a fair valley, pretending to hide its real and honourable purposes behind the outward facade of an Egyptian temple or a famous Perivale factory.

Industry must be honest to itself; it must look and be what it is, like the oast-houses of Kent or the woollen-mills of the Cotswold Valleys; further afield Grimsel and Trollhättan—also honest in themselves—have not destroyed their superb surroundings. Before those responsible for the development of power generation in Great Britain there lies a tremendous opportunity, which must be grasped. The existing Grid, which is to be extended, already provides one of the few examples of national planning that we have. The extensions to that system must be planned both as a whole and with intimate knowledge of the requirements of each and every region; that means, as well as national planning, regional surveys and regional industrial surveys, followed by regional planning. The recent industrial survey of West Cumberland shows the lines that an investigation of the industrial needs of an area should follow.

Areas such as the Highlands of Scotland, the whole of Wales, the North-East Coast, and others (not least Eire) must each be studied as a region; they can never be developed intelligently and for the common good if the needs of industry and agriculture are not considered from the beginning, along with the needs of the human population, in terms of health and happiness. Such consideration demands new standards of national, regional and local planning, not merely executive action, however excellent in its technical application.



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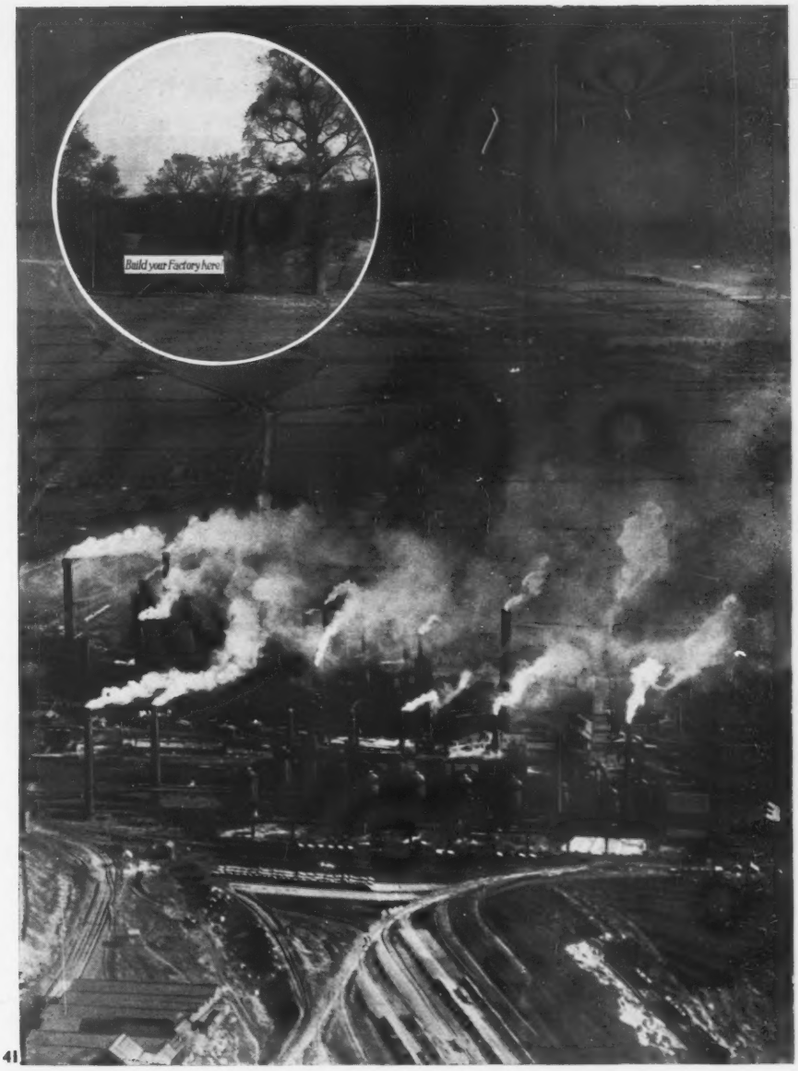
"It is not possible from the evidence submitted to us to avoid the conclusion that the disadvantages in many if not in most of the great industrial concentrations, alike on the strategical, the social and the economic side, do constitute a serious handicap and even in some respects a danger to the nation's life and development, and we are of opinion that definite action should be taken by the Government towards remedying them."

The Barlow Report, Paragraph 413



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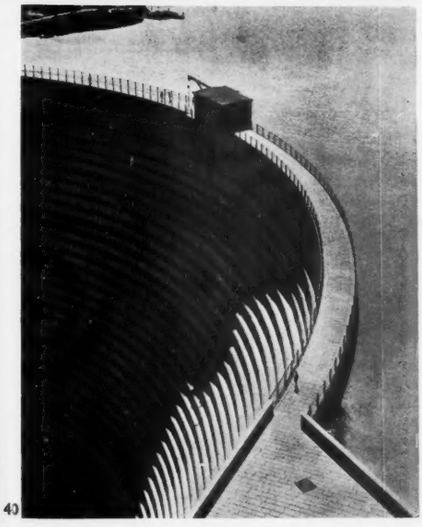

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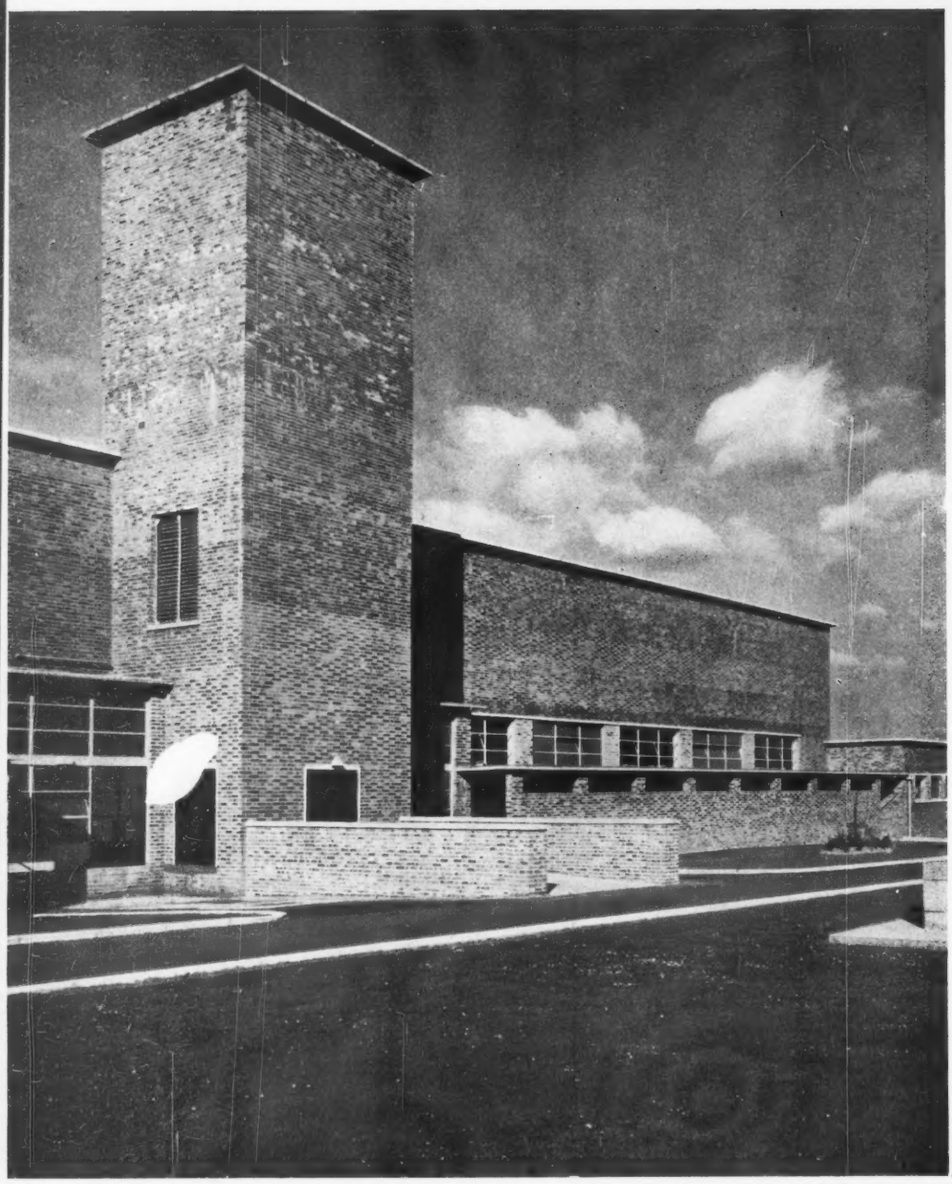
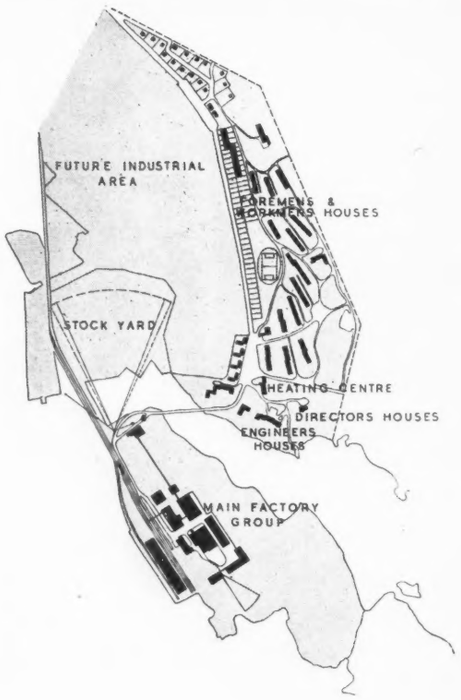
41, Middlesbrough to-day; **39** and **40,** the Grimsel Reservoir and Dam in the Swiss Alps showing the beauty that can be created by industry rightly sited and honestly constructed; **42,** the Blackwater Reservoir in Scotland, built to collect water for the Kinlochleven Generating Plant, and remaining for long periods a waste of mud banks.

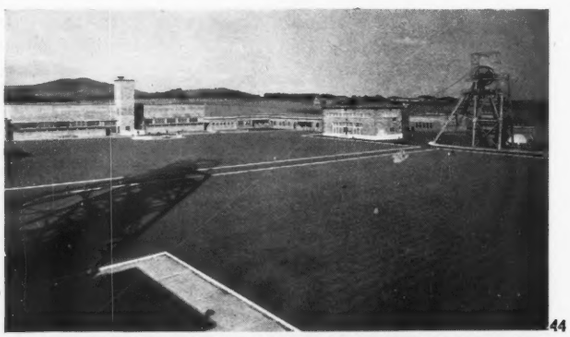
42



43

Industry need not be ugly; industry need not be dirty; industry need not cause nuisance to its surroundings. **43,** Buildings just completed at Comrie Colliery, Fifeshire—the Pithead Baths and Offices. **44,** The Pithead and the Engineers' Shop. **45,** The Sunila Pulp Mill in Finland. Its plan is given below left. The small vignette above is of the Norris Dam of T.V.A.





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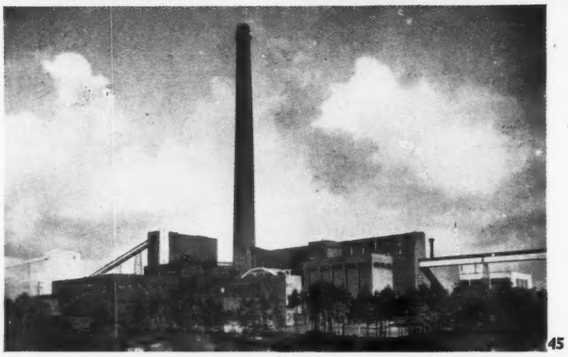

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9 THE DESIGN OF INDUSTRIAL BUILDINGS

J. A. Dempster

The architects of the Miners' Welfare Commission have a fine record of achievement in the construction of industrial buildings that have been wholly functional in their purpose and, at the same time, are buildings of high architectural merit. They have recently co-operated with the Fifeshire Colliery Company in the construction of a new colliery at Comrie that gave rise to a laudatory speech in Parliament from the Secretary of State for Scotland.

HOW many of us compare the character of this land of ours of 100 years ago and to-day. Consider, for example, the original character of the valleys of South Wales and the result of developments to which man has lent his hands; the charm of many a coastal strip and the disfigurement by the haphazard introductions of industry; or the Lancashire landscape in the North as compared with the South of the same county. No argument for the justification of industrial expansion due to the coming of coal and iron can be made an excuse for the desecration of this countryside. Free and rapid expansion was all that was asked for by those early industrialists, keen on being first in the world's markets with the new products of a young and industrial nation. The rapid change-over from a purely agricultural countryside was never planned or calculated; it just happened. Industry, and the sale of its products, was considered all important and, as other industries developed and expanded, so agriculture and allied industries diminished, with the result that the landworker had eventually to gain a livelihood by other means, often in a town.

Since the early days of industrial expansion few, if any, planners have been consulted as to the location of industry, and as to the planning and integration of its buildings, including housing. Many of the difficulties to which this neglect has given rise could have been avoided.

The early acceptance of a planned industry, as we know it to-day, would have relieved the struggle we have now in front of us in the post-war years of trying to put right the wrongs of our *laisser-faire* economy.

A greater interest is now taken in the siting, planning and design of our more important buildings, but it is just as important that the same care should be taken in connection with the more mundane buildings and particularly in the rise of new industrial undertakings which can quite easily cause untold disfigurement in town and country. Certain control of buildings in our towns to-day is by Statute and it is likely that further powers will be available for the direction and control of the many new planning schemes, but all these attempts to bring about the perfect state will be of little avail if control is not in the proper hands.

When President of the Royal Institute of British Architects, Sir Giles Gilbert Scott said: "Vast blighted areas have arisen throughout the manufacturing districts of the North and Midlands, and these have been accepted as the inevitable accompaniment of industry. We architects know that ugliness, untidiness and lack of planning, so evident in these examples, are not the inevitable accompaniment of industry; we deny that industrial districts and buildings need necessarily be hideous, and we claim that beauty can be achieved with utter simplicity combined with good planning and imagination. The pity is that the good psychological effect of cheerful, bright and tidy surroundings upon those engaged in industry has been appreciated by so few industrialists."

We architects, however, are not unmindful of the fact that an increasing number of people are displaying a great interest in what our country is going to look like to their grandchildren and great-grandchildren. The outlook and knowledge of the public could be educated to assist the architect in attaining the ideals towards which he strives. Changes of Government and "vested" interests must not be allowed to obstruct the work architects and associated technicians must essentially perform, if what remains of our natural architectural heritage is to be preserved and if new developments, and particularly industrial developments, are to be orderly and complementary to their surroundings.

To plan and design a good building on paper is not enough; the design must be part of its surroundings; the building must grow out of the ground on which it stands.

In considering the location of industry, I am not unmindful of the need to have due regard to the use of land according to an accepted standard of classification, and I hope the recommendations of the Barlow Report will be adopted before it is too late, but the location of industry near to sources of raw materials and labour must not be lost sight of.

Fitness for the purpose must be a salient feature in the design. Designing thus is usually associated with tables, spoons, chairs, etc., but fitness for the purpose is equally important in the design of buildings, and for the attainment of the conditions necessary for the health and efficiency of management and workpeople. To bring order and seemliness out of confusion is the function of good design, and the architect realises that his work can benefit the man in the workshop as well as the management. Brightness, space, cleanliness and economic planning of areas are as essential to the shareholder as they are to the operator of the machine.

The best examples of industrial architecture satisfy all these needs, and new materials and methods constantly open new avenues and possibilities. Modern steelwork and reinforced concrete offer more scope for flexibility and open planning than the materials of which some of the older buildings are constructed. Our warehouses and factories can carry greater loads as well as having greater capacity and our workpeople can carry out their duties in well lighted, hygienic and air-conditioned buildings.

Economic planning of industry to-day is one of the most important essentials of its prosperity. The modern industrial building must be economic if it is to be a building fit for its purpose. In other words its value to industry must be greater than its cost, and this must be the viewpoint of the successful industrialist. He knows, or should know, how much can be done by the architect in planning his project in such a manner as to be economical to the workmen using it, as well as to the directors themselves.

We have many good industrial projects of immense size and of good siting and design throughout the world to-day, and in our own country we have the excellently planned and equipped Team Valley Trading Estate. The outstanding examples of the work of the Tennessee Valley Authority in America or the Great Dam at Dniepropetrovsk in Russia call for special mention.

Other schemes which have stimulated a new interest in industrial architecture may be cited:—The Bata Factory at Zlin, Czecho-Slovakia, and the very excellent tobacco factory at Linz, Austria, the Van Nelle Factory, Holland and the Co-operative buildings of Sweden are but a few examples from the Continent before the war started. In our own country we have the great concrete and glass factory at Nottingham for Boots the chemists, the Murex plant at Waltham Cross and Roche Products at Welwyn Garden City.

In the coalmining districts, Pithead Baths have created a new outlook amongst the mining community and the landscape of the coalmining areas generally. At Comrie in Fifeshire a new colliery is now complete. Situated in beautiful undulating country, just north of the River Forth with the Ochil Hills in the background, lies this bright little industrial area. Twenty years ago one would have said, "Why desecrate a beautiful landscape with an ugly colliery?" but this has not been the case, for the Colliery Company were enlightened and caused the surface to be laid out and the buildings to be planned and designed by architects who were appreciative of the possibilities of siting the buildings to suit the landscape. But for the headgear and haulage ways to the bing (some distance away) anyone used to the old colliery layout would be amazed to see the haulage of black diamonds through a railway cutting set midst heather and whin.

The results of such planning will be far-reaching in years to come. The well-arranged and well-kept surface buildings, apart from their effect on operating efficiency, are now arousing a psychological response in the miner resulting from improved environment at the place of work. It is hoped the work will be less burdensome and some improvement in the life's occupation of the miner effected.

Such an experiment in planned industry will be watched by many critics, but I am sure many will agree that the old saying that good planning and beauty in industry is an unnecessary luxury, is very much out of date, and that beauty of design and appointment pays dividends. The words "luxury" and "extravagance" do not enter into industrial architecture to-day; it is simplicity of design which makes for inexpensiveness. That, together with making your buildings fit into your landscape, should dispel the thought of industrial blight on a new countryside.

10 POWER STATIONS IN THE LANDSCAPE

G. A. Jellicoe

The vastness of the modern Electric Generating Station is beyond human scale. There is no reason why its proportions should not be æsthetically satisfying but it cannot but dwarf all human habitations in its surroundings. It seems that it can only be appreciated in its full majesty when sited in an untamed landscape, in scale with its own immensity.

J. G. CROWTHER, in his book, *The Social Relations of Science*, draws attention to the fact that modern American production in relation to that of ancient Egypt is probably in the ratio of two thousand to one. In other words, one modern man, with the aid of machinery, can do the work of two thousand slaves. Despite inventions, gadgets, theories of management and other incidentals to modern civilisation, the source of all industry can be traced to the production of power. It is not surprising therefore that the manufacture of power is a wonder even to modern man, for in it he instinctively sees his liberation from physical toil; and for the same reason the buildings and structures that house this manufacture also have glamour. Before, however, anything can be discussed concerning the design of power stations it is necessary to relate the function of these buildings to those of the other activities of the community. A sense of proportion in their relation to their environment must be retained.

It would appear that the age from which we are now just emerging discovered the splendour that arises from the true expression of production. It tended to worship production for the sake of production, as much as anything because the previous age had deliberately set out on a policy of suppression. In retrospect this so-called functional age now appears to have been itself also unbalanced.

It is true that it is raw material which keeps modern civilisation in motion and provides man with the ability to undertake adventures in the use of leisure; but raw material must remain to the fabric of civilisation what the foundations of a house remain to the superstructure. When this perspective becomes topsy-turvy we meet outbreaks of public emotion such as those at Lincoln, Durham and elsewhere.

With this in mind, therefore, it would seem possible to reach certain conclusions as to when and where the design of power houses can reach and communicate a sense of power without brutality. These conclusions might be summarised as follows :—

1. The ideal location is within the landscape that itself provides the source of power and where there is no considerable human habitation. The classic examples of this are the world-famous dams, but the same factors are still visible in such a place as the Loxley Valley, near Sheffield, where the eighteenth century water mills follow one another in succession.

2. The scale of the landscape, being undisturbed by human habitation, will probably be in scale with the power house and both will be beyond human scale. It must be remembered that the source of power is quite literally monstrous and that the supply itself is only humanised when distributed over the innumerable fields of human activity. Indeed, one of these harnessed monsters can provide the basis of living to millions of human beings.

3. The power station is the instrument that is tapping a source of wealth that is beyond comprehension. It is in direct communication with the forces of the universe, itself the greatest generating machine of all. It would appear that the true architectural expression of the power house should therefore be that of the machine; and only secondarily of the humans who organise, control, and serve it. If the purpose of the architect is primarily to cherish and express the humanities in building, then it would seem that he has no concern with all those structures that house machinery and that they become the realm of the structural engineer; but he does design those buildings which house human beings. In plain words the functionalist, or the civil engineer, should, in theory, design the power house, and the architect, within this framework, should design the administrative buildings.

4. It follows from this, therefore, that in theory, the finest landscape for the environment of a power house is also the wildest, and is not consciously landscaped at all, other than where it must be tamed and humanised for the administration.

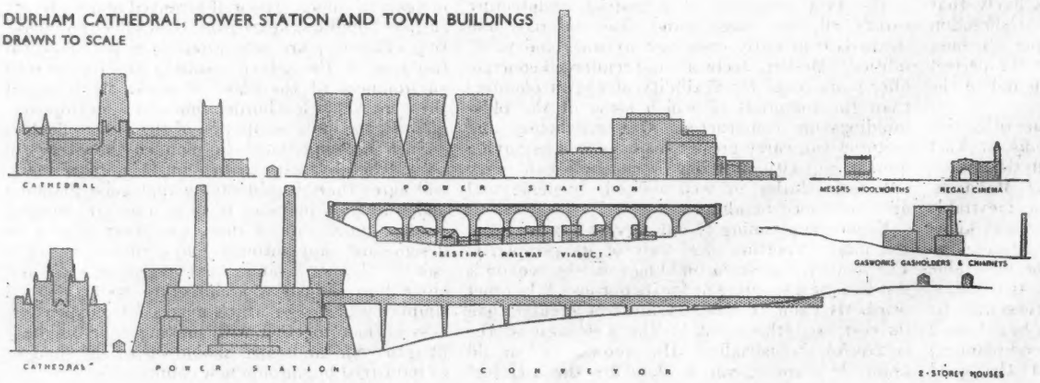
In practice the position is usually very different. Except for remote sites in Wales and Scotland, it is rare to find the power station either directly tapping the source of power or not impinging upon human habitation or other activities. The source of English power is predominantly coal, which is carried to a site whose choice has been governed, first by distribution, and secondly by accessibility and convenience to those employed. The first frills of civilisation are thrown round to mitigate the essential ruthlessness. But the forces are there and the original scale and grandeur cannot be concealed. Bulk alone must make a great power house disproportionate and overwhelming to the builders of a civilised community.

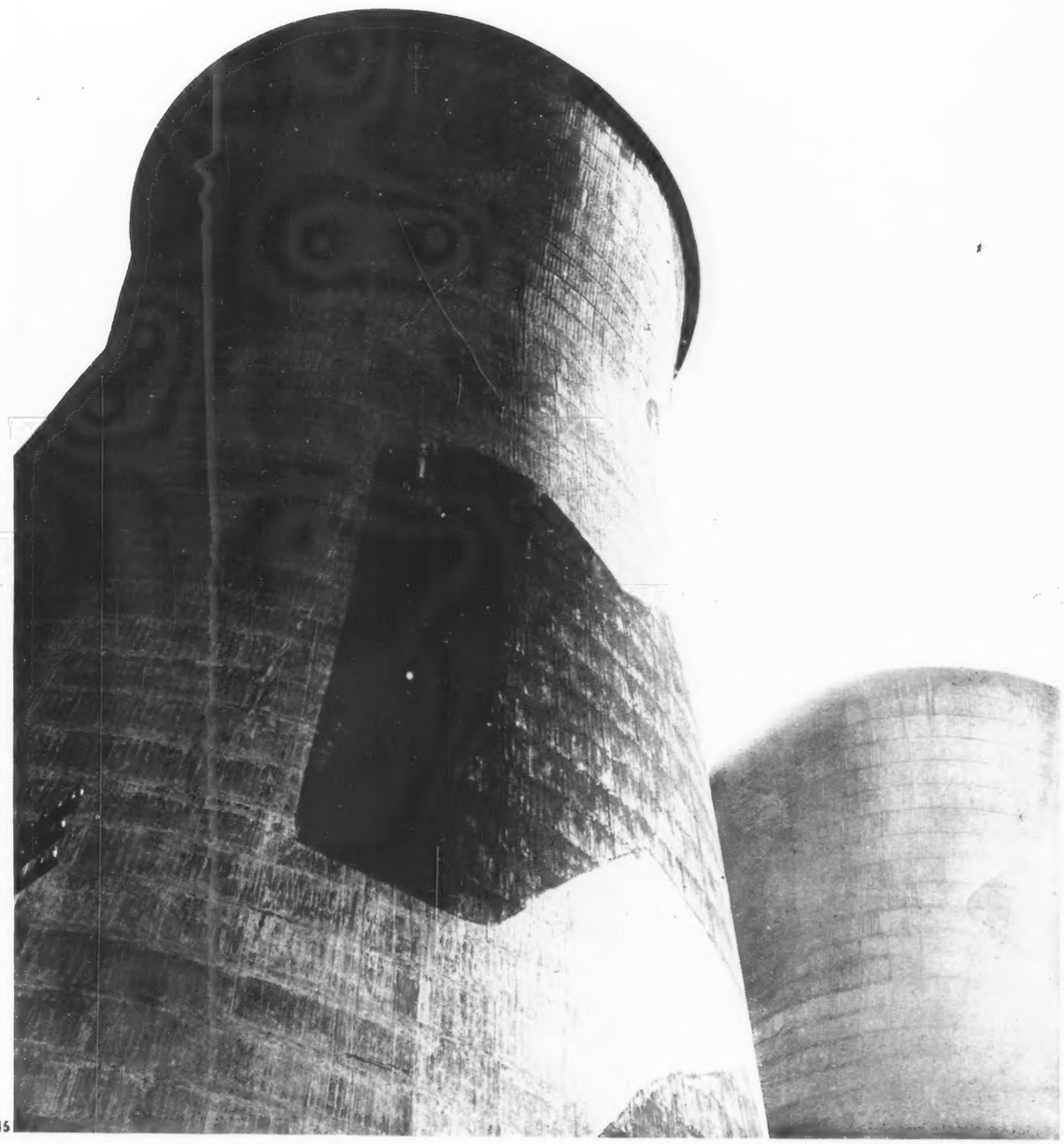
The idea of a power house is, of course, one of the grandest of our times and the essential point is to conceive the power house and its environment as one landscape design. Separate it from its environment and complications begin to rise. This is why civil engineer, architect and landscape architect should work together as a team; and why the landscape of the Tennessee Valley Authority is as distinguished as any in the world. It is sincerely to be hoped that the undertakings of the Scottish Hydro-Electric Board will be equally efficiently and grandly conceived and its resources in landscape not frittered away in day-to-day decisions.

There would seem to be a general law in man's enjoyment of the universe, that production tends to give him satisfaction and is therefore the basis of beauty, and waste dissatisfies him and is therefore the basis of ugliness. Two factors in the design of a modern electric power station, in particular, appear discordant. These are the chimneys and the accompanying cooling towers. The chimneys, although concerned with draught, are primarily concerned with the throwing off of energy into the air; this energy spends itself to the detriment of the surrounding environment, whereas, if harnessed at the source, it could be an added source of wealth. The cooling towers are frankly one purpose, and Sir Charles Reilly is quite correct in pointing out that the energy in heat thrown out by these structures could be devoted to useful purposes. Though science has not yet made this a practical proposition, the truth remains that both chimneys and cooling towers are fundamentally unnecessary and will remain intuitively an insult to the intelligence. The fact that the gigantic hyperbolic curve of cooling towers is beautiful in itself only adds to this insult, which is most pronounced when they are located in or near those cities whose landscape tells of the struggle to preserve the humanities. No man puts his dust-bin by his front door, however well this dust-bin may be designed, and the analogy is not dissimilar.

With the place of the power station in the landscape in proper perspective, it is then possible to make proposals as to how a compromise landscape can be designed, when the environment is already man-made and principally consisting of little fields and hedgerows, farms and country lanes. There would seem to be only one essential, and that is that the layout should be planned not for beauty but for purpose; and it may be found that the complexities of use will themselves provide a beauty that will promote a relationship to its surroundings. For instance, trees are often required for multiple purposes, they are certainly required as wind shelters and for shade, and they may also be required for dust filtration and for camouflage of inevitably dirty corners. Design the tree plan as coolly as the power house itself and nature will do the rest. Nature will play havoc with your design and make it willy-nilly the emotional bridge between the turbines and the cows pasturing in the adjoining fields. Both exist, when all is said and done, for a similar purpose.

DURHAM CATHEDRAL, POWER STATION AND TOWN BUILDINGS
DRAWN TO SCALE





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Beyond all else the electric motor and the electric furnace are responsible for the change from the old order to the new. The old order at the Potteries, **48,** the new order in the model of the long-term plan for Earle's Cement Works at Hope, Derbyshire, **47**. The ideal location for industrial buildings beyond human scale is in an open landscape.

48

11 POWER, PEOPLE AND PLANS

Thomas Sharp

An electric generating station, whether it uses steam or water power, employs very few people and these highly skilled and well paid. It does not encourage, but rather repels, other industries from setting up in its immediate vicinity (other than some of the electro-technical industries which, again, employ extremely few people). The noise and emissions inseparable from a steam power station, and the sheer bulk of the buildings, mean that homes and power stations are incompatible. There is nothing which makes it necessary for a power station to be situated in, or immediately adjoining, any town or village. It should stand by itself away in the country where its fine architectural possibilities may be fully exploited.

THE problems of power stations in relation to town planning are not new. But they have been brought into high relief in recent years by the increased size to which stations are now being built and by the ruthlessness with which some of them have been sited.

During the past year there has been bitter public controversy over power stations in four cathedral cities. At Peterborough, Lincoln and York, projects which have been resented as "outrages" against the architectural character of these special places may have had some excuse in that they were concerned with the natural, though alarming, growth of stations which began in a small way years ago. It is difficult to call a halt to the development, in a particular spot, of some firmly established undertaking. The difficulties of this are shown in other industrial fields: at Oxford, for example, where a job begun in a back-yard has gradually changed a university city into an industrial town. So the gradual though increasingly damaging growth of generating and transmission stations in these three cathedral cities cannot be as easily ascribed to complete callousness as can the project for the great station at Durham, which is an entirely new undertaking. The Durham project is plain philistinism. Not consciously so, of course. The promoters had no such intent: on the contrary their intent in a blindly limited sense was all for good—to supply electricity: nothing more. Nothing else interested them: they did not care a button that they might irreparably damage some of the finest urban prospects in Western Europe. They did not care because it had never occurred to them to care. Their job is to supply electricity: that is all that matters to them.

Those of us who fought in opposition to the Durham project were apt to say bitterly "anywhere else rather than here." Our line of defence was that this city, in the middle of a century-old industrial area, had by a miracle escaped industrialisation; that it should be kept free from great industrial buildings; and that the power station could easily go to one of the hundred small mining towns and villages in the region round about. Our arguments were largely based on our sense of architectural values (though also on the recognition of the special cultural functions of the city; but this again was partly a matter of architecture). In fighting as desperately as we knew how, to prevent an architectural outrage on Durham, we were considering only the particular problem of this particular power station in relation to this particular city. In trying to thrust the power station from Durham into some other town, we were taking a (necessarily at the time) narrow view. Certainly, if it was to be Durham or a mining town (and, heaven knows, those in that coalfield are dreadful places), we were right in saying it should be the mining town. But we were saying that only because of our feeling for architectural values. And there are other values.

Considerations of human and spiritual values, it seems to me, must bring one to the conclusion that a great modern power station is out of place in any town, whether it be a mining town or a cathedral city. Whatever kind of people live in the neighbourhood of the power station, whether they be cathedral clergy, university students, miners, insurance agents or greengrocers, they suffer alike from the powerful station emanations. Of course if they have protested before the station was built they will have been told that it is scientifically impossible for any dust, steam or other nuisance to arise. At any public inquiry they will have been blinded and silenced by science. But they will eat dust with their morning porridge, nevertheless: showers of steam will make pavements damp and at times glassy with ice; clouds of vapour will not infrequently shut out the sun by day and the moon by night; a hill of soot, ash and clinker will mount up by the cooling towers; various contraptions for dealing with the daily thousands of tons of coal will clang and rattle and shunt. There will be "nuisances" enough and to spare, whatever expert evidence may prove: nuisances of a kind which no one should have to suffer in or around his home: nuisances which mean that homes and power stations are incompatible when they come within a mile of each other.

These physical disadvantages are obvious enough. The damage to social and spiritual values is not so obvious. But it is at least as great. The damage here comes from the sheer stupendous bulk of the modern power station. The untrained or conservative mind may react strongly against the strange shapes of some of the buildings, particularly against the hour-glass curves of cooling towers to such a degree that, at the inquiry into the Durham project, a representative of a local Arts Society suggested that the six cooling towers should be designed in the same style as the cathedral tower. This criticism can be discounted. Power stations have immense architectural possibilities. There is no reason why they should not be among the architecturally great buildings of our age. But their scale makes it difficult to associate them with other buildings and to relate them to human standards. Take the Durham project again as an example. That power station is not to be of the largest kind, and Durham Cathedral is not one of our smaller cathedrals. Yet the power station buildings will have more than three times the total bulk of the cathedral buildings; the roof of the main building will be nearly twice as high as the cathedral roof; each of the six cooling towers will have two and one-third times the bulk of the great central tower of the cathedral, if that were carried right down to ground level (and the original design was for three cooling towers each *six times* as large as the cathedral's central tower). Or, to bring comparisons nearer to the human scale, one could get more than 750 ordinary houses into the central building alone; the whole of the houses of an ordinary English country market town, into the turbine and boiler house of a single power station, and that not of the largest kind. Into the whole of the buildings of this Durham power station one could put at least 1,500 houses.

The domination of a cathedral, or some important social or cultural building, over the rest of the buildings of a town may be inspiring and good, in that such buildings express and symbolise spiritual values. But domination by some vast building or form concerned only with material things is an outrage on the human spirit. Material-romanticists who live most of their lives in soft places may be thrilled by the dramatic pictorial effects of other people's homes crouching at the feet of monstrous "forms," as they sometimes declare themselves to be by the dead and spiritually deadening pit-heap pyramids of mining districts. For those who live in their shadows, these things are not romantic. Neither, it must be said, are they often regarded as outrages. In a world where work means bread, and where the fear of unemployment is never far away, they may frequently be dumbly regarded as symbols of subsistence. Which merely shows to what a depth industrialism has brought us. For an outrage on the human spirit it nevertheless is, that men's living places should be tyrannically over-topped and dominated by forms which have no spiritual meaning or value whatsoever.

We who opposed the erection of the power station at Durham were wrong, therefore, when we wished it on one of the mining towns around the city. In the matter of spiritual values, a power station may be even more destructive in a mining town than elsewhere, for in such a place there is nothing to stand up against its tyranny. The smaller a town is, and the less provided it is with the spiritual symbols which cultural buildings represent, the greater, indeed, will be the tyranny of such a building over the spirit of the town's inhabitants.

But there is nothing, in fact, which makes it necessary for a power station to be situated in, or immediately adjoining, any town or village. It gives no benefits to balance in even a small degree its own evil effects, for it neither itself opens up a large field of employment nor attracts other industrial establishments to its immediate neighbourhood—on the contrary there are some which it repels. Its "raw materials" of coal and water can be got as easily in the country as in the town. And as for its comparatively few workers, skilled and well-paid men, there can be no great hardship if they are required to travel a few miles daily to their work.

The sum of all these considerations, it seems to me, is that in future no power station should be built in or immediately near to a town or village. It should stand by itself away in the country where it will exercise neither tyranny nor nuisance over any place where men live together. There, its fine architectural possibilities may be fully exploited without damage to any lesser buildings—though not necessarily without damage to landscape, unless its siting is well considered; for in landscape, too, the matter of scale is important. It is for someone else to attempt to enumerate in these pages the principles of landscape siting. But, for myself, I feel that whatever may be the proper place for a power station in the countryside there is no place at all for it in a town.

12 SHRINES OF HISTORY

The Dean of Durham

In siting power stations immediate commercial advantage should not prevail over the general public interest. Historic buildings, that have escaped the ravages of centuries, are entitled to claim respect from modern enterprise.

THERE are some sites in Europe so precious that no effort should be spared to save them from desecration. If (to take but one example) coal were found in Attica and it were proposed to erect the necessary pithead gear close to the Acropolis, the conscience of civilised mankind would not be satisfied until every resource of engineering and architecture had been called into play.

In England there may be no sites as grand, but there are some as precious : they may be "historic shrines" in the literal sense of the term—consecrated both by religion and by centuries of history—or they may have only the consecration of beauty to commend them.

Durham—like York and Lincoln—is such a site. No one will deny that Durham is a beautiful city, although not as beautiful as it would have been had its citizens been wiser in the past. It is no whit the less ironical that it should be threatened today with just such a disaster as those which it has till now miraculously escaped. And let it be said forthwith, almost every corner of this chequered island of ours has its Durham, be it ancient city or peerless landscape ; each or any of them may have to face a threat of Philistinism as sudden and as silent as that directed against Durham. The Durham case must become a symbol and a warning to them all.

For Durham is the only beautiful city in this small mining county ; everywhere else the needs of industry have been paramount. Towns and villages have grown with as little regard for beauty as for the well-being of their inhabitants. Let it be made absolutely clear that opposition to the Power Station at Durham was, and is, in no sense an opposition to the growth of industry, or to industrial buildings as such, but simply and solely to the choice of this particular site for a building of this particular kind. We entirely believe that the chimneys and the cooling towers, designed by Sir Giles Gilbert Scott, could be admirable examples of their kind : our case simply is that no architect —however great his genius—can design buildings on so monstrous a scale, within a bare mile of the Cathedral and Castle, without irreparable damage to the beauty of the site.

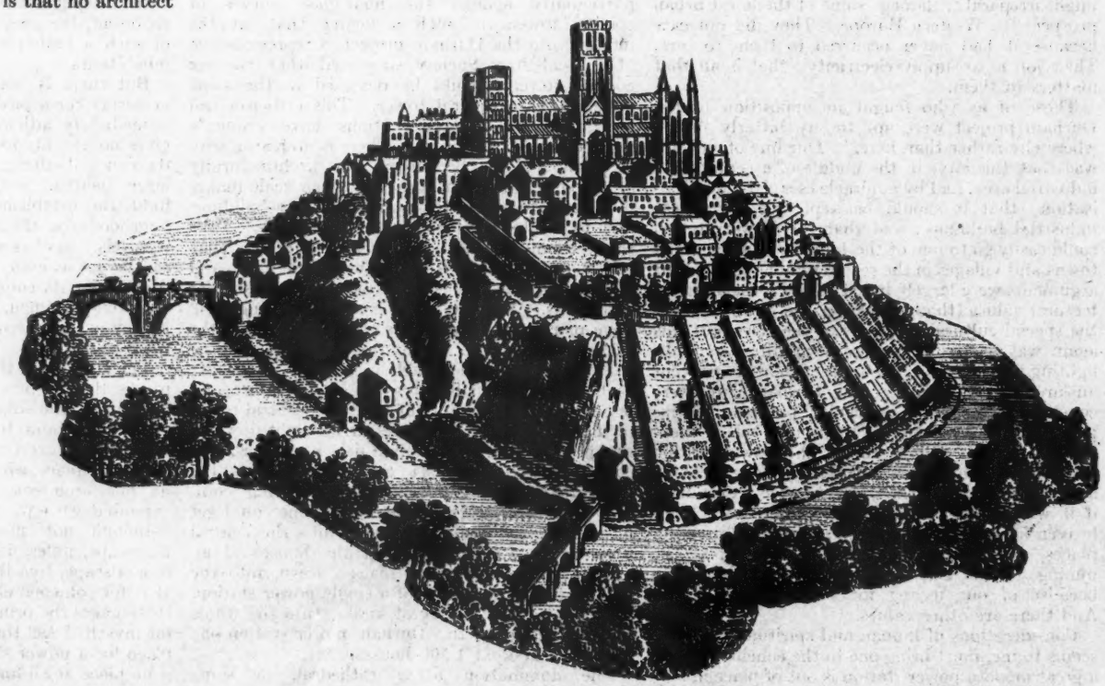
Nor are our objections by any means based on artistic grounds alone. Durham has before it a real and honourable future as a Cathedral city, the centre of a University, and the County Capital, as well as a Mecca for tourists. That Durham needs new industries, new sources of employment, there can be no doubt, but surely—if a period of "full employment" does lie ahead of us—it is only wise that the right industries for this particular location should be chosen after a careful and selective weighing-up of the needs and the possibilities ?

That Durham wants new and better housing there can be no question ; why, therefore, a giant generating station close to the site already chosen as being the most suitable for housing ? Surely, if "planning" means anything, good houses and a diversity of industry can be found for Durham at a cost far below the proposed £3,500,000 which—once spent—will only give permanent work to two or three hundred ? Not only that, coal dumps and ash dumps and noise will make the best available housing site a sterile wilderness, unfit for men and women to live amongst and even more unfit for children. And with the site will go the whole character of Durham's pleasant river walks in that part of the Wear Valley that lies between Kepier Hospital and Finchale Abbey, themselves two beautiful and ancient buildings deserving better treatment.

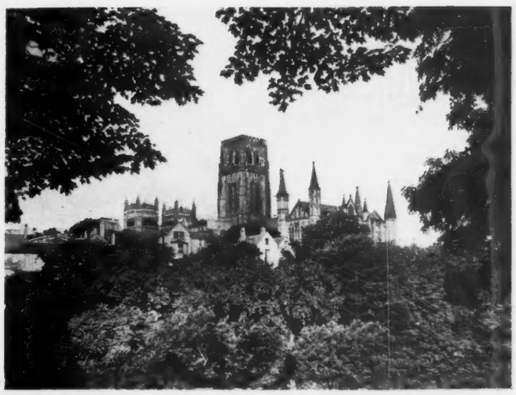
There is good reason to believe that other sites are possible ; they may have disadvantages and involve the Company concerned in more expense, but commercial advantage should not prevail over the wider local and national interest, and any engineering difficulties are hardly likely to be insuperable. I am not competent to decide whether such gigantic chimneys and cooling towers are in fact indispensable, or whether the particular use of coal which they contemplate is the wisest use that can be made ; but it is not unreasonable to believe that they may well be considered out of date within a comparatively short time. If that is so, Durham will have been spoilt to no purpose, and we shall be left with an immense monument to the inevitable fallibility of a particular generation of industrial engineers. It is a melancholy thought that some centuries hence the pilgrim from a distant continent may be found lingering among the colossal ruins of a Power House far larger, and quite possibly more enduring, than the stone of the Cathedral and the Castle of Durham.

Durham has escaped many dangers in the past : the Scots tried in vain to take it, and the only soldiers of their race who entered, came as Cromwell's prisoners after Dunbar ; it has, almost more wonderfully, been saved from that æsthetic blight which was the heavy price paid for prosperity in the age of coal : it will be a national tragedy if so great and so ancient an inheritance is wantonly thrown away.

In ancient days Penda, the heathen King of Mercia, attempted to burn Bamborough ; St. Aidan, the Bishop of Lindisfarne, cried in his distress "See, Lord, what ill Penda is doing !" and, it is written, "the wind changed and the smoke lifted from the fair city." Our prayer is that after more than a thousand years Aidan's experience may be repeated and Durham, like Bamborough, be saved.



This vignette of the Cathedral district of Durham is taken from the cover and title page of *Cathedral City, a plan for Durham*. By Thomas Sharp. The Architectural Press, 1945.



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Buildings that do not brook competition: **49,** Durham, **50,** Lincoln; **51,** York; **52,** Peterborough.

POTENTIAL NATIONAL PARK AREAS

Mountain areas, suitable for the development of hydro-electric power, are often potential sites for National Parks. There need be no conflict of interests so long as the design of engineering works and installations is honest and intelligent, so long as water used is returned to the river from which it came. **53,** the Lake District (Wastwater and Great Gable); **54,** the Scottish Highlands (Pass of Glencoe); **55,** the Peak District (Bunster Hill and River Dove); **56,** Snowdonia (Gwynant Valley); **57,** Central Wales.

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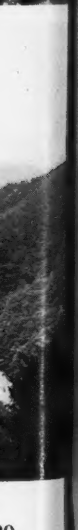
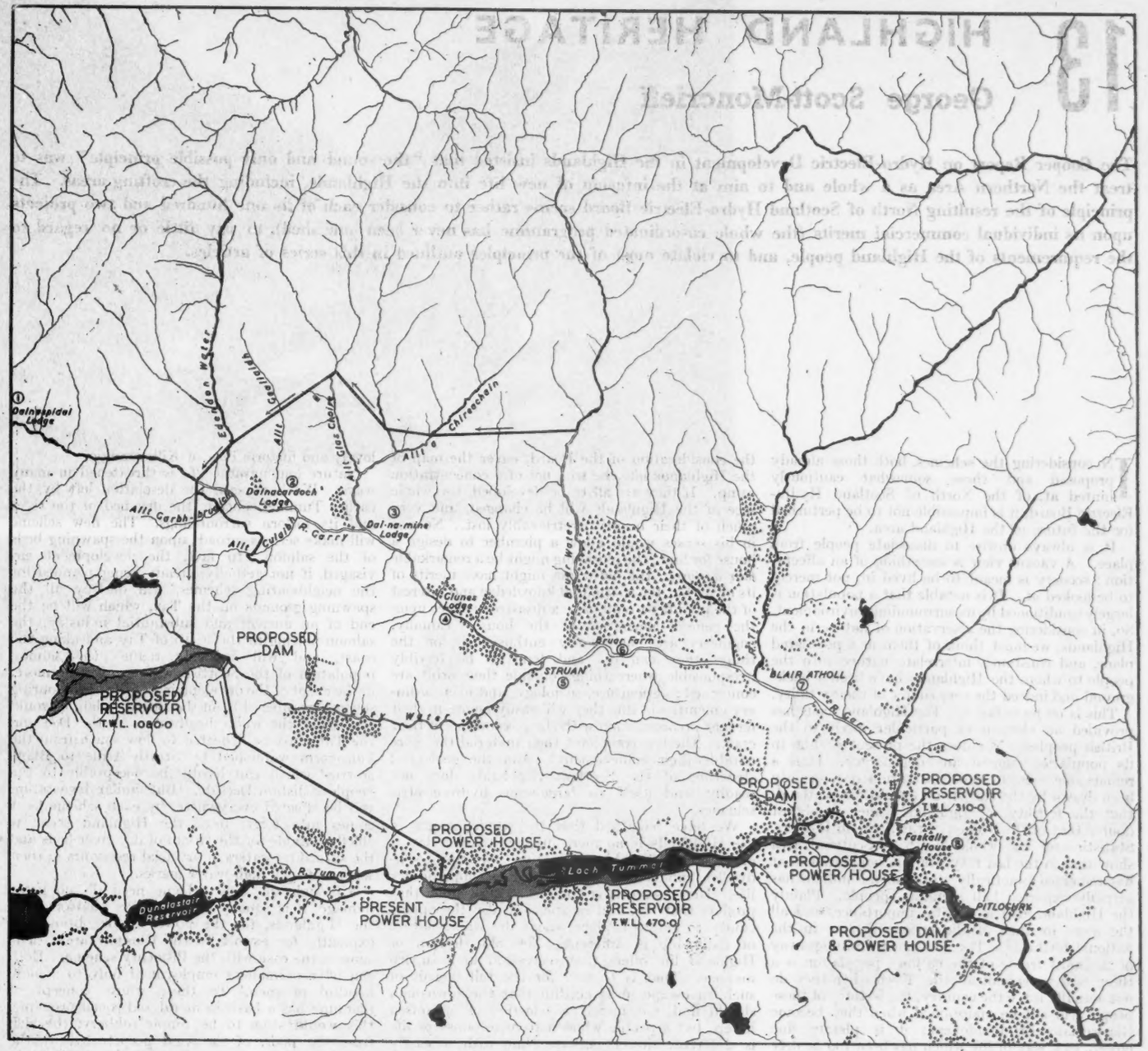
TENTIAL
AL PARK
OF GREAT





PERCENTAGE OF WATER STILL AVAILABLE IF NEW SCHEME CONSTRUCTED								
POINT NO.	1	2	3	4	5	6	7	8
ESTIMATED DRY WEATHER FLOW	100·00	0·91	9·67	13·20	20·95	20·90	47·70	51·50
ESTIMATED AVERAGE ANNUAL FLOW	100·00	1·23	12·25	16·62	26·10	25·80	54·20	58·00

PROJECT NO. 25 THE TUMMEL-GARRY SCHEME

13 HIGHLAND HERITAGE

George Scott-Moncrieff

The Cooper Report on Hydro-Electric Development in the Highlands insisted that "the sound and only possible principle" was to treat the Northern Area as a whole and to aim at the infusion of new life into the Highlands, including the crofting areas. The principle of the resulting North of Scotland Hydro-Electric Board seems rather to consider each of its one hundred and two projects upon its individual commercial merits (the whole co-ordinated programme has never been published), to pay little or no regard to the requirements of the Highland people, and to violate most of the principles outlined in this series of articles.

IN considering the schemes, both those already proposed and those somewhat cautiously hinted at, of the North of Scotland Hydro-Electric Board, it is impossible not to be perturbed for the future of the Highland area.

It is always unwise to dissociate people from place. A vacant view is something of an affectation: scenery is meant to be lived in, not merely to be looked at. It is notable that a population is largely conditioned by its surrounding environment. So, in considering the reservation of nature in the Highlands, we must think of them as a populated place, and constantly interrelate nature with the people to whom the Highlands have been a background and indeed the very source of their vitality.

This is no mere fancy. The Highland locus has provided an element of particular merit to the British peoples. Nor does the present decline in its population suggest any degeneracy. It is a remarkable fact, to which attention has recently been drawn by the Registrar-General for Scotland, that the fertility of Highland women is almost double that of the women of the Scottish Borders. Statistics for the whole North of Scotland area show that in the last fifty years, a population that has remained practically static at one million has actually exported half a million people. Plainly the Highland area is of vital importance, and all the more in view of the serious decline in the national birthrate. The continued draining away of the most fertile of the nation's population is a thing that we cannot afford. Even when they do not actually leave the country, the fertility of these people will not be maintained when they become Glaswegians or Londoners; it is plainly due largely to a way of life which has been too facilely dismissed as "primitive" and "backward."

It is certain that any scheme to safeguard the Highland population must be based upon its indigenous way of life. The flooding of fertile areas and the erection of industrial settlements (cf. Kinlochleven) will not achieve the same end. It has been pointed out that such settlements, indicated in the Cooper Report, would largely be on the western seaboard, on sites isolated by mountains from easy access to Highland produce, and presumably to be supplied and victualled by the ships coming in to take away the industrial produce. Such settlements have nothing in common with a properly constituted "organic" population; they have nothing in common with the development carried out by the Tennessee Valley Authority, which was concerned with revitalising the life of a distressed population on the primary basis of its own internal economy; in fact they can best be compared with concessions granted to industrial speculators in such unwholesome parts of the world as the West Coast of Africa. But the Scottish Highlands are a part of the heritage of European civilization; they have every claim to be treated as such.

The extraordinary beauty of the Highland scene should not be regarded as an expensive luxury, to be scrapped for any passing whim of engineering enthusiasm or private profit. The schemes under the consideration of the Board, cover the map of the Highlands like the wire net of a concentration camp. If they are all to be developed, the whole face of the Highlands will be changed, and very much of their beauty irretrievably lost. No one in his senses would allow a plumber to design a house for him; the plumbing might be a remarkable *tour de force;* the bathroom might have merits of its own; but the specialised knowledge and interest of the plumber would have a disastrous effect upon the general amenities of the house. Equally, engineers are customarily enthusiastic for the things they can do, and tend to be terribly irresponsible where things outside their orbit are concerned; agriculture, sociology, and even ordinary amenities of life, they will easily ignore in their fervent preoccupation with the possibilities of their craft. The less compliant their material the more notable their achievement! And the geological structure of the Scottish Highlands does not readily lend itself to large-scale hydro-electric schemes.

We have remarked that the scenic beauty of the Highlands is no mere luxury. And today it offers an invaluable recreation for the town-dweller, exhausted by the increasing tempo of city life. Here again, it is not the scenery alone that proffers that rest and escape, but also the opportunity to get to a place where the whole nature of daily life is different. The old rhythm of Highland life offers that recreation in a superb manner. That is to say, for the full benefit of such an escape, it is needful that the townsman should find, not merely a selection of urbanised hotels, but a people whose native response to life is different, slower perhaps, but with a vastly edifying value of its own. Nor, indeed, have modern trends yet shown themselves reassuringly superior to any degree sufficient to make us cocksure about scrapping all the old ways, of mixed farming and simple living, out of hand.

To date, three schemes have actually been subjected to public inspection. The first to be decided is at Loch Sloy. This is a comparatively harmless scheme, entailing only the flooding of a remote loch and the building of a power station on Loch Lomon side. The scheme proposed for Kyle of Lochalsh is likewise not very drastic, although already there are grounds for supposing that the local population is not, after all, to receive adequate provision for obtaining the use of the power. At Loch Morar, the first flooding is not very extensive; but there is word of an intended further flooding of forty feet, which would submerge such fertile land as there is along the loch-side and ruin a particularly lovely place.

Publication of the Pitlochry scheme shows that drastic flooding of very fertile agricultural land is intended. Pitlochry, a popular holiday resort, will lose its golf course, walks, amenities and charm. The famous Falls of Tummel, recently presented to the National Trust for Scotland, will be lost (which would seem to destroy the whole meaning of a "National Trust"), as will the Falls of Bruar and of the Garry at Struan, and the lovely and historic Pass of Killiecrankie.

Nature and natural life is threatened in many ways. We have seen the desolation left by the earlier Tummel scheme, the dry bed of the river and its forlorn surroundings. The new scheme will make serious inroads upon the spawning beds of the salmon. In fact, the development envisaged, if not actually already being planned for the neighbouring schemes, will destroy all the spawning grounds on the Tay, which will be the end of an ancient and substantial industry, the salmon-netting in the Firth of Tay and along the coast, and will seriously reduce the salmon population of the Scottish waters. Furthermore, in the event of the development of the neighbouring scheme, numbered 31 in the Board's plan, it would seem that the whole headwaters of the Dee and the Tilt must be deflected to flow south from the Cairngorm watershed by Strath Ardle to Blairgowrie—which can hardly be acceptable to the people of distant Deeside. But similar devastation will be effected everywhere, by each scheme as it comes into force, until the Highland scene is chiefly notable for the stones of dry river-beds and the spreading waters of artificial reservoirs in their setting of ugly high-water marks.

Although the Sloy scheme need do no great damage, it is equally of no service whatsoever to the Highlands, for the power to be obtained is explicitly for export to the Glasgow area. The same is the case with the Pitlochry scheme. Both can offer permanent employment only to a mere handful of men. To those whose concept of planning has a basis in moral and social principle, this would seem to be simple robbery, the rich from the poor, of the kind perpetrated by the powerful Ahab against the unfortunate Naboth. It is absolutely useless for the supporters of the schemes to argue that the funds to be obtained will subsidise Highland life, when, with the wretched price to be received for the exported power, the profits accruing to the Board can only be very small, and the form in which Highland life is to be subsidised is entirely arbitrary.

From the Highland point of view, no hydro-electric scheme promises any good unless it is combined with a comprehensive scheme concerned with Highland life. This must take into consideration agriculture and fisheries, transport, local industries of a modest nature suitable to the area, and the incomparable scenery of the Highlands—not wasted and squandered for the benefit of Lowland towns, but made accessible for the much more real benefit of the townsman.

The North of Scotland Hydro-Electric Board has yet to show that it has good intentions; that it will not be used as a cover for exploitation by unsympathetic interests. Of its nature it is the very antithesis of all the principles of good planning that we had (perhaps rather optimistically) assumed would inform all such Government subsidised schemes of the future. For it isolates one aspect of the problem and deliberately rejects responsibility for any other—even for the rights of a people to their own countryside.

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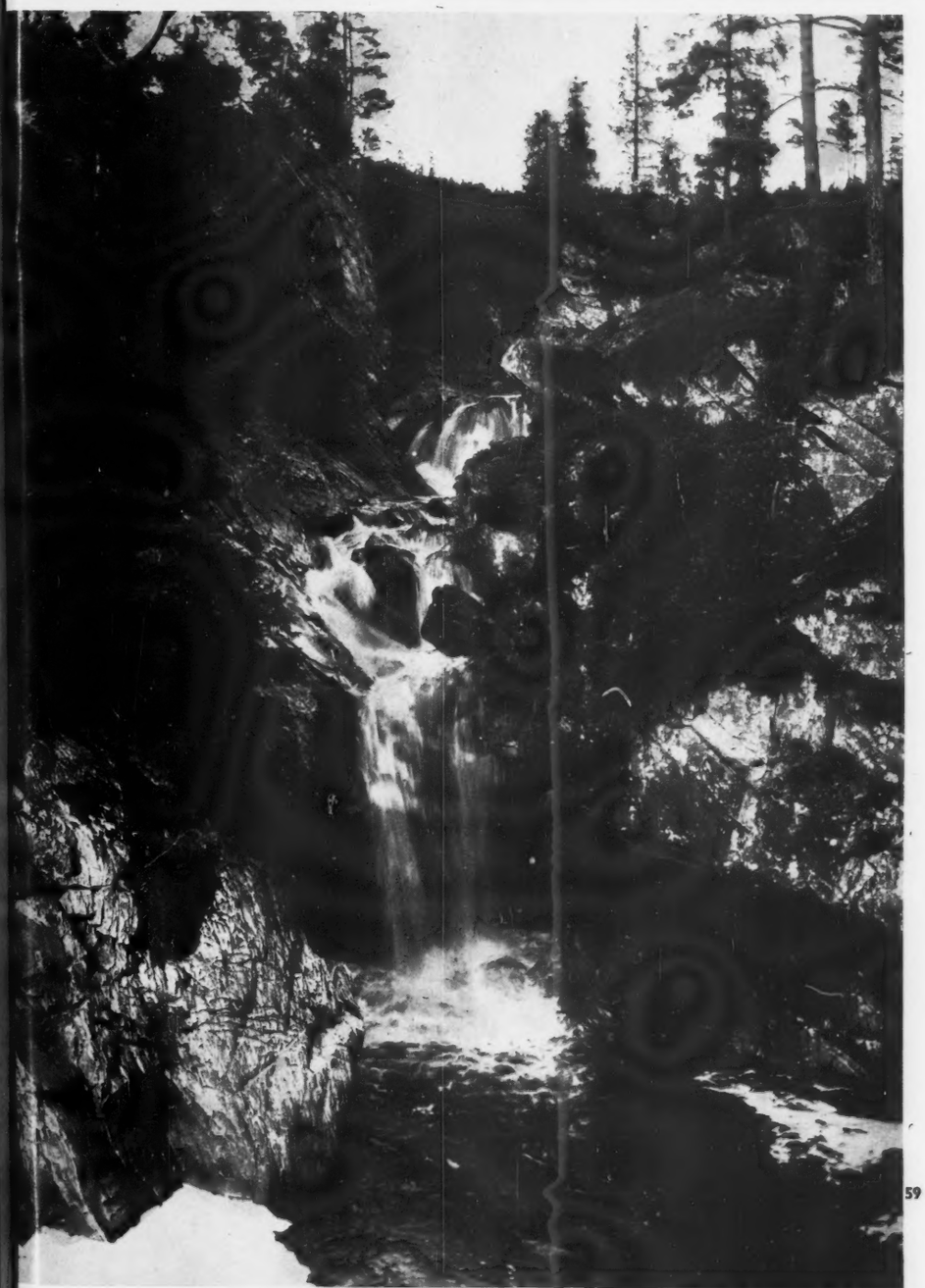

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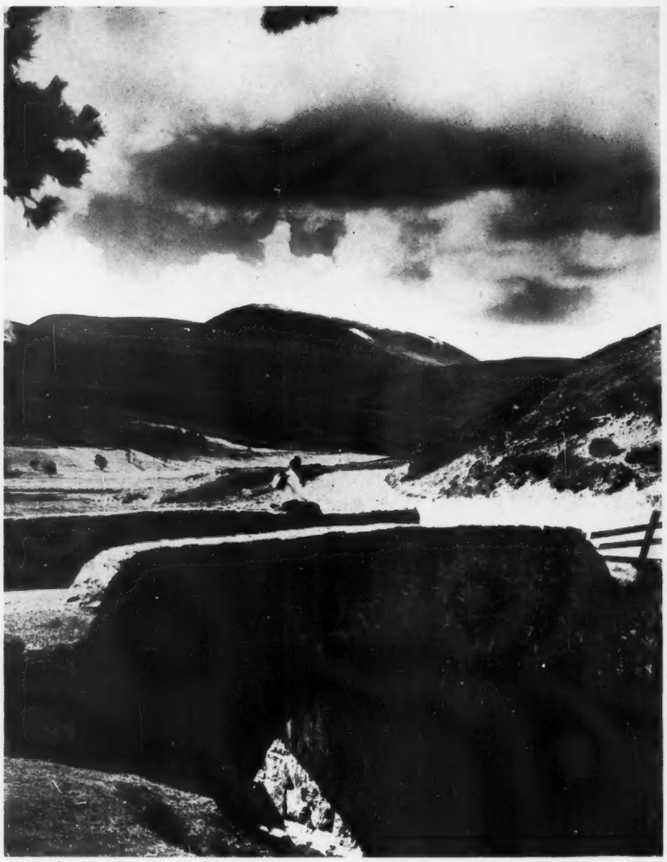
By harnessing the remote waters of Loch Sloy, **61,** at great expense, electric power can be generated for only two and a half hours daily. The river Garry, **58,** glides and tumbles through the Pass of Killiecrankie ; the North of Scotland Hydro-Electric Board propose that the Garry shall be diverted into the Tummel, so that the life will be taken from Killiecrankie. The height of the Falls of Tummel, **60,** recently presented to the National Trust, will be reduced from feet to inches. The Fall of Bruar, in Central Perthshire, **59,** will disappear.

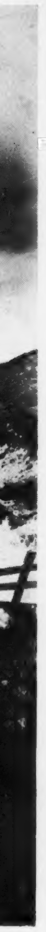
62. The backbone of the Highlands is the mixed farm. In the summer the sheep graze over the hills, in the winter they are brought down to the valleys and the low ground.



63. The tourist industry must continue to be one of the main sources of revenue for the Highlands, just as the Highlands must continue to be a source of inspiration and health to the people of the towns.

64. Salmon and trout fishing on the highland rivers is amongst the best in the world; river fishing for salmon and trout will be replaced by indifferent fishing for trout in a reservoir if the rivers are drained as now proposed.

65. The River Edendon, about two and a half miles below the point, where the waters are diverted to feed the Grampian Power Company. If the river dies, the valley that it formed dies too and the watercourse becomes a stinking drain.



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14 THE THREAT TO PITLOCHRY

Lord Malcolm Douglas-Hamilton

Twelve Scottish rivers and the tributaries thereof are, in the words of the North of Scotland Hydro-Electric Board, to have their waters "impounded, abstracted, diverted and used for the purposes of the scheme," known as Project No. 25. By this scheme, three new generating stations will be constructed in a valley that already contains two stations, both of which deliver 75 per cent. of the power they produce directly into the Grid. No suggestion is made that this new scheme will benefit the locality ; it is only claimed that the sale of the new electric power to the Grid should prove sufficiently profitable to finance other, unspecified, schemes.

NORTH of Dunkeld stretches some of the finest country in the Highlands. Although the mountains are high and rugged, it is not bleak like parts of Ross and Sutherland, nor is it grim like Glencoe. It is a friendly country chiefly because it is developed and civilized. When the Secretary of State for Scotland introduced to Parliament his North of Scotland Hydro-electric Bill, he described in dark colours the poverty, the squalor and the declining population which were characteristic of the Highlands. Such generalisations may be true of the Western Highlands and of the Isles, but not of Central Perthshire.

The life of Perthshire is built upon a delicate balance of competing interests, a characteristic of any healthy society. The basic industry is agriculture; the local tradition is that of the mixed farm, excelling in the thrifty production of milk, oats, potatoes, roots, clover and the black-faced sheep. In the main the hills are covered with heather, their slopes well-timbered, and the low ground by the river is cultivated. A typical farm consists of 1,000—2,000 acres of hill grazing, and 200—300 acres of arable. In the summer the sheep graze over the hills; in the winter they are brought down to the low ground to avoid the icy storms.

The district in times of peace was visited by very large numbers of tourists, who provided a substantial contribution towards the income of the county. Apart from large hotels in Pitlochry, Aberfeldy and Blair Atholl, there are a number of small boarding houses and cottages, which take visitors. Such an alternate source of income means that the people are less critically affected by trade depressions.

The visitor comes to the district for a variety of reasons, not least amongst them the mountain air and the mountain scenery. The young and athletic go for long tramps over the hills; others may prefer the gentler walks along the Tummel and the Garry, turbulent Highland rivers of unequalled beauty. It is estimated that 50,000 people each year used to visit the Pass of Killiecrankie, the scene of the battle where, in the hour of victory, Bonnie Dundee was killed by a sniper in Urrard House :

"Horse and man went down like driftwood,
When the floods were black at Yule,
And their carcasses are whirling
In the Garry's deepest Pool."

Today a metalled road and a main railway wind north through the defile, but Killiecrankie remains one of the lovely places of Scotland.

Others come to Perthshire for sport and recreation. Apart from the trout fishing in river and loch, the salmon angling in the Tay and its tributaries is amongst the best in Scotland or the whole world; the angling "rights" are assessed at over £20,000 a year. Still more important are the nets in the Tay estuary, where tens of thousands of salmon are caught each season; the rateable value of the nets far exceeds that of the angling up-river. Several hundred men are directly employed by these fishing interests.

In Britain " sport " has become a favourite butt of townspeople, many of whom have little idea of the meaning of the word. Yet in the United States, the Tennessee Valley Authority has taken great pains and spent much money upon improving the fishing and the shooting too. No one maintains that sporting interests should be paramount, but only that they should be allowed to take their proper place among the national assets. Certainly the local population realise their value.

The waters of the Tummel and the Garry have already been harnessed for generating electricity by the Grampian Electricity Supply Company. The yearly output of their two generating stations, at Loch Rannoch and Tummel Bridge, is 220,000,000 units, of which 75 per cent. is sold to the Central Electricity Board for consumption in the Lowlands. Central Perthshire, therefore, is favoured with a supply of energy more than enough to satisfy any likely demand.

When the Grampian Scheme was built, it was inevitable that some damage should be done. The main constructional works of the Grampian Company are in the heart of the mountains which form the boundary of Perthshire and Inverness, near the Pass of Drumochter. The land in this area, being only moorland and rock, is of little value. No damage therefore would have been caused if the scheme had not suffered from the same defect as so many of the other schemes now projected for the Highlands, namely water was diverted by tunnel and aqueduct from its natural watershed. Accordingly the upper reaches of the Garry and Edendon are now dry, and many miles of good salmon spawning beds lost. Fortunately the damage was not serious and it may have been right to incur it in order to obtain the advantage of an abundant supply of electricity. But if the Tummel and the Garry are further disturbed, the effect upon the Tay will be disastrous, as they provide some of the best spawning beds in the whole system of rivers. Both the netting and the angling will be irreparably damaged, the salmon being unable to reproduce themselves. This will be the most spectacular effect, but biologically, in other ways, the damage done will be as disastrous as it has been in all the chemically polluted rivers of England and Wales.

The Hydro Electric Development Act was passed in 1943, at a time when the attention of most people was diverted elsewhere. It was impossible to discuss its provisions adequately in the counties chiefly affected—Ross, Inverness, Sutherland, Argyll and Perth—and even in the House of Commons its passage did not occupy more than six days. In Perthshire most people imagined that, as the Grampian Scheme was already completed, no further works would be proposed. Even the doubters felt that they could rely upon the repeated assurances of the Secretary of State that the Board would be guided by the wishes and the welfare of the local communities and that nothing drastic would be done. When it was announced that the Chairman of the Board would be the Earl of Airlie, a man long associated with all that is best in Highland life, hopes ran high for the success of the new Board.

When the Board announced that one of its early schemes would be on the Tummel and the Garry, the dismay was general, and the construction scheme, published in February, confirms their fears. The Garry will be reduced to a mere burn, and all the arable land at Loch Tummel and Pitlochry will be submerged, so that the economy of the mixed farms in the neighbourhood will be destroyed. At the same time, the Board propose to take the waters from the Bruar, a tributary of the Garry, but offers to provide a flow of water over the Falls of Bruar during summer days when tourists are afoot; similarly they offer to replace the ancient Bridge of Clunie, to be submerged, with "a replica . . . or a design to meet the æsthetic requirements of the County Council." No comment is thought necessary on these proposals.

The bottom dam will be in the heart of Pitlochry, the water-level varying up to 8 ft. every 24 hours. The Recreation Ground, the centre of so much local activity, will be under 55 ft. of water, and there is no satisfactory other site, although the Board state that they will provide an " equally good alternative." The Tummel and the Garry have already been developed as far as it is possible to do so without upsetting the whole balance of the life of the locality.

The great rivers, the burns and the lochs of Scotland are threatened, not only Tummel and Tay and the waters of the Perthshire hills. The peerless Glen Affric and Glen Strath Farrer, Glen Lyon and Strath Tay, are on the list, among one hundred and two schemes. It is not the rise and fall of the waters of the reservoirs, nor yet the dried river beds and the massive buildings, that threaten the Highlands. An artificial lake can improve a valley, astonishingly; our Scottish rivers have always known spate and drought; good industrial building is not beyond the powers of man. No, some of us have the future of the Highlands and the Highland population (a priceless asset to Britain) more closely at heart than that. The threat is that men, trained as engineers, and as engineers only—civil, electrical and mechanical—can be spared in these times (when engineers are desperately needed for other purposes) to impose their schemes and their will upon a whole region, with little or no training in the wider significance of what they do. Their schemes are drawn up in secret; their schemes are published piece-meal; they glibly refer to the " rehabilitation " of the Highlands, but not one word in all they write or say tells us how such rehabilitation is to be effected, in terms of land and men.

Two thousand years ago the poet told in that famous galumphing hexameter of how the Giants struggled to achieve the impossible, trying to place Mount Ossa upon Mount Pelion, as their stepping stone to heaven :

" Ter sunt conati imponere Pelio Ossam."

Today man, no less clumsy but stronger and more stubborn than Giants, sets out to pour the waters of Garry into Tummel, Lyon into Lochy, and so on until ten times ten. To achieve what? Watts! The life of animal or plant, the structure of existing society, the more settled values that make human happiness possible, and which the Highlands have always possessed in so wide a measure, these things must be merged in a civil engineer's paradise, where every bank and every brae becomes a catchment area, where every catchment area must drain to an aqueduct or a tunnel, until the sedge is withered from the lake and no bird sings.

An eminent engineer once remarked " Water is Watts to us." Water is merely watts to the Board, and the Board has been invested by Parliament with immense powers—powers which they are in danger of using for evil instead of good.

The problems of Pitlochry are the problems of most of the land areas of Scotland; are we to stand by and watch whilst Killiecrankie is bereft of its river and the farmers of Pitlochry of their land ? The Highlands must be studied intensively and as a whole, from every angle, not only from the engineering point of view, in secret. We need in Scotland a Board of new men who will make an intelligent and frank attempt to interpret the wishes of the local communities and the intentions of Parliament.

15 THE RESPONSIBILITY OF THE CITIZEN

Collin Brooks

Few people other than land-owners ever attend Public Enquiries into the siting of Power Stations or other industrial undertakings. The reason is a very human one : property owners (a) have something tangible to lose and (b) are carefully instructed by their legal or other professional advisers. It is nevertheless undoubtedly the right and duty of any citizen to attend and to protect himself, or the locality, if it is—in his view—in any way menaced.

The real trouble about Public Enquiries as they are conducted at present is threefold ; that they are not judged by independent persons, that the Government Department concerned is not in the least bound by the Report resulting from the Enquiry, and that there is no compulsion to publish this Report, so that, when the Department does not follow it, this fact does not necessarily come to light.

"WHAT have the people to do with the laws, except obey them ! "

This ingenuous—for it was ingenuous and not contemptuous—exclamation has echoed down two centuries as an example of a point of view not only abhorrent but unintelligible to modern democracy. It is coupled in many minds with John Milton's :

> And what the people, but a herd confused,
> A miscellaneous rabble, who extol
> Things vulgar . . .

The supreme political paradox of our own day is, surely, that those who sincerely and devoutly believe that " the good of the people is the highest law " have come to be linked in many minds with the bewildered cleric who saw but that one serf-like association between the people and the laws—those who are prepared, mentally, to elevate the people to the highest stature are felt, in practice, to be reducing them to Milton's confused herd. The very word "Planners" has come in political discussion to be used as frequently as a term of abuse and distrust as it is used as a mere description.

The extreme wing of " anti-planners "—that school represented at its frankest and most forthright by Sir Ernest Benn—not only accuses State or Community planning of being, by its very nature, unable to achieve the betterments which Private Enterprise can provide, but also accuses it of threatening to destroy whatever dignity and potentiality of growth may be left in the common man. When, indeed, that mysterious person the Common Man is held up as the selected beneficiary of everybody's good works, those who mistrust Planning (in our contemporary use of the word) declare tersely " Codlin's the friend—not Short." They allege that whatever else Planning may do for the Common Man it will certainly leave him common by removing from him any need to exert himself and depriving him of all incentive to tend his own good or even shape his own communal aspirations.

It must be admitted that, under any system, as communities grow more complex, the consciousness of responsibility in the individual citizen tends to decrease. Even if the management of community affairs could be kept simple, the mere growth in the size of communal units would have that effect. To quote again a too hackneyed passage, a hundred years ago Carlyle derided :

> " the notion that a man's liberty consists in giving his vote at election hustings, and saying, 'Behold, I, too, now have my twenty-thousandth part of a Talker in our National Palaver.' "

Today when the ordinary citizen, if he votes at all, can only claim about one fifty-thousandth part of a Talker in an assembly of over six hundred members, and that an assembly which, because of its change of function and extension of interests, is compelled more and more to delegate the actual business of Government to Departments of State and special bodies, the relation of the people to the operations of Government is remote indeed. The tendency is for the Common Man to content himself with asking for those amenities and benefits which he thinks he would like, without troubling at all as to how they are to be provided, or to accept those which some vote-seeking Party confers upon him, without worrying as to the means of their provision, until some impingement of P.A.Y.E. or the rising price of beer and tobacco compels him to realise that no benefit is free and no amenity comes without something else being foregone to pay for it.

Whatever system is in use, it is obviously vicious that the people at large should content themselves with merely demanding supplies, services and facilities—or with accepting them—without seeing, or attempting to see, the implications of those things as a whole and in every aspect—fiscal, sociological, domestic, and so on. It is equally vicious that the people whose demand, or supposed need, impels the provision of such services and facilities, should be left uneducated in the complexities of such matters.

The need for a far more enlightened and vigorous mentality in the electorate is far greater in an era of vast national or communal Planning than in any other. Planning presupposes two things—compulsion of some kind when the initial Plan is agreed, and relative permanence of result. It has been well said that had the era of Planning come in the days of Good Queen Victoria we should be living in a land of Albert Memorials, and would be encountering the greatest difficulty in adapting the newer discoveries of electricity and the internal combustion engine. The people have, one must presume, some right to choose the shaping of their continuing environment ; if, by being given some new service, they are simultaneously trapped into a new mode of life or a new architectural surrounding, they have been tricked. They have a right to turn in their restlessness upon those who—however negatively—misled them.

We know, too well, the apathy which befell local politics before the war, the lowness of the poll, the complete lack of interest in the personalities and policies of the candidates. We also know how little interest is taken or use made by the average citizen of his Local Authorities. Indeed, it is amazing how little use is made of the amenities which those Authorities provide and maintain from the rate-payer's money—the libraries, art galleries, and museums. The genuine interest in the machinery of national politics—as contrasted with its romanticism and "drama"—was always spasmodic, and confined either to the excitement of an election or to some drastic measure of Reform, such as The Parliament Bill which could be translated to the lower intelligence as *Peers versus the People*. But the spasmodic interest in the national machinery of Government, and the almost negligible interest in the local machinery, were vigorous and perpetual in comparison with that taken—or, rather, not taken—in the less familiar forms of communal organisation. The people have, in fact, forgotten or have never known, of many of the safeguards which the Constitution and usage have provided for them. The technique of convening and using *A Town Meeting* is probably utterly unknown to any but a few specialists. Not one elector in a million knows, probably, that such a form of public protest or insistence is really part of the theoretic machinery of Government.

Even less realised, if that be possible, is the right to secure, and the technique of securing, any form of *Enquiry*. Occasionally the Press will report briefly that a Public Enquiry has been held into this or that proposal ; occasionally it will report that some land-owner or possessor of riparian or foreshore rights has appealed before some Ministerial Inspector against some fiat prohibiting him from going forward with some project or another. Apart from these very rare reports, such inquiries are utterly foreign to the electoral mind, which knows neither how they come about, nor why, and cares less. But in such institutions the citizen has a ready means of giving form to the responsibility he feels for the shaping of his own and his children's material and cultural modes of life, and in a properly alert society—whether living under Collectivism or the most unfettered form of Free Enterprise—he would be educated into their use and significances and encouraged to use them.

It is not only the right but the absolute civic duty of the resident citizen to attend these Public Enquiries when they are held. He has no excuse for neglecting them, since they must, by law, be properly advertised in the vicinity. Any citizen who is apprehensive of any change in his locality which may menace its comfort and amenities can, himself, by application to his local authority, be instructed as to how such an Enquiry, or a Town Meeting, can be summoned to protect him.

If we accept any form of the philosophy of the State, other than stark Totalitarianism, it is the Citizen who matters. He and his family form the primary unit, with the community as its secondary expression. The planning of his habitations and of his places of labour, the provision of facilities and services for a fuller and more spacious life, should express not those who may conceive them, but should express *him* and his natural temperament. If they do not, they warp his growth both as a social and a political figure, and destroy instead of increasing happiness . . . and politics, of which all Planning is a part, " is the science of happiness " said Joseph Chamberlain, that pioneer in community betterment.

If, then, we are to have the best from the contemporary readiness to plan and to provide, it is vital that the Citizen should be taught to feel his responsibility, and aided to express it.

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A Public Enquiry, **66,** and the appeal to Parliament are the only weapons that the citizen can wield, if he wants to fight narrow-minded development, and make his contribution to the physical planning of his own locality.

Electricity can bring and must bring the greatest benefit to all. It would be disastrous if the works of man necessary to confer that benefit are ill-conceived, ill-planned, and a menace in themselves.

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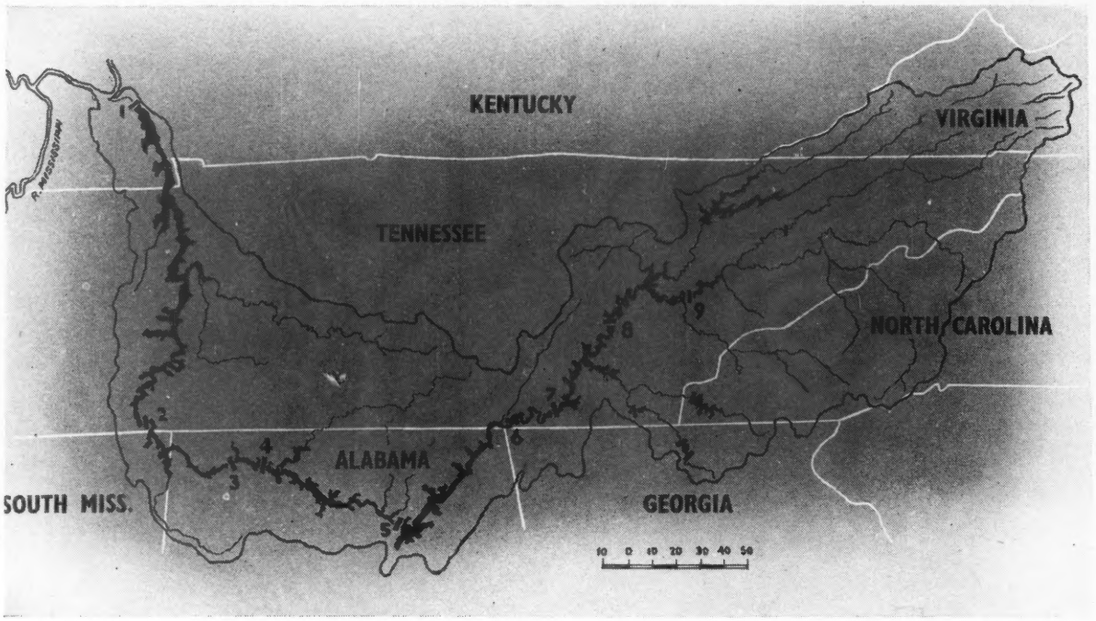
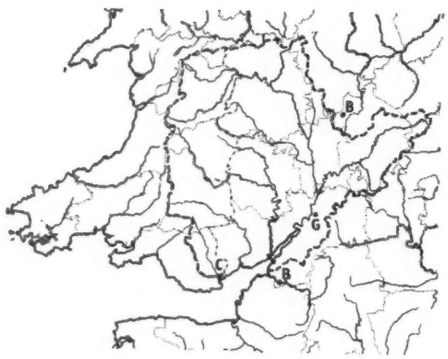
REGIONAL PLANNING FOR ELECTRICITY



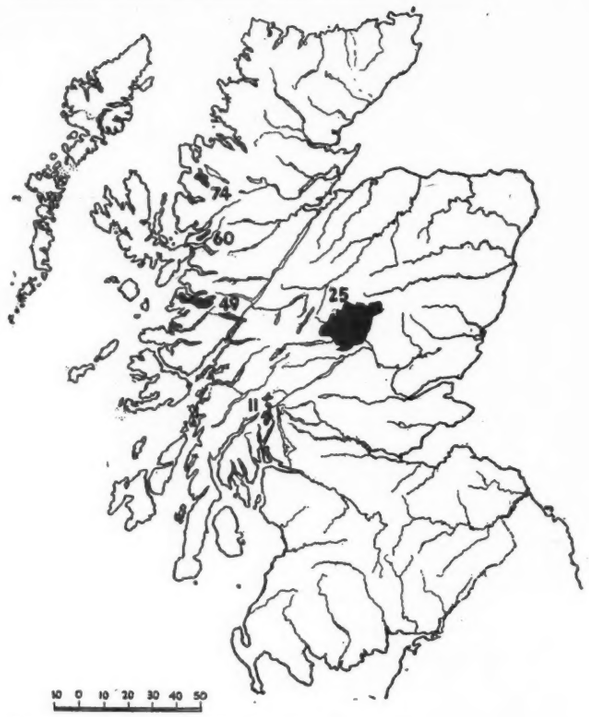
THE TENNESSEE VALLEY AUTHORITY

Estimated potential output 12,000 million units. Output from individual dams, 1943, in million units :—(1) Kentucky, not completed 1943 ; (2) Pickwick, 1,043 ; (3) Wilson, 1,849 ; (4) Wheeler, 953 ; (5) Guntersville, 634 ; (6) Hales Bar, 299 ; (7) Chickamauga, 681 ; (8) Watts Bar, 773 ; (9) Fort Loudoun, not completed 1943. (Total output, 1943, 7,845 million units).



THE SEVERN BARRAGE

Estimated potential output 2,207 million units.



NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Estimated potential output 7,000 million units. Output from existing schemes in million units :—British Aluminium Company, 524 ; Grampian Power Company, 209. Estimated output from proposed schemes in million units : *Project No.* 11, Loch Sloy, 100 ; *Project No.* 25, Tummel-Garry, 275 ; *Project No.* 49, Loch Morar, 20 ; *Project No.* 60, Lochalsh, 10 ; *Project No.* 74, Gairloch, 15.

About four and a half million people from seven states live in the Tennessee Valley Authority's area. There was a problem of people living in poverty on barren land. After an elaborate regional survey a regional plan was prepared which took into account the physical, economic and social needs and possibilities of the whole area. Ten years later electric power is being profitably distributed to 85,000 farms (one in five) and over half a million homes. The residential customers consume an average of 1,450 units p.a. at a cost of just over 2 cents a unit (under £8 p.a.). The rest of the output goes to local war industries at costs ranging from 0.15 cents. These include aluminium and other metals, foods, fibres, timber products, chemicals, aeroplanes, ships' boilers, explosives and synthetic rubber.

About four hundred thousand people from seven counties live in the Highlands of Scotland. Here there is also a poverty problem and a land problem. No survey has been conducted, no integrated plan has been prepared. Five of one hundred and two unrelated projects have now been published. Almost all the electric power is used for one industrial undertaking or transported via the Central Electricity Grid to distant industrial areas.

The construction of the proposed Severn Barrage will have an effect upon the water supplies, power supplies and communications of some three million people, living in fourteen counties. The scheme as at present envisaged is an isolated engineering undertaking. The map shows the approximate area that should come under a regional authority.

ANTHOLOGY

The Romantic Scientist in Norway

" We left Christiansand in the morning at twelve, and at four found ourselves safely moored in the harbour of Arendal. We passed generally within the rocks, and had the same kind of scenery as in our voyage from Mandels—an immense variety of little rocky *islands* constantly opening upon us ; and sometimes our passage seemed hardly large enough for the passage of the boat. The harbour of Arendal is very beautiful, and the town most singularly placed upon a rock, with rocks surrounding it and deep water close to the houses. Trees crown the rocks, and neat little houses come close to the water's edge. I went immediately to a beautiful wooded rock just above the town, where the Mandel scenery appeared as if echoed upon the river of Arendal. I likewise went to visit the iron mines, which are curious, in sienite, with all the rare specimens well known to mineralogists. One of the mines presents a very fine excavation, and you look out upon a tranquil little lake, with pastoral and wooded scenery around it. The day after, a row to the fall of the river : not so large as that of the Torjedahl, but with the same features ; the banks pastoral, the usual vegetation below, and pines above. Where one branch of the river enters the sea, close to the fresh water, and in what can be scarcely brackish water, myriads of beautiful medusæ were to be seen ; but none in the absolutely fresh water. In the afternoon we went to Mr. Tiddicamp's country seat to a feast—a dinner where all the neighbourhood was invited ; where *cabbage* was the first dish put on the table, after the usual prelude of anchovies, sausages, and spirits. The anchovies excellent. After the cabbage came ham, carved and served, as by a servant maid, by the young lady of the house, a very pretty girl. After the ham cutlets and peas dressed in the shells, then chickens with parsley ; then cakes with jelly (gooseberry cake), with plenty of Bourdeaux and Madeira, and toasts during the whole of dinner. When I gave *Liberty*, FREYHEIT, the whole party rose, and sang a song in full chorus. My health was drank, and the Royal Society, and the British Constitution, and the memory of Lord Byron. After dinner we all shook hands, and then walked to see a most magnificent view ; the sea on one side, and wood almost interminable, with lake and mountain on the other, and a thousand little ponds all surrounded with wood. Some mountains, of apparently the elevation of the Grampians, in the back ground, but without snow. We were struck at Arendal by the manner in which the women were treated. The postmaster was rowed to the Vice-Consul's to this grand dinner by a female servant, who was rather good-looking and young, and who dashed through the surge as a Thames boatman would have done, with her great hulking master sitting opposite to her. I was carried across the lake, from the iron mines, by a boat-woman. The ladies *speak* only Norwegian ; but I saw pianofortes, which marked at least the love of music. From the time we landed in Norway till now we have had no night ; the twilight in the west is succeeded by twilight in the east, and at midnight I could read the smallest print. The Norwegian rivers that we have hitherto seen are all beautifully clear, and display their mountain origin and their passage through lakes ; the tendency of colour is to green, but no peatiness ; nor have I yet seen any river with that celestial blue which characterises the Rhone. I caught in the Torjedahl two trout, and a sea trout about the size of a large herring. In the Arendal river I caught nothing. I am sure the saw-mills and saw-dust must interfere greatly with the fisheries in these magnificent streams."

SIR HUMPHRY DAVY (John Davy : *Memoirs of the Life of Sir Humphry Davy, Bart.*, 1839)

MARGINALIA

Acknowledgments

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W. A. Poucher, F.R.P.S. ... 54, 56
To-day's Industrial City of To-morrow (L.P.E.) ... 38, map on p. 108
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A Plan for Bath

The re-planning scheme for Bath has been made public though it is not yet available in book form. The plan is the joint work of Sir Patrick Abercrombie, Mr. J. Owen and Mr. H. A. Mealand, the latter two being the City Engineer and the Town Planning Officer of the City. The plan includes an area of 220,000 acres with a population of some 80,000 people. Its main features are in the central area a redesigned station square with a central bus station nearby, new shopping streets a little further west, a new concert hall nearer the Abbey, a cultural centre on the premises of the present Guildhall north of the Abbey by the river with a café and swimming baths on the opposite bank, a new wide shopping street west of the centre and a large health centre south of it towards the river. The outer area is grouped into thirteen neighbourhoods. One of the most attractive features of the plan is the intelligent use made of the river. It is odd how few English towns have been able to derive other than commercial advantages from their rivers. Durham and York are the only examples that at once come to mind. The possibilities in a place such as Bath are enormous if the Georgian architecture of Bath is, needless to say, scrupulously to be preserved. Conversion of terraces into flats is suggested, and the Royal Crescent is to serve as municipal offices.

Durham News and Lincoln News

Here is the latest score in the Durham and Lincoln electricity fights. At Durham the battle seems to be nearly won. The Minister of Town and Country Planning is going to make further enquiries before reaching his decision, chiefly because geological evidence seems to point to a precarious state of the subsoil on the proposed Kepier site. At Lincoln the next stage will be a close examination of Sir R. Pattinson's proposal to avoid cooling towers altogether by obtaining water for the power station from the River Trent.

The Beiunskis

With all due respect to the drive and professional capabilities of Mr. Moses, the Napoleon of New York traffic and transport, he seems to be playing a somewhat questionable part in planning and architectural politics. His sallies on long-haired planners are notorious, and have called forth a spirited reply from Frank Lloyd Wright in one of the curiously shaped and curiously designed News Letters from Taliesin. Meanwhile Mr. Moses has also set out on a campaign against the " Beiunskis," that is foreign architects in the United States. " Beiunski," a name of unpleasant sound, means the man who goes on saying : " Bei uns," i.e., in our country —things are done like this or like that. Thus it is explained by Elsa Maxwell in the *New York Post*. Gropius, Breuer, Saarinen, all fall into this category of Mr. Moses's. " Gropius," he says, " is hurting our architecture by advocating a philosophy which does not belong here." It would not be worth our space to report this controversy, if there were not the danger after the war in all countries of such a narrowly nationalistic outlook. Britain maybe is safer from it than most others. We like being told by people what in their countries has been successful, and why. We don't mind profiting in due course from other's experience. That is perhaps because we have had so much patent benefit from the Flemish weavers, the French Huguenots, the Vermuydens and Tompions, the Vanbrughs and Van Dycks, and Holbeins, and so on to the Sir Otto Niemeyers and indeed the Gropiuses. Still, it may be just as well to sound a warning in time.

What Hitler couldn't do, we can

Reigate Priory, an uncommonly fine house of the fourteenth, sixteenth and eighteenth centuries, is in danger. Plans for the carving up of the estate are already before the Council. Will the house and its sixty-nine acres of parkland be saved for the town, which has the first option on them ? THE ARCHITECTURAL REVIEW had foreseen in 1938 these troubles for a town so close to the London suburban area as Reigate (*see* Volume 83, pages 229 to 238).

Well Walk, Hampstead, is not safe yet. The inquiry is complete ; but the results will not be known for some months.

In the High Street at Solihull, near Birmingham, stands a fine fifteenth-century house, Greshold Manor House. It is being auctioned, or may have been, by the time this notice comes out. In the prospectus it was advertised as " of interest to proprietors of cinemas and multiple stores." £12,000 are needed to save it. Six thousand pounds have been found. Will the rest be forthcoming ? The case is bad enough

But the worst case at the moment is Hove. The lovely Regency squares and terraces are to be obliterated, if the surveyor of Hove has his way. He wants to replace them by large blocks of flats which he regards as more practical and more cheerful. The worst of it is that people will agree—and

Terraces of Hove, in danger of destruction. *See note on page* lv.

indeed have agreed. A correspondent to *The Times* who lives in Brunswick Square has expressed his approval of the surveyor's scheme. It is to be hoped that Hove will have enough residents to stand by their best buildings, residents to whom visual dignity and decency matter more than a dust shoot and a centrally heated lobby with an imitation Chippendale chest with flowers on, and a uniformed commissionaire.

The City's Destruction Record

Between September, 1939, and February, 1944, the City of London had 715 sirens, 417 high explosives, 13 land mines and 24 oil bombs—little compared with what the R.A.F. and the American Air Force are doing now. Yet the destruction covers an area of approximately 164 acres out of the built-up 460 of the city. 40 churches and 20 halls of livery companies were destroyed or damaged.

War Damage in Germany

Though no official reports are out yet, it appears that the Carolingian octagon of Aachen, the most perfect surviving example of ninth-century architecture, is intact, except for one small shell-hole through the dome. The fourteenth-century choir is undamaged too. The Town Hall is gone.

At Trier, newspaper correspondents report, the Porta Nigra is only shrapnel-chipped, the Amphitheatre is badly battered, and the Romanesque Cathedral is "a rubble-filled shell except for the nave."

On unoccupied Germany, the Germans have published a booklet in Spanish showing bomb damage to buildings of architectural value. Most of them had been recorded already by THE ARCHITECTURAL REVIEW in June 1944. To this list must now be added the Cathedral and the old houses of the Roemerberg at Frankfort, apparently severely damaged, half-timbered houses at Brunswick, one of the churches on the Gendarmenmarkt in Berlin, the church of St. Lambert at Münster, the Leine Palace and the Leibniz House at Hanover, and the church of the Jesuits at Cologne.

Birmingham Leads the Way

The Stationery Office has at last published the report on Design and Designers in the Light Metal Trades which a local committee of the Pick Council under the chairmanship of R. D. Best (of Bestlite fame) had completed in 1940. It is the best such report on one individual industry so far available, and should be read by anybody interested in the future of industrial design in England. Price 1s.

Ragnar Östberg

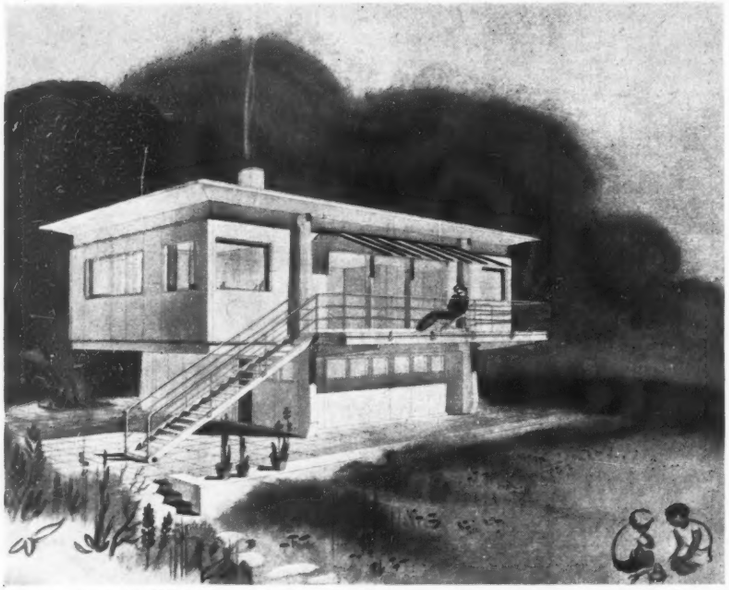
Ragnar Östberg, the architect of the Stockholm Town Hall, has died at the age of 79. His Town Hall is one of the most influential of twentieth century buildings. Its inspiration is noticeable in many places in this country, especially the Norwich City Hall. It stands for a romantic and vernacular brand of Early Modern Movement, nowhere traditional but nowhere revolutionary either. It allowed for a good deal of friendly decoration and can, in fact, be regarded as the fountain head of that graceful, if a little mannered, Swedish ornament which has helped so much in the twenties to overcome period inhibitions amongst architects in other countries. The Stockholm Town Hall —as so many buildings in a similar

[continued on page lviii

L. E. Walker, Photo.

HOUSE, ST. NICHOLAS' CHURCHYARD, KING'S LYNN
Circa 1645

THIS scene deputised for a Dutch background in a recent cinema film, as did other parts of King's Lynn. The strong Dutch influence shewn by many of the buildings is not surprising, for the town was the headquarters of Cornelius Vermuyden's Hollanders who came over to drain the East Anglian fens, and who even used Dutch bricks and roofing tiles, brought here, as ballast, in ships that had carried potatoes on their outwards voyages. If parts of King's Lynn are literally Dutch in origin, it may be said that we helped to restore the balance by sending them 'PUDLO' Brand waterproofer which, right up to the German invasion of the low countries, was a valuable aid in their constant fight against flood and dampness.



From the R.I.B.A. Exhibition of French Prefabrication. M. Lots's design for a private house. See note on this page.

continued from page lvi]

historical position—is likely to suffer from the quantity and quality of much of its minor progeny. In looking at it and considering the genius of its architect one has to forget about this and take the building on its own merits, on the merits of its picturesque grouping, its sensitive handling of materials, and its truly popular monumentality.

Exit Mr. Strauss

The Prime Minister has accepted the resignation of Mr. H. G. Strauss, Parliamentary Secretary to the Ministry of Town and Country Planning. The reason is not one of planning differences, at least not according to the statements published. His successor is Mr. A. Jenkins, M.P.

French Prefabrication

This exhibition at the Royal Institute of British Architects of drawings shown in the Paris Salon of 1944 was both sad and hopeful. Here were French architects and groups of architects full of ideas, thrilled by the possibilities of mass production in housing, and yet —for political reasons—utterly unable to get anything done. Frustration has left its marks in all these drawings. It is bad enough for our architects to see the results of their research in no better shape than that of one occasional experimental house. If even that check is removed the common sense of the architect loses control over his imagination, and the results seem as unreal as any Piranesi engravings. The work shown is exclusively for steel construction, although surely steel is as short in France as in England. No information is given on the recent development of ferro-concrete, which used to be the chief medium of modern architecture in France. The quality is uneven. It ranges from the best modern Paris tradition (Lots) to modernistic bogus (Pingusson).

All-Gas and All-Electricity Kitchens

Two kitchen exhibitions have recently been held: The British Commercial Gas Association's Kitchen Planning Exhibition at Dorland Hall and the Electrical Development Association's Exhibition of All-Electric Kitchens at the Building Centre. The consultant to the former is Miss Jane Drew. Her exhibition is more an exposition of research and its results than the other. Such problems as uniform working levels, prevention of accidents, reconditioning of existing kitchens are considered. Of prefabrication in kitchens the most interesting item is Mr. W. Segal's hot-water supply unit for small houses with coke boiler, hot-water cylinder for 30—35 gallons, linen cupboard and water tank. The Building Centre Show is of four model kitchens with electric wringer, drying machine, washing machine, thermostatic controlled oven, etc.

British Architecture for the Turks

An exhibition of British Architecture, held by the British Council at Istanbul, has had an attendance of over 18,000 in three weeks—an excellent record. May it mean that our Frys and Yorkes and Gibberds will, after the war, replace the strong Austro-German contingent of modern architects employed on the public and private buildings of Turkey.

A Dixon Scott Photograph

Last month's frontispiece, the Brighton Pavilion, was a photograph from the Dixon Scott Collection of the British Council, reproduced by the Council's courtesy.