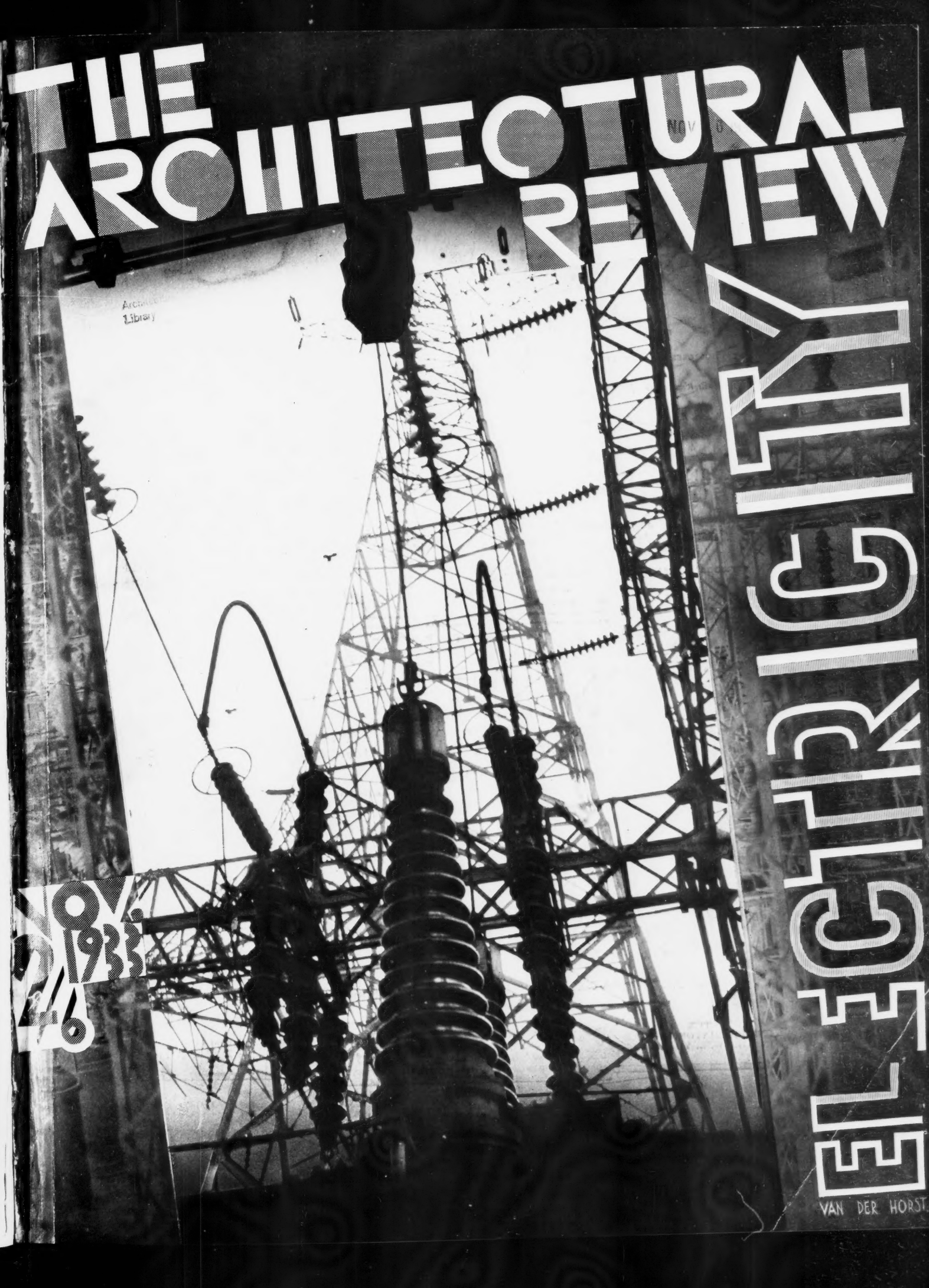
THE ARCHITECTURAL REVIEW



ELECTRICITY

VAN DER HORST

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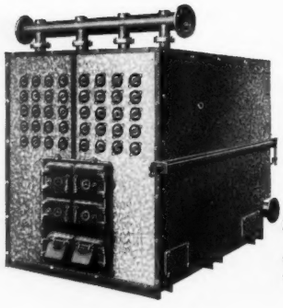

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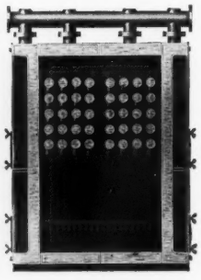

WATERWAY TOP, BOTTOM AND SIDES

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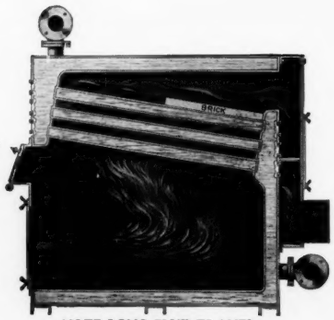

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THE
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A Magazine of Architecture & Decoration

Vol. LXXIV, No. 444 — November 1933

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Plates

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United Kingdom, £1 5 0 per annum, post free. U.S.A., $6.00 per annum, post free. Elsewhere Abroad, £1 5 0 per annum, post free. Cheques and Postal Orders should be made payable to THE ARCHITECTURAL PRESS, LTD., *and crossed Westminster Bank, Caxton House Branch.*

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An index is issued every six months, covering the months of January to June and July to December, and can be obtained, without charge, on application to the Publishers, 9 Queen Anne's Gate, Westminster, S.W.1.

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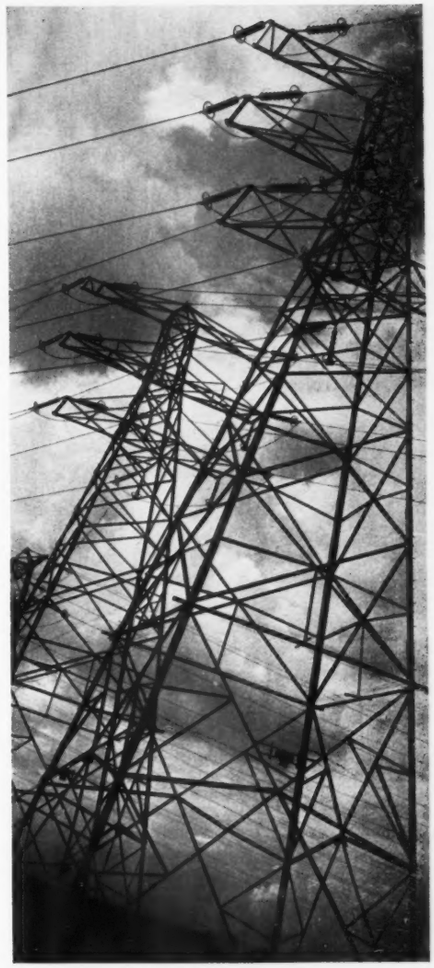
The secret of these hills was stone, and cottages
Of that stone made,
And crumbling roads
That turned on sudden hidden villages.

Now over these small hills they have built the
concrete
That trails black wire :
Pylons, those pillars
Bare like nude, giant girls that have no secret.

The valley with its gilt and evening look
And the green chestnut
Of customary root
Are mocked dry like the parched bed of a brook.

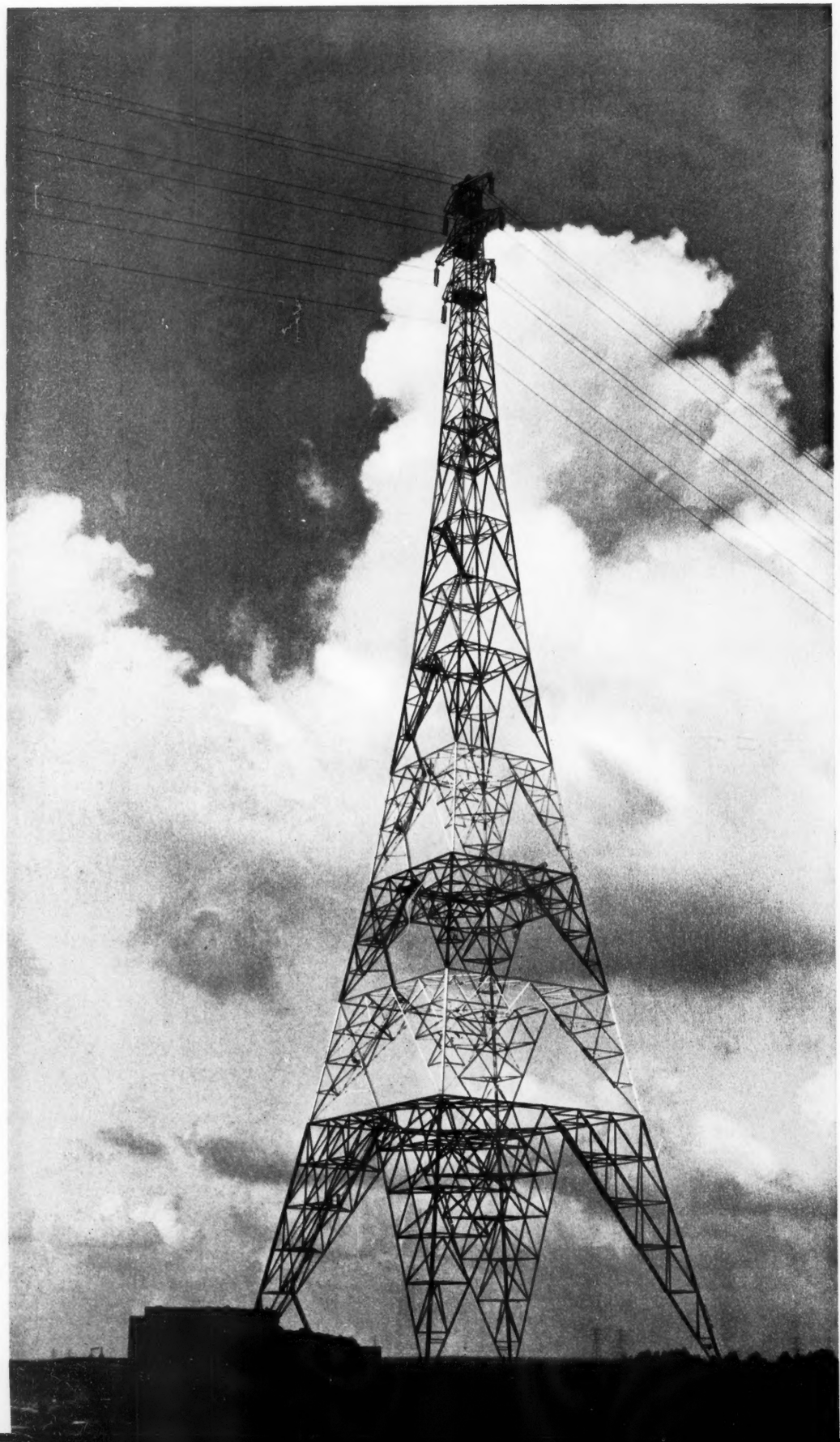
But far above and far as sight endures
Like whips of anger
With lightning's danger
There runs the quick perspective of the future.

This dwarfs our emerald country by its trek
So tall with prophecy :
Dreaming of cities
Where often clouds shall lean their swan-white neck.



THE PYLONS

STEPHEN SPENDER (Poems 1933)

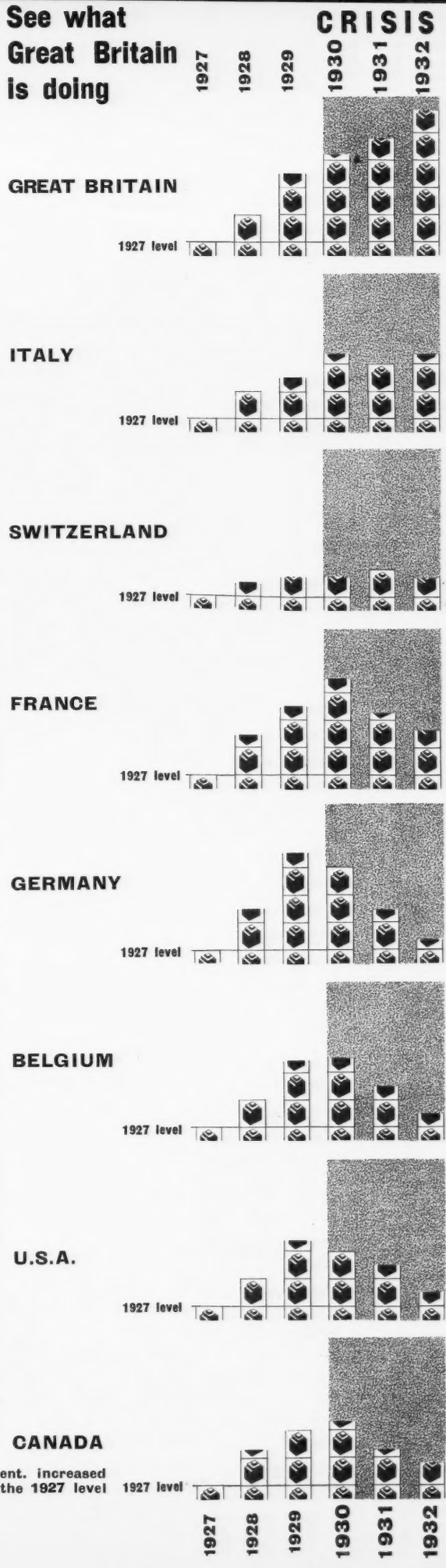


The construction of 4,000 miles of main and secondary transmission lines, of 273 transforming and switching stations, of seven central control rooms to direct operations in the scheme areas has given rise to a whole series of difficult structural and even architectural problems. Rivers have had to be crossed in all parts of the country—the Thames towers at Dagenham, here illustrated, with a span of over 3,000 feet, 487 feet high; the Roding tower at Barking Creek, 362 feet high; the Severn crossing at Upper Arlingham, almost 300 feet high; the Forth crossing at Kincardine, 298 feet high; the Clyde crossing at Yoker, 280 feet high, and a large number of towers between 200 and 300 feet. In the whole area of the national system are more than 55 river crossings.

Cross River

ELECTRICITY

See what Great Britain is doing



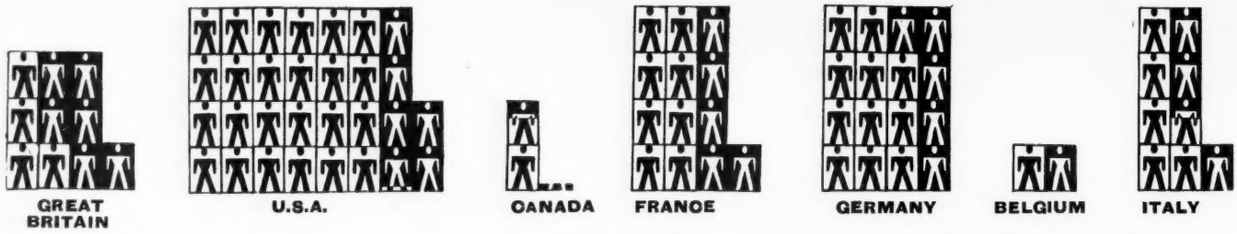
NEGATIVE issues, movements of disruption, these have largely dominated the post-war scene. In Great Britain there has been at least one positive force of quite first-rate importance: the great nation-plan for electricity supply. As a result of this plan, complete electricity services will, in a few years from now, be as easily and as universally available as are the postal services today. So far, it has been rather uphill work, being an electricity user in this country. Very soon it is going to be uphill work no longer. Electric power is going to be there for everybody to use, not merely a privilege of the moderately rich, like soft pile carpets, good wines and log-burning fires. It will make the lives of millions roomier, healthier and cleaner.

That plan is the event which this number of THE ARCHITECTURAL REVIEW was designed to record. But it cannot stop at that. An electricity plan cannot function in a void. And so we have to refer our readers to that larger plan on which the future of England is now seen to depend. This country has lately discovered how appalling and how dangerous is the looseness and the disorder of its structure today. The thing called "planning" is noticeably in the air. It is so much "in the air" that as these words are written there is being read throughout England the first issue of a new paper expressly founded to combat it. We hope the paper will prosper and rid us of a lot of bogus planning that can never do anyone any good. It cannot, of course, rid us of planning. This machine-using civilization of ours will either go on or go under: there can be no third course; and if it is to go on, then planning will be as necessary to it as a time-table is to a railway. It is clear that if our individualists' hopes come true there will be no place for a national electricity supply in England. As, however, modern England is quite likely to continue as a going concern, an efficient national electricity supply will probably be found its first and greatest asset. A nation plan without a national electricity supply is possible, but at the moment remote. Because the two are so inextricably bound up together, the subject of planning has had to be given a very considerate share of these pages.

But there are other aspects that require to be looked at, and our contributors have done their best to look at them steadily and intelligently. When it comes to the uses of electricity the picture they present is not, cannot be, a complete picture. There is nothing about electricity in transport. People do not always remember how completely dependent modern locomotion is on electricity. The sparking-plug is a very small thing in an internal combustion engine, but its invention was as important as the discovery of fire was to the later discovery of gunpowder. Flying is no less a product of electricity than is the radio. Here, too, is a subject that has had to be omitted from these pages, along with telephones, electric signalling and other forms of communication which electricity has made possible. Then why, it may be asked, produce a special number on Electricity with all the most interesting things left out? The answer is that, being an architectural paper, we have confined ourselves to the architectural field, to the part played by electricity in habitable buildings, public and private. We leave our readers to judge whether this smaller field is rich enough to have been worth while.

Some of the articles that follow are addressed to architects; some to the public at large; while one or two are the sort of articles that we hope will be read by the electricity people themselves. We believe that the cause of electricity is still too often better served by its amateurs than by its professionals. There are signs that the belief in electricity and the hopes for its future are stronger among mere laymen than it is among the electric people who should be the prophets of this belief. Too many of them do not somehow seem to be quite sure about electricity. This is partly because they are such decent, human people. After all, electricity is part of the scientific and industrial age, and decent people have a way of feeling anything but happy about the industrial age. It began exceedingly badly. It fell upon a peaceful, ordered world unawares and did some hideous damage. But electricity has no part in the badness of the industrial age; on the contrary, it is one of our principal reasons today for believing that the industrial age may yet prove a blessing instead of the curse it sometimes looks like being.

 means 10 per cent. increased consumption on the 1927 level



MEANS ONE MILLION CONSUMERS

In Seven Countries

MEANS ONE MILLION NON-CONSUMERS

At the head of this page is a diagram illustrating the penetration of electricity in seven important countries. Each unit represents one million "connected" consumers. It will be observed that Britain lags far behind the other countries with less than 50% of the number of consumers connected, as compared with the United States and Germany with over 70%, and France and Italy with 60% connected. Thus over half of our work of electrification still remains to be done. At the foot of the page is a double diagram showing quantities of current consumed. The left half gives the consumption of electricity per consumer for public lighting and domestic services. The American consumption is much larger than in Europe chiefly owing to the more generalized use of refrigerators. On the right the consumption for other purposes, mainly industrial and traction, is shown by flashes. The enormous rate of consumption for Canada is influenced by its large paper and wood-pulp industries which are entirely dependent on hydro-electric power.

Economic Background

DURING the past two years there has been keen discussion about the economic future of this country, and various projects have been put forward for the planning of industry and of economic activity generally, to ensure at least some orderly approach to the organization on intelligent lines of the national life. Such interest has always been aroused in the past by severe trade depression largely because unemployment and declining profits reveal disorganization and waste, while prosperity and active production serve to obscure, and in some way excuse, defects in the existing economic structure. There is evidence, however, that the present movement towards planning is one which will endure and one may well ask why this should be the case.

There are probably four major developments which have coincided to force into prominence the demand for planning and for rational control.

MEANS PUBLIC LIGHTING AND DOMESTIC SERVICES

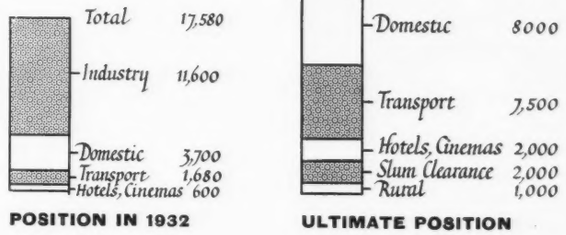
MEANS INDUSTRIAL AND OTHER SERVICES

(1) The progress of mechanization has on the one hand reduced employment principally in the basic industries, such as ship-building, iron and steel, agriculture and coal mining, while it has brought into existence a market for new products manufactured by smaller industries necessary to the work of mechanization. This has resulted in a transfer of labour out of the traditional industries of Great Britain, into smaller industries, not all of which could easily be located in highly industrialized areas. In those industries the type of labour employed, the conditions of employment and even of

social relationship after work are different from those obtaining in the older industries.

(2) Accompanying, and at some stages preceding, mechanization, electrification of manufacturing processes has represented a speeding-up of production and a change in the relationship between labour as a unit in the modern machine and labour as a unit in the old, semi-mechanized factory where handicraft and acquired skill were all-important. Before the war, for example, industry was electrified probably to the extent of about 20 per cent., while the present figure is in excess of 70 per cent. Every new factory that is built now is an all-electric factory, in the majority of cases deriving power from the public network. The process of conversion, which has only covered hitherto a short period of 50 years from the time of the first public electricity supply, and had made no real advance prior to the war, has been accelerated to an extraordinary degree, so much so that a major trade depression, such as that which has ruled since the beginning of 1930, has had no effect in seriously retarding or diverting it.

Forecast for Great Britain



The total rectangle represents in each case the aggregate consumption of electricity and is split up into its constituent parts. It should be noted how Industry predominates in 1932 and how by the future growth in the other services of electricity the share of industry is reduced to 45%. In estimating the optimum consumption we have assumed a degree of industrial electrification of about 80%, with an addition for new industries, complete electrification of the railways, a consumption of about 1,000 units per household in slum clearance schemes, as well as in housing generally.

(3) The result of mechanization and electrification combined has been a greater mobility of industry itself in the sense that industry is no longer confined to any particular area, and is not dependent on the proximity of water and power supplies to the same degree as formerly. As part of the same development notice should be taken of the fundamental change that has taken place in transport. Road transport has been developed to such a degree that the great centres of population have become more accessible to manufacturing units located at some distance outside of them.

(4) With this has come inevitably the development of the public utilities, first among them being electricity supply. The electricity supply industry was comparatively unimportant until the end of the war and it had no real influence on the economic configuration or development of the country, but, in 1933, with a capitalization of almost £400 million, with an enormously extensive distribution network supplying energy to more than half of the manufacturing and industrial processes of the country, to more than half of the households, to many thousands of farms and rural townships, it has entered into almost every phase of national activity and the speed of penetration is such that in about ten years' time very few activities will remain outside of its range. With electrification should be grouped the control and maintenance of new roads which, while scattered through innumerable local authorities, have all the characteristics and responsibility of a great public utility service. The provision of housing on a very extensive scale, both by public authorities and by private enterprise, has assumed many of the characteristics also of a new public service without public control or responsibility.

It is possible to describe other factors which have had some part in determining the present economic configuration of Great Britain, but the above are the most important and together represent the first stages of a profound social and economic revolution greater than anything which this country has yet experienced.

Some perception of this change has penetrated the public conscience and has been, and will be, translated into action by the government itself, action which must concentrate those new activities and services so as to ensure some degree of order and avoidance of waste in future development. Thus mechanization has displaced labour in large numbers between one industry and another, and changes in the competitive power of the great exporting industries, due to the industrialization of previously undeveloped markets overseas, has thrown large masses of labour on the market which have not yet been absorbed. The electrification of industry, combined with the improvement in road transport, has allowed industrial factories to grow up in the vicinity of the largest markets, notably in South-east England and the Midlands, without reference to the old industrial areas, and the labour for those industries has been recruited locally.

Such a process of industrialization in the South has introduced new social and building problems whose solution is very difficult. Changes in the standard of living, resulting from the progress of scientific discovery principally associated with electricity, have created new social necessities and influenced public taste away from old materials, old methods and old processes. Such changes can be seen at their clearest in the growth of wireless as an instrument, the expansion of the cinema, the increasing demand for fine textiles for wearing purposes, the extraordinary variety of modern houses—not all of it admirable—and the change in the conception of what should be adequate equipment for such houses.

One first consequence has been emphasis on the necessity for town and regional planning, if only to ensure that the new industrial areas in the new townships arising from the shifting of population should be reasonably efficient and, as far as possible, in line with the harmonious development of the country; on the grouping of industries and services to ensure that they will be adequate to the demands of the new industrial regime; on the reorganization of the old industries to make certain that they will be strong enough to survive the changed world conditions; and finally, on the intelligent utilization of the economic resources of the country.

In discussing, therefore, the reorganization of the electricity supply industry in Great Britain, one must have, always in mind the fact that the new economic revolution forms a background to what has been attempted, and will probably decide the success or non-success of the co-ordination under public control of the production and main transmission of the greatest single force within our present industrial and economic structure, namely, electric power.

HUGH QUIGLEY

Order striding into chaos. The slender towers pick their way elegantly over slag heaps, rubbish dumps and past disused chimney shafts, towards the waiting town. Factories which once caused that storm cloud of which Ruskin complained (see page 209 of this issue) will soon be installed with electrical power, and the sun will shine again, showing up the unplanned muddle of a former industrialism.

The Region and Power Supply

At the present time it is of some importance to consider the trend of regional planning and its relation to the national scheme of power distribution, and to what extent the synthesis of a regional framework is in progress. Regional planning in this country may be said to have arrived at a critical stage of its development, since it has gradually come into being from the realization that local planning schemes required to be co-ordinated to have any reality of background, and that certain areas obviously required consideration as a whole.

The extension of planning powers by the recent Town and Country Planning Act to all land, whether urban or rural, subject to certain conditions which can be very flexibly interpreted, has altogether widened the scope of planning from the limited aspect of the control of urban outgrowth. A statutory basis has been conferred upon regional planning by joint committees, though the delegation of powers to county or larger units by the local district planning authorities is entirely permissive, and there is no definite indication of desirable regional groupings.

The tendency of recent movements of population, the evidences of planning in certain industries and agricultural marketing boards, and, above all, the completion of the first constructional stage of the nationally planned "Grid" for electric power supply, are co-related factors which further indicate the necessity for an organized regional planning upon a broader and more functional basis.

There are in existence in England and Wales at the present moment 120 "regional" planning areas* under joint committees, of which 48 have executive powers, the remainder being advisory only; and some 45 reports have been issued by these bodies. These regional planning areas are distributed irregularly throughout the country, the greater number being located in south-east England, Lancashire and parts of the Midlands, and are generally portions of counties or else areas around urban or industrial nuclei, whose close grouping has made some sort of co-ordination imperative. In Kent there are to be found six "regions," seven in Sussex and four in Surrey; five in Essex, with one portion blank. Derbyshire and North Staffordshire intervene with a regionally blank space between Lancashire and the Midlands; the greater part of Northumberland, Durham and Yorkshire has no regional planning. The whole of Lincolnshire, Isle of Ely and Hunts is without a regional plan, as are the greater parts of Norfolk, Suffolk, Shropshire, Hereford and Mid-Wales; Wiltshire, Dorset and most of the West Country further remain dormant as to any organized regional planning.

The total number of town planning schemes in England and Wales to date is 1,394, representing 759 authorities. Of these, however, only 82 have reached the stage of final approval by the Ministry; and no fewer than 849 (or 60 per cent.) only represent "resolutions to prepare schemes, but draft schemes not yet adopted, or schemes submitted." Municipal planning is hampered by the artificiality of its boundaries, the very varying degrees of activity of adjacent districts, and general lack of co-ordination.

Planning aims at a synthesis, the ultimate and obvious synthesis being the national plan. To aim at a synthesis without any clear conception of the regional framework required has neither logic nor reason, and yet this is at present the case.

The following remarks referring to the "Lancastrian"* region (Lancashire and Cheshire) are significant in this respect:

> The close grouping of expanding towns round Manchester-Salford, round Liverpool and in the Ribble Basin, has made necessary some form of co-ordinated regional planning within which town planning is subsidiary. What is lacking at the moment is the realization that within a geographical unit such as Lancastria, co-operation among the regional committees is not only desirable but necessary. . . . The more Lancastria is studied in all its geographical aspects, the greater becomes the impression of unity in diversity. Yet disputes, often bred through fear of absorption by the larger towns of smaller communities, are unfortunately not infrequent in spite of the activities of regional committees. . . . There is an immediate and urgent need for the closest possible co-operation between all local authorities, great and small, if the fullest possible use is to be derived from the sum of the factors which grant Lancastria its individuality.

A clear conception here evolves of a region which has a definite entity and individuality, and which is at present being

* See Map 4, page 165, and also *Town and Country Planning*, August 1933, pages 104 and 115.

* From *Great Britain—Essays in Regional Geography*, Cambridge, 1930.

" planned " by a number of fragmentary or overlapping schemes, and where no solution is apparent for the determination of the respective spheres of influence of the chief great nuclei. National and regional planning must remain to a great extent vague phrases unless they are considered as a framework in which the potentialities of functional regional activities are assessed and adjusted, so as to provide an economic balance of national expansion. Towards this end the distribution of electric power throughout the country is one of the most potent factors. The scheme of the Central Electricity Board is both national and regional, in that the country is divided up into regions for the purpose of a balanced load for the distribution of power.

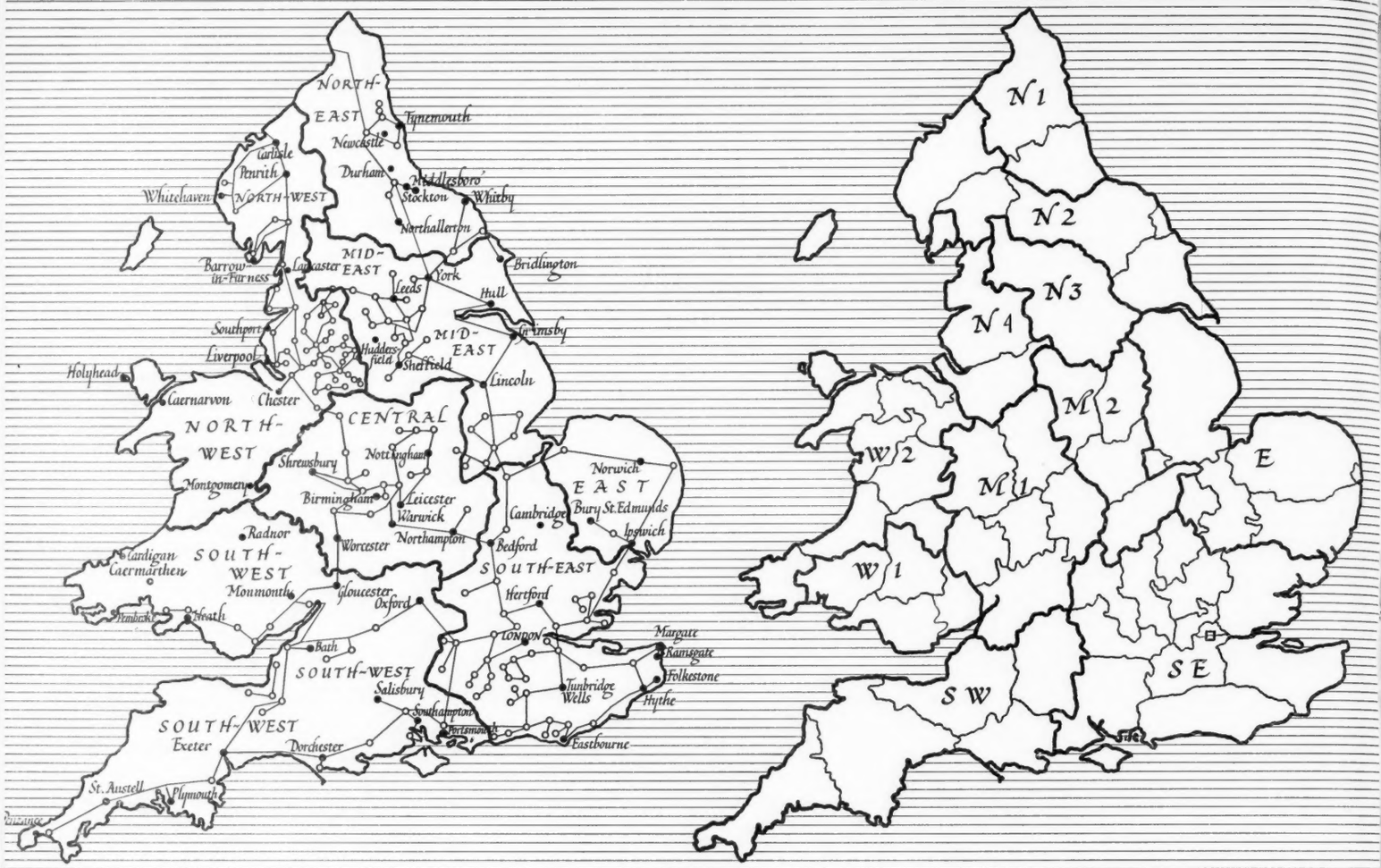
In considering the fundamental aspect of co-ordinated regional planning in relation to national economic expansion, power supply and local urban growth, the first question which arises is: What is a region? While, on the one hand, " *North-East Blankshire* " is obviously not a fundamental planning unit, neither is this necessarily some very large area of the country which is conveniently so considered for the purposes of power supply, or, for instance, for the analysis of population and employment, as the regions employed by the Registrar-General and the Ministry of Labour. Somewhere between these will be found the true regional unit; and although the element of arbitrariness cannot be entirely escaped, and opinions must inevitably differ, yet regions can be reasonably determined whose geographical and economic conditions indicate areas of demarcation and regional integration. On this basis a case could be made out for some 20 regions, each generally comprising several average county units, within which the smaller "regional" schemes now in existence, or to be filled in, would bear a similar relation as the local district schemes now do to the existing regional schemes.

The Central Electricity Board has divided the country into nine areas—Central Scotland, South Scotland, North West England, North East England, Central England, South West England, East and South East England; broad divisions in which the main industrial areas are balanced with the inclusion of co-related agricultural areas.

On pages 173-175 of this number there appears a detailed description of the North West England regional area.

One of the Grid towers seen from the north bank of the Thames at Dagenham, near the Barking Power Station. This tower and its companion on the Kent shore at Woolwich are the highest of the Grid. They are 487 feet in height and carry 132,000 volt main transmission lines, spanning 3,000 feet across the river. This photograph and also that of the frontispiece were taken by Mr. Hugh Quigley.

The present subdivisions of this area, whether of local supply companies, or again of joint planning committees, have neither, on the one hand, efficiency of functioning, nor, on the other hand, sufficient breadth of outlook to provide a balanced synthesis or system of regional development. North Wales is clearly related economically to the Liverpool district; and Cheshire is related to both Wales and Lancashire. Though, geographically speaking and culturally, Wales is a distinct region, for economic purposes, and the distribution of power into rural districts, it is necessary to include some portions of Cheshire and the Shropshire borders within this region, in order that the industrial load in these districts may balance the lack of industrial activity in the remoter districts. The basis for Regional Planning is here suggested upon the subdivisions of the main Electrical Regions. It is to be noted that, as compared with the Census Regions, these regions to some extent ignore the county boundary divisions, though they do not cut across local district boundaries.



1

Electricity, like transport, is a mobile force, and its areas of distribution, which require to include industrial nuclei with agricultural regions to obtain a balanced load, are not essentially determinable by geographical or cultural boundaries. In view of the general distribution of modern power and transport now proceeding, it must be the concern of regional planning that the *basic* regional character shall be retained and not exploited by indiscriminate developments, whether industrial or residential. In this sense the regional balance is not one of equal wealth or industrial activity; but a means of reducing the congestion in the great industrial districts by the planned distribution of activities which will assist the reorganization of the agricultural districts. Unless, however, the authorities concerned are prepared to exercise fully the powers available for the control of development and amenities, the distribution of power and transport will not be utilized for the greatest benefit of the community, and the accompanying diffusion of building activity will continue to be shapeless and sporadic, confused and uneconomic.

Not only is the necessity for the determination as to what form regional co-ordination shall take brought to the fore by the provisions of the new Act, but further its very title, *Town and Country Planning*, brings to the front the crux of the matter —the adjustment of the relative spheres of urban and rural development. The Town and Country Planning Act merely regards agricultural land as "rural amenity," to be preserved from irregular building development; and no positive attitude towards it emerges from the perusal of the Act. "Rural Development" has little meaning here unless agriculture is considered and zoned for as a basic industry; as areas of primary production, both general and specialized in relation to traditional and potential local land utilization and marketing developments. Electrical power distributed throughout the rural districts provides the source for the efficient mechanization of agricultural processes, and their extension to agricultural-industrial productive units in the immediate vicinity. The "factory farm" is one solution of the agricultural problem, and of which evidences are to be seen. The distribution of industrial units closely connected with agriculture, such as canning factories, etc., in fruit districts, by no means postulates the creation of, or the proximity of, industrial towns, but does connote adjacent village nuclei, reasonable transport and power facilities, and a sufficiency of specialized agricultural production. Many native industries, such as paper mills, tanneries, etc., are found functioning

2

Map 1 is England and Wales as subdivided by the Central Electricity Board for the purpose of electric power transmission. There are seven areas, which are named as follows: North-east, North-west, Mid-east, Central, South-west, East and South-east (the two last being now generally considered as one unit). Map 2 gives the census divisions of the Registrar-General. The six main regions contain each the following counties:— South-eastern: Bedford, Berkshire, Buckinghamshire, Essex, Hampshire, Hertfordshire, Kent, London, Middlesex, Oxford, Surrey, Sussex. Northern: Durham, Northumberland, Cumberland, Westmorland, Yorkshire, Cheshire and Lancashire.

Plans for England

3

on a similar basis in relation to adjoining villages and hamlets.

The distribution of such units, whose design need not be a rural disfigurement any more than a local corn mill or brewery, is made possible alone by the diffusion of electric power; and the load taken under conditions of efficient operation further provides the means of economic supply to the surrounding farms and villages. This conception of diffused industry of a certain type needs consideration from the planning point of view. It does not imply extensive "industrial zoning," nor is it connected with "garden city" development; its primary consideration is its relation to an intensively developing agricultural background.

The framework of rural England, with its market towns, county towns, villages and hamlets, is no fortuitous system, but one which has been stabilized in the course of centuries by mutual adjustment and competition, the radius of influence of marketing centres depending upon existing transport facilities. The railway era did not disturb this system so much as the recent advent of motor transport which has contributed to reduce the importance of many small once prosperous "market towns" to that of decaying larger villages. It is evident that many of these can never recover their ancient importance; and that the nearest large town of the district will continue to attract the villages for a greater radius around, both for shopping and amusements.

From the regional point of view, however, it appears no longer reasonable for individual competition to result in stagnation of some centres with undue congestion or expansion of others; and local "town planning" obviously cannot provide a basis for relative adjustment. The small country town must therefore under existing conditions sink to the level of a village, or become a residential appendage of the nearest large town. The coherent revival of the agricultural background and connected industries based upon electric power supply may, however, provide a means of preventing the further decay of these subsidiary centres.

The aim of regional planning must be to provide a basis for an equalized economic expansion so far as possible within the region; rather than intensive developments at certain points at the expense of continued decay in others. Those areas which

4

Midland: Gloucester, Hereford, Salop., Staffs., Warwick, Worcs., Derby, Leicester, Northants, Notts. Eastern: Cambs., Hunts., Lincs., Norfolk, Rutland, Suffolk. South-western: Cornwall, Devon, Dorset, Somerset, Wilts. Wales forms the sixth region. Map 3 has been suggested by the "Cambridge Essays in Regional Geography," which contains the first serious attempt at a reasoned analysis of Great Britain on a regional basis. Map 4 shows the 120 areas now adopted by joint committees for regional planning. A list of these areas is given in the next column.

The following is a list of **120** areas shown in map **4** above. These are the areas that have been subject to Survey and Regional Planning by Joint Committees, **48** of which have Executive powers. They are marked with an asterisk. The numbers give the approximate order of the formation of the Committees. Those that have issued Reports are marked †. **1**, Doncaster†; **2**, Manchester† (Parts of Lancs., Cheshire and Derby); **3**, Deeside† (Flint and Cheshire); ***4**, S. Teeside†; **5**, W. Middlesex†; **6**, S. Tyneside†; **7**, N. Tyneside†; ***8**, Rotherham†; **9**, Mansfield (Notts and Derby); **10**, Wirral†; **11**, N.E. Surrey and W. Kent†; **12**, Thames Valley† (Parts of Surrey and Middlesex); **13**, E. Glamorgan; **14**, Lancaster and Dist.†; **15**, Mid. Glamorgan; **16**, E. Kent†; **17**, Leeds and Bradford†; **18**, Nottingham and District; **19**, Afan and Neath Valleys; **20**, Midland† (Warwick, and parts of Worcester and Staffs); ***21**, N. Tees; **22**, S. Essex†; **23**, E. Carm. and W. Glam.; **24**, Bath and Bristol† (Part of Somerset); **25**, N. Staffs; **26**, Chesterfield†; **27**, S.W. Lancs.†; **28**, Worthing and Dist.; **29**, N.W. Kent†; **30**, S.W. Kent; **31**, N.E. Lancs.†; **32**, Hertfordshire†; ***33**, S.W. Sussex†; **34**, Mid-Cheshire†; **35**, Mid-Surrey†; **36**, W. Surrey; ***37**, Preston and Dist.; **38**, N.E. Kent†; **39**, Brighton, Hove and Dist.†; **40**, N.W. Surrey†; **41**, N. Middlesex†; **42**, S. Bucks and Thameside† (In 77); ***43**, Woodbridge (Nr. Ipswich); **44**, Eastbourne and Dist.†; **45**, Fylde (Lancs.); **46**, Berkshire†; **47**, Lake Dist. S.†; **48**, Sheffield†; **49**, S.E. Sussex†; **50**, Oxfordshire†; **51**, Leicestershire† (Part of); ***52**, Basingstoke; **53**, N. Wales (Part of Caernarvon and Denbigh); **54**, Mid-Northamptonshire†; **55**, Cambridgeshire (Part of); ***56**, Brighouse and Dist. (Yorks.); **57**, E. Sussex (N. Area); ***58**, Hartlepools (Durham); **59**, Cumbria† (Cumberland and part of Westmorland); **60**, Wye Valley (Part of Hereford and Mon.); **61**, Swadlincote (Staffs.); ***62**, S. Devon; **63**, Gloucestershire (Part of); ***64**, Hythe and Eltham; **65**, Wrexham (Denbigh); **66**, Southampton; ***67**, Norfolk (E. Central); **68**, Bushey and Watford (In 32); ***69**, Mid-Herts (In 32); ***70**, Folkestone; ***71**, Central N. Durham (In 6); ***72**, Keighley (In 17) (Yorks.); ***73**, Woodstock (In 50); ***74**, S. Oxfordshire (In 50); ***75**, Witney (In 50); ***76**, Leek (In 25); **77**, Buckinghamshire; ***78**, Manchester (Sub-Reg. In 2); ***79**, Chorley (Sub-Reg. In 2); ***80**, Bolton (Sub-Reg. In 2); ***81**, Bury (Sub-Reg. In 2); ***82**, Leigh (Sub-Reg. in 2); ***83**, N. Cheshire (Sub-Reg. In 2); ***84**, E. Cheshire (Sub-Reg. In 2); ***85**, Rossendale (Sub-Reg. In 2); ***86**, Oldham and Dist. (Sub-Reg. In 2); ***87**, N. Derbyshire (Sub-Reg. In 2); ***88**, Wigan and Dist. (Sub-Reg. In 2); **89**, Reading (In 46); **90**, Winchester; **91**, Oxford; **92**, Cheltenham (In 63); **93**, Chester (In 3); **94**, Northampton†; **95**, Portsmouth; **96**, N.W. Sussex; **97**, W. Essex†; **98**, Bedfordshire; **99**, Rugby†; ***100**, Clacton and Tendring; **101**, Scarborough; ***102**, Tonbridge (In 30); ***103**, Chipping Norton (In 50); ***104**, Rochdale (In 2); ***105**, Wolverhampton and Dist.† (In 20); ***106**, Burnley and Dist. (N.E. Lancs. No. 2, In 31); ***107**, Sutton Coldfield and Redditch (In 20); ***108**, Banbury and Dist. (In 50); ***109**, Batley and Dist. (In 17); ***110**, Penrith and Dist.† (In 59); ***111**, Mid-Cheshire (Area No. 3 In 34); ***112**, Mid-Cheshire (Area No. 5 In 34); ***113**, N.E. Durham (In 6); ***114**, S.E. Kent; ***115**, New Forest and Dist.; ***116**, NE. Essex; ***117**, Mid-Cheshire (Area No. 4 Runcorn, In 34); **118**, Mid-Essex **119**, E. Suffolk; **120**, Greater London† (1927).

are in decay require as much consideration as to planning as those where development is evident.

Regional zoning which merely refers to vast areas of very varying character and potentialities as " areas of rural preservation," is too vague and indefinitive to be of any serious value. The greater part of the English countryside is just as much moulded by the hand of man through successive centuries as are the interspersed towns and villages ; only a fraction retains its primitive aspect. Farm and meadow, hedge and coppice are all part of a system which the urban dweller takes for granted but which agricultural decay can only transform, not into municipal parks, but into wasteland, flood and marsh. The location of the areas of now specialized production in agriculture for cereals, intensive dairy farming, fruit, etc., has been determined by the utilization of the qualities of the soil and methods of production developed through generations of effort. The great agricultural developments of the eighteenth century in Norfolk, and such broad schemes as the reclamation of the now fertile Fenlands, bear witness to this effort. The first step in Planning is towards the maintenance and extension of these primary producing areas by an Agricultural Plan which will form part of the main framework of Regional Planning and Power Distribution. Considered separately, such a plan would be the converse of the " Town Plan." Here, the farm is the unit of planning, with its grouping of arable, pasture or orchards, village nuclei and agricultural-industrial units ; the urban and industrial groupings representing the complementary section of the economic framework.

Only by agricultural planning on a regional basis can a new balance be achieved as against the over-balanced and congested industrial centres and the gradually denuded countryside —taking *agriculture* to mean not only primary production of food, but to include all the secondary industrial productive factories and distributive organization in connection with it. The primary circuit of internal exchange between the products of the countryside and the manufactures of the towns needs to be re-established upon an economic basis, and the medium of diffused electrical power is the principal and essential means to this end.

Such a region, for instance, would be the *South-East*, comprising Kent, Sussex and part of Surrey, enclosed by the North and South Downs, and characterized by the great central area of the Weald ; or again, *East Anglia*, a definite entity defined as a low plateau bounded by the North Sea and the Fenland Basin. The *London Basin* again provides a geographical unit between the North Downs and the Chilterns. Here, however, the enormous attraction and expansion of the central nucleus within this area renders the geographical boundaries of lesser importance ; though the boundaries taken for the existing Greater London Region are of interest as conforming to limits within the geographical framework, and also as having cut across the county boundary divisions. The expansion of London is clearly a matter related to all the adjoining regions. The suggested " decentralization " of London within a radius of twenty-five miles from its centre requires reconsideration in the light of its extra-regional influence, and from the broader view of the function of regional planning in the readjustment of economic balance through the diffusion of power and revitalising of provincial centres.

If regional planning is to be considered as something more than the splitting up of the country into artificial units, then the regional framework must surely be organized upon a *functional* basis—in which each region has some particular function in relation to the national plan. Thus the interrelation of the individual regions to each other, as well as to the national framework or to the great distributing centres, will involve the policy of a greater and more intensive specialization of activities according to local suitabilities and traditions. The greater distributive facilities and congested markets of the London Region need to be counter-balanced by efficient cross-currents of exchange and distribution between regions having complementary needs and products. This involves the reconsideration of cross-country transport communications as contrasted with the predominately radial system from great centres. The case for such communications as the proposed Thames Tunnel connecting East Anglia and Essex with Kent and the Southern Counties rests upon such a basis, as does the orbital road system around London, under construction.

The proposed formation of a ring of satellite towns around the immediate radius of London to provide for the transference of industry and expansion from within, is only a partial solution of the main problem ; further, in such a conception, the actual radius of influence of the great centre is underestimated. The solution of London's congestion implies, on the other hand, internal reconstruction on a scale befitting the problem for the most economic utilization of the land already occupied by ill-regulated, decaying or uneconomic development, and from the broader regional point of view, the economic expansion of the centres of development of the adjoining regions, the revitalizing of the agricultural background, the control of main road development, and the separation of heavy industrial works from the commercial and residential districts, as for example, in the direction indicated as London's great industrial area—the Thames Estuary and South Essex.

The tendency of economic activity, of industry, agriculture and power and their regulation can be visualized according to theory, practice, and individual bias. What is of ultimate importance, however, is the synthesis towards which all this tends, and its expression in the lives of the people, including the external expression of building and the land. Of what like is the new Face of the Land to be ? A countryside dotted with bungalows and shacks, scarred with petrol pumps, concrete roads and corrugated iron factories—as the debris of the towns, accelerated by the diffusive forces of power and transport, spreads over hill and valley ? If such should be the case, then continuity will have been broken ; the thread and pattern of the design warped and twisted ; and economic progress itself defeated by confusion of effort, no less than spiritual values debased by desecration of natural character and beauty.

Regional Planning in the vital sense alone can avert this ; but sporadic and disorganized planning cannot ; because for one thing the essence of the *region* should be of a force which should utilize and transmute all development in harmony with its intrinsic character. That character may be latent or evident, but its source is in the land and the folk it sustains. In a period of transition, as the present, it is most important that the traditions of the past should be conserved ; in the sense that there must be no discontinuity, but only continuity of purpose amongst changing forms or sources of power. This conscious awareness of the great chain of evolving factors which have laid down the " Plan " of this country from times now incredibly remote, and filled in that Plan with details which preserve the historic picture of the past—this is the basis of the *interpretative* aspect of Regional Planning. The first industrial era based upon coal and steam power was accomplished without any organized planning, producing the congestion which now requires unravelling, with its complementary rural decay. The new industrial era has as its servant a source of energy which is essentially diffusive, and at the same time conducive to seemly building development from its freedom from the smoke and grime which accompanied the first industrial period, and which will effect the most momentous revitalizing of the land. The diffusion of power, industry, and population now progressing under modern conditions cannot be any longer left to hazard, and the only logical means to ultimate reorientation is the guidance of economic expansion by functional regional planning within the national framework.

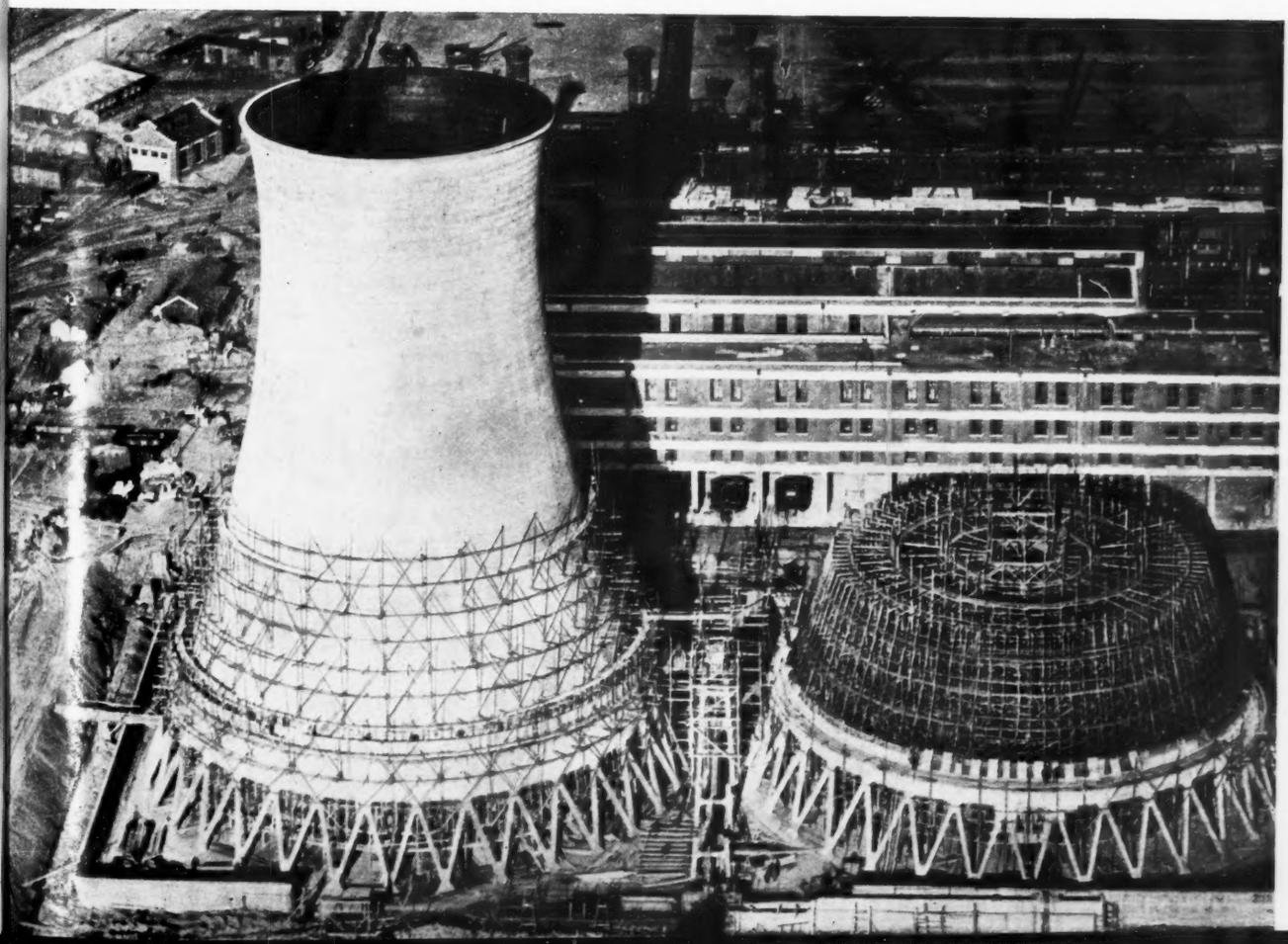
ALWYN R. DENT

NATIONAL TRANSMISSION

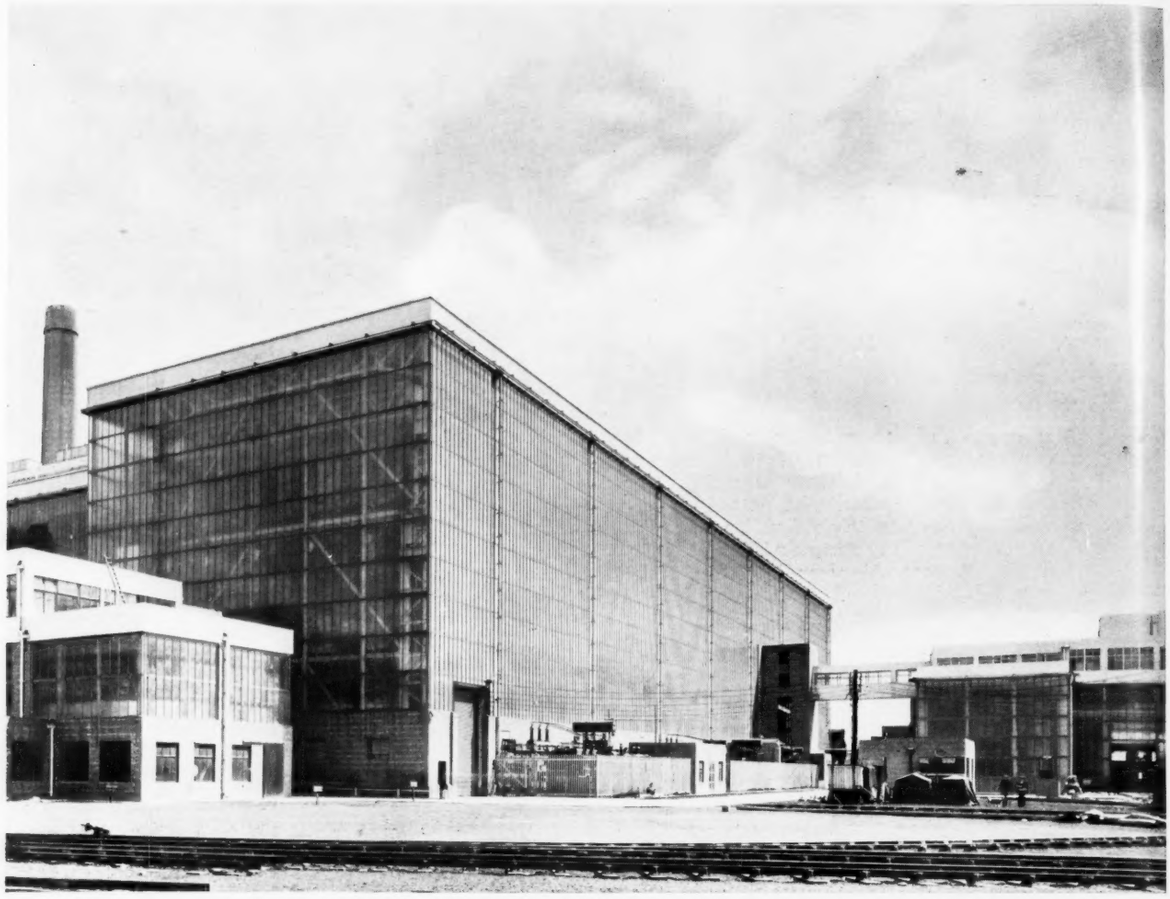
THE work of reorganizing public electric supply has aimed at the elimination of waste in power production, simplification of administration, principally technical and financial, and the territorial extension of power supplies so as to realize the triple function of reducing prices to a point where the public system would be able to convert private plant; of interconnecting supplies so that an unlimited quantity of energy would be available at low price for industrial and general economic purposes; of ensuring proper adjustment to demand of manufacturing capacity so that excessive capital expenditure would be rendered unnecessary and careful budgeting take the place of pure speculation.

At the present time, the national production of electricity is carried out by about 666 public supply undertakings owning 442 generating stations with an annual output of 12,248,000,000 units; by railway, tramway and non-statutory undertakings owning 79 generating stations with an annual output of 1,404,000,000 units, and by industrial and commercial firms, hotels, farms, cinemas, country houses, garages, etc., owning between 3,000 and 4,000 generating stations with an annual output in excess of 6,000,000,000 units. The total national output from all sources is consequently about 20,000,000,000 units. Of the public supply undertakings, local authorities accounted for about 7,350,000,000 units and power companies for the remaining 4,898,000,000 units. The work of reorganization initiated by the Electricity (Supply) Act of 1926 applied only to the public supply undertakings responsible for about 61 per cent. of the entire national output, and in their case to the co-ordination of production and main transmission of electricity—not to distribution and sale to the ordinary consumer. The assumption was and is that the public supply systems would in time, through their work of reorganization, become so efficient that they would compete successfully with the privately owned generating stations and thus ensure complete conversion. In time, therefore, the entire supply of electrical energy would be undertaken by a national organization operating through a fully co-ordinated power production and main transmission system.

It was thus essential to reduce the number of generating stations, so that the economies resulting from centralized production in large volume might be achieved; to interconnect the generating stations selected in order to ensure equalization of load over the whole country with better operating conditions and the reduction of reserve plant to a minimum figure; and, finally, to create, if necessary, secondary systems running out from the main interconnected transmission system in order to facilitate the electrification of outlying areas and improve demand over the whole national network.

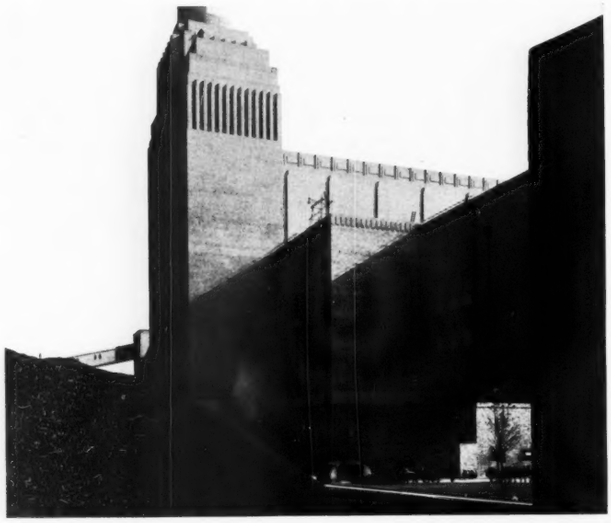


Erecting Concrete Cooling Towers in a modern Super-Power Station. In a generating station the steam emerging from the condensers, through which it passes after being exhausted from the turbines, requires to be cooled before being pumped back into the boilers and insufficiency of running water supplies is made good by these special cooling towers



Under the Electricity (Supply) Act of 1926, the Central Electricity Board was set up as a public body to carry out this work of reorganization. It is nominally independent of Parliamentary control, in the sense that no Government department has power to interfere in its actual administration, but it is subject to Parliamentary supervision in the sense that the members of the Board are appointed by the Minister of Transport, while, in common with other supply undertakings, the Central Electricity Board, being a statutory body, must come under the jurisdiction of the Electricity Commission wherever the legal limitations or definitions of its powers render it necessary.

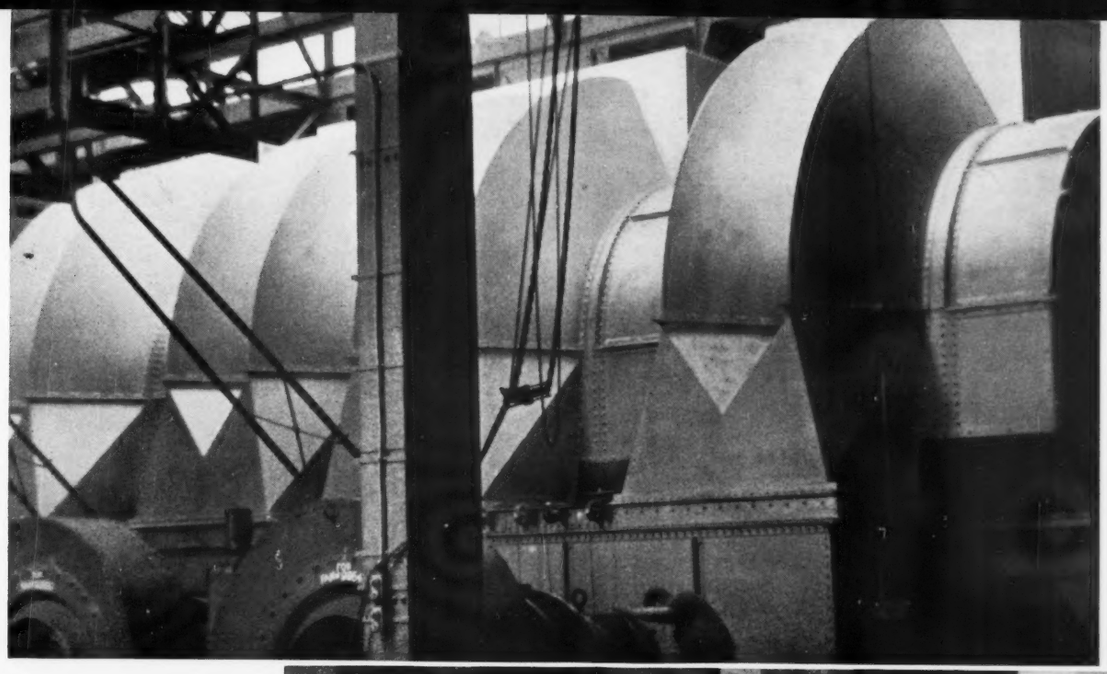
The financing of the national power scheme is carried out by

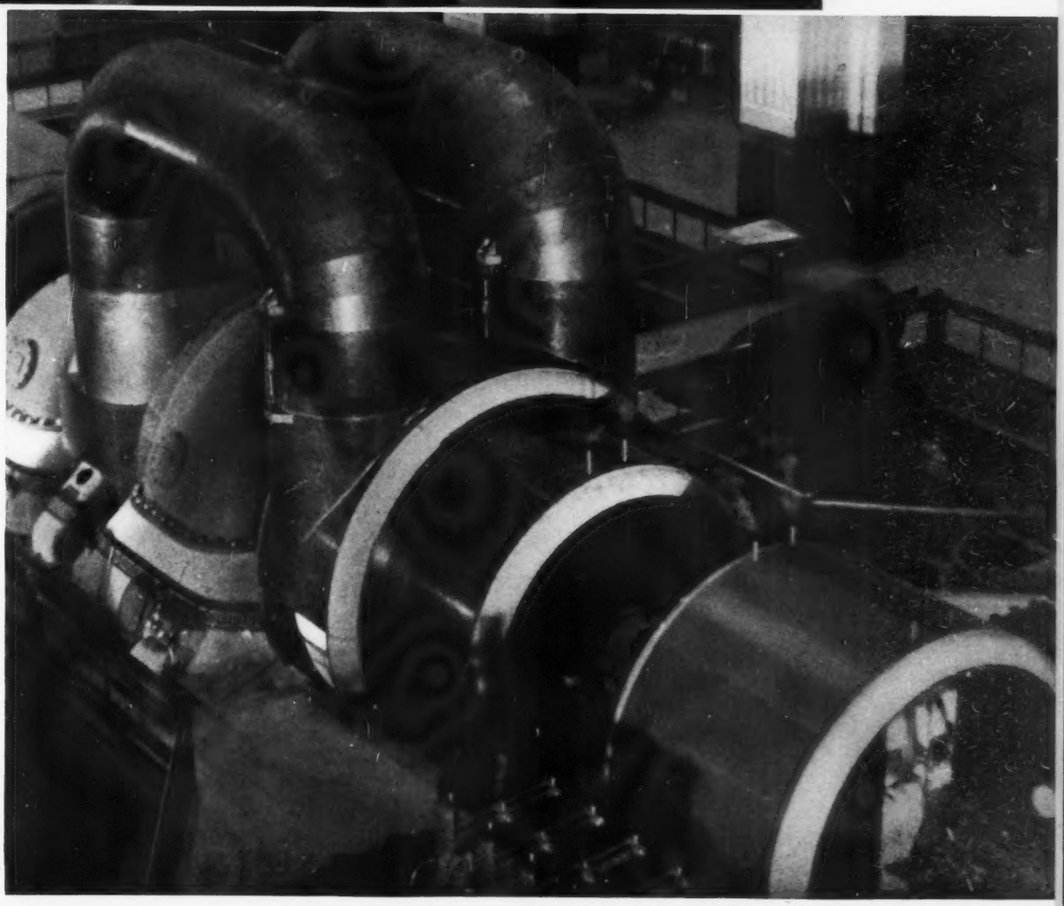


Above and below are illustrated examples of new Super-Power Stations built to feed into the Grid. The Battersea station, below, built to a conventional design in brick, has a capacity of 134,400 kilowatts in two enormous generating units and, with the addition of a new turbo-alternator on order, will develop about 240,000 kilowatts. It feeds primarily into the Central London network of the London Power Company but furnishes energy to the Northfleet grid switching station for supplies to Kent and Sussex. The Dunston station, built on modern lines in steel, glass and concrete—an architecturally satisfactory achievement—has a capacity of 150,000 kilowatts in three units. It is a central source of energy for the North-East England section of the Grid.

the issue of fixed interest bearing stock with no voting powers and the Board had, under the Act of 1926, the right to call for a Treasury guarantee to cover principal and interest for the construction of the main transmission system up to the maximum of £33½ million. We can deal in detail with finance later. The important thing to note at this point is that a new type of executive body was created by the Act of 1926 to deal with the reorganization which was necessary to make the public supply of electricity efficient and elastic at the same time.

Under the scheme as proposed by the Act, Great Britain was split up into 10 main areas, notably, North Scotland, Central Scotland, South Scotland, North-East England, North-West England and North Wales, Mid-East England, Central England, East England, South-East England and South-West England and South Wales. Schemes for each of these areas, with the exception of North Scotland, were prepared by the Electricity Commission after very careful survey of the power situation, exact study of capital costs and running charges and a preliminary estimate of the growth of electricity consumption over a period of 10 years. Each scheme provided for the selection of a small number of generating stations for permanent operation, and a small number for temporary operation during the period of transition and for the closing down of the remainder. It provided also for the construction of main transmission lines operating at 132,000 volts, capable of carrying quantities of energy up to 50,000 kilowatts in one circuit





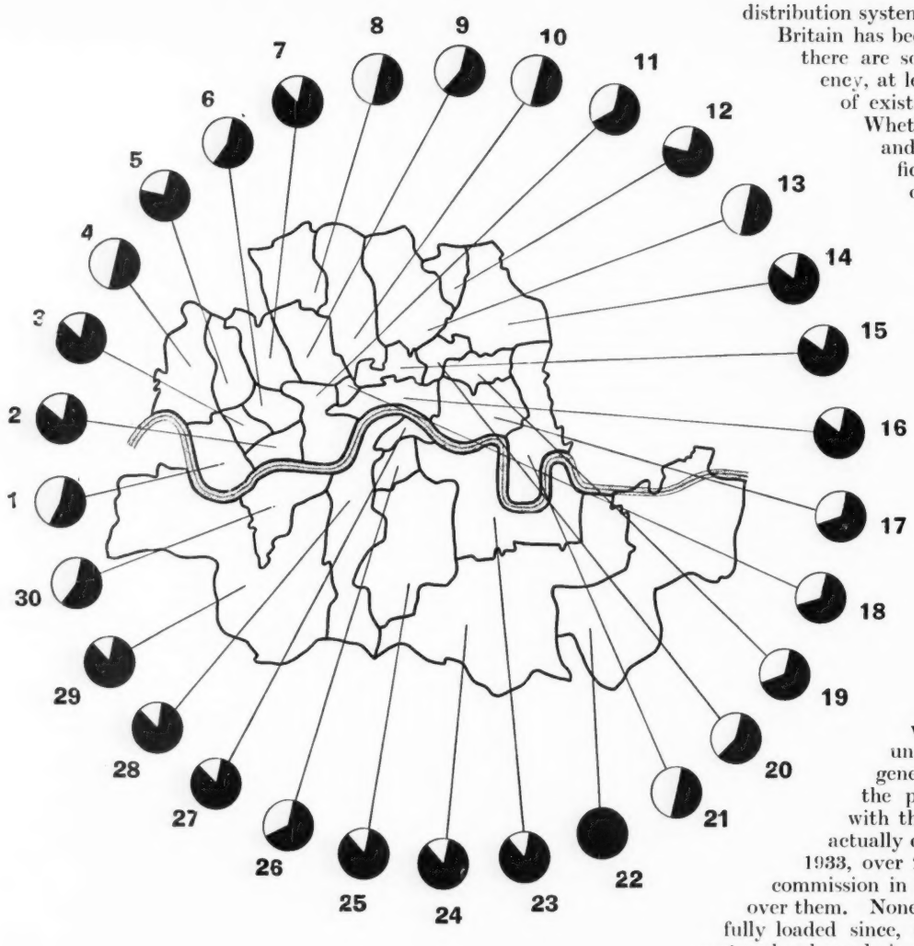
Battersea Power Station. Architect, Sir Giles Gilbert Scott. The top illustration shows four grit collectors through which combustion gases pass on their way to Sirocco fans, thence to a primary spray chamber and finally to gas-washing equipment. In this way, the gases delivered to the chimneys are purified, grit removed and dangerous fumes washed away. The bottom view is of a 67,200 kilowatt turbo-generator comprising a three - cylinder turbine with double-flow low pressure cylinder coupled to main and auxiliary generators. The turbine is in the centre and the auxiliary generator on the right. The length of the complete unit is 102 feet. Electricity is generated at 11,000, volts, transformed up to a pressure of 132,000 volts and fed into the Grid system.

Birth of Power

The South-East England Scheme is here pictorially shown in order to illustrate how the Grid works. Electrical energy is generated at 11,000 volts in a steam-power station, transmitted overhead or by underground cable to the transforming station where the pressure is raised to 132,000 volts, thence to a main switching station which may be a load dispatching point for the entire area. One circuit may go to link up generating stations in the East, with extensions to the South ending in a rural distribution scheme; a second circuit may go South and West to furnish energy for railway electrification purposes; a third circuit may go West to facilitate development in a residential area. The map is of the National Power Scheme showing 132,000 volt main transmission lines. Secondary lines have been omitted. The main lines interconnect about 130 generating stations to form a pool of energy from which supplies can be drawn for distribution purposes by supply undertakings. Including the secondary system there are 273 transforming and switching stations which can form tapping points for Grid supplies. Below is the Bonnington Hydro-electric Power Station near the Falls of Clyde in Lanarkshire — one of the most beautiful stretches of river, wood and cliff in Scotland.

from one part of the scheme to another. The scheme also provided for the construction of transforming and switching stations to render possible the work of interconnection and the introduction of central control. The Board, after receiving the scheme from the Commission, adopted it with one or two modifications. In the first week of September, 1933, five years and nine months after the placing of the first contract for the construction of transmission lines, the entire national system was completed.

It comprised 3,000 route miles of 132,000 volt lines, linking up about 130 generating stations and 1,000 miles of secondary lines operating principally at 33,000 volts, radiating out from the main transmission system to open up outlying areas.



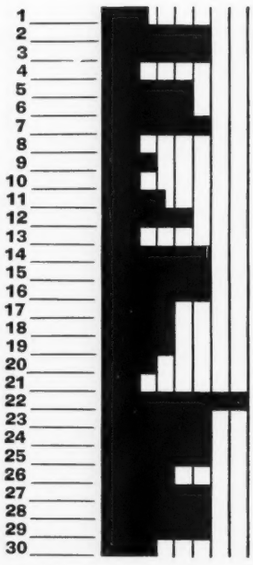
distribution system. The progress of electricity in Great Britain has been so rapid in the last two years that there are some grounds for believing in the efficiency, at least over large sections of the country, of existing distribution systems and methods. Whether new methods and new systems and new conceptions of adequate electrification must be substituted for the old is a question which is at present under investigation and cannot be answered without very extensive discussion.

The Grid has been, as far as one can judge, a successful engineering achievement, but the test of the most spectacular production lies, not in the harmonious and symmetrical grouping of units or the theoretical efficiency of its parts, but in its power to add to wealth through the performance of a useful economic function.

After the construction stage, therefore, the second main stage has been the entrance into operation of the national power scheme as a trading concern. Since 1929 arrangements have been made in advance of complete schemes in order to give supplies to authorized undertakers who otherwise might have been forced to incur unnecessary expenditure on extensions of generating stations, and, in certain cases, the provision of main transmission lines, with the result that out of the 4,000 miles actually constructed at the end of September, 1933, over 2,700 miles were in commission—in commission in the sense that electricity was passed over them. None of the lines could be considered as fully loaded since, of course, the national transmission system has been designed to deal with the electricity output

The completion of the national power scheme means the completion of the wholesale main transmission system. It does not mean, of course, the development of distribution lines in a similar national system to cover all parts of the country and reach all types of consumers. This phase is not touched by the Electricity (Supply) Act of 1926, and it is left still to the enterprise of authorized distributing undertakers. Those undertakings at the present time number more than 666 and may cover very small areas. It would be a mistake, however, to assume that distribution is being carried out inefficiently or inadequately in the country as a whole. As a matter of fact, North-West England, where so many individual undertakings are shown, provides an example of extremely efficient distribution and the provision of very low cost energy to the consumer.

The engineering, financial and administrative problems raised by co-ordination of distribution are almost completely different from those represented by co-ordination of production for main transmission and their solution cannot be so simple or so rapidly capable of realization. It is possible, granted a clear understanding of their duties and responsibilities on the part of supply undertakings for a completely co-ordinated main transmission system to function efficiently side by side with an unco-ordinated



1 Fulham Borough Council.
2 Chelsea Borough Council.
3 Brompton & Kensington Electricity Supply Company.
4 Hammersmith Borough Council.
5 Notting Hill Electric Lighting Company.
6 Kensington and Knightsbridge Electric Lighting
7 Metropolitan Electric Supply Company. [Company.
8 Hampstead Borough Council.
9 St. Marylebone Borough Council.
10 St. Pancras Borough Council.
11 Westminster Electric Supply Corporation.
12 Stoke Newington Borough Council.
13 Islington Borough Council.
14 Hackney Borough Council.
15 County of London Electricity Supply Company.
16 Charing Cross Electricity Supply Company.
17 Stepney Borough Council.
18 St. James's Electrical Company.
19 Stepney Borough Council.
20 Shoreditch Borough Council.
21 Poplar Borough Council.
22 Woolwich Borough Council.
23 London Electric Supply Corporation.
24 South Metropolitan Electric Light & Power Company.
25 County of London Electricity Supply Company.
26 Borough of Southwark.
27 City of London Electric Lighting Company.
28 South London Electric Supply Corporation.
29 County of London Electricity Supply Company.
30 Battersea Borough Council.

London's 30 supply concerns make a pretty pattern of price variation, as the graph indicates. In the top illustration the areas served by the various concerns are outlined on a map of the County of London. A full black circle signifies a sixpenny rate. In the lower graph the rates are represented by horizontal strips of varying length.

of the country right up to 1943 at least, and it is estimated that the present annual output which is in excess of 13,000 million units, will be more than doubled in that year.

In two main areas, namely, Central Scotland and Mid-East England, where Grid tariffs came into operation on the 1st January, 1933, the Grid has been operating as a trading concern, and it has shown on the whole that the estimated economies resulting from interconnection can be achieved without serious difficulty. At the beginning of 1934, trading will take place in South East England and North West England and North Wales, and probably the entire national scheme will be brought in at the beginning of 1935.

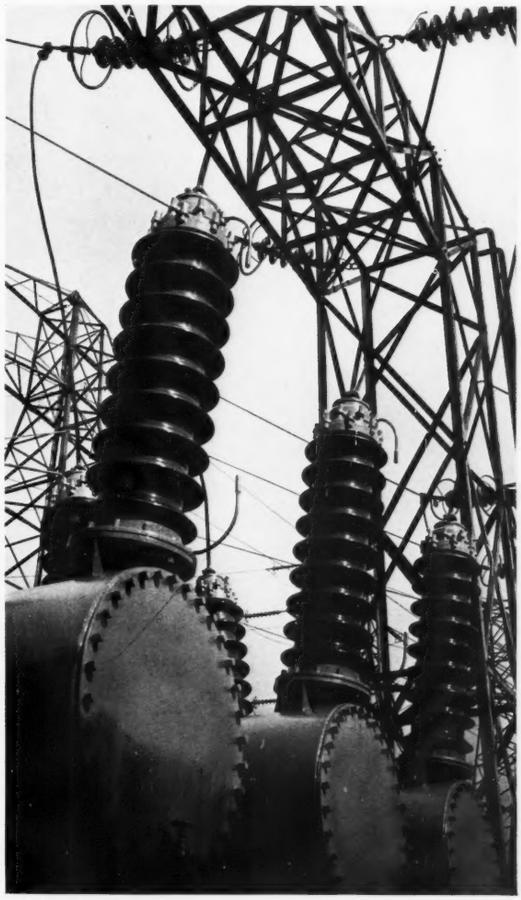
Nothing has so far been said about standardization of frequency, largely because standardization of frequency is a matter which, while necessary to effective interconnection, has had little direct influence on the design and construction of the national main transmission system. Standardization would have been necessary in any case in order to ensure that the whole country would profit by standard supplies of electricity, even if the main transmission system had not been erected. Certain areas, particularly the Clyde Valley, North East England, Central England, and a part of South Wales, have been developed by supply undertakings on a non-standard basis. In some areas electricity has been generated, transmitted, and distributed at a frequency of 25 cycles per second, and in other places at 40 cycles per second, while the national standard has been fixed at 50 cycles per second.

To effect standardization it has been necessary, therefore, to instal between 1,500,000 and 1,800,000 h.p. of new electric motors on consumers' prem ses, particularly in the iron and steel, shipbuilding and engineering industries, to carry out the rewinding of alternators in generating stations, and the rewinding of other equipment used for the transmission and conversion of electricity; while in North East England it has been necessary to arrange for the construction of an entirely new generating station at Dunston, incidentally one of the best examples of contemporary functional design in existence.

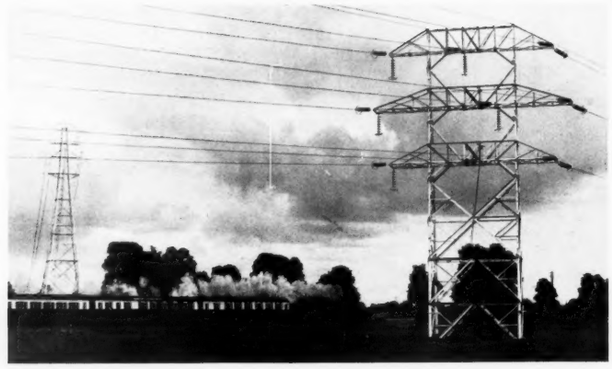
The total cost of the work of standardization has been estimated as between £18 million and £20 million, and this work has been entrusted to the Central E ectricity Board in addition to the construction of the main transmiss on system, so that the total cost of the scheme, including standardization of frequency and capitalised interest during the period of construction, will not be much less than £50 million.

The cost of standardization is a charge on the entire electricity supply industry; the actual charges represented by it are collected by the Electricity Commission in the form of a levy based on units sold and transmitted to the Central Electricity Board. The actual charges represented by the cost of the Grid must be obtained by the Board from the sale of electricity in bulk from the main transmission system to authorized distributors, the proviso being made that over the first 10 years of its operation the Board should make no profit. Consequently the Grid tariffs have been drawn up in such a way that for the first few years at least deficits will result, which will be made good by surpluses in subsequent years, but during those early years the Board can borrow to cover such deficits and ensure the necessary working cap tal. The principle adopted has been the equalization of cost over a period of 10 years in order to ensure the lowest possible price at the outset and to even out the economies resulting from the growth in the production and consumption of electricity.

ANGUS FARQUHARSON



The left hand illustration shows insulator bushings on transformers in the foreground with insulator strings in the background. The circuits are insulated from the steel structure by the latter so that energy emerging from the transformers through the conductors shown on the top of the bushings can be transmitted without danger. On the right are insulator bushings on surge absorbers which smooth out surges in the current passing from the overhead lines into the transforming station – surges which may be due to lightning or to temporary interruptions of supply.



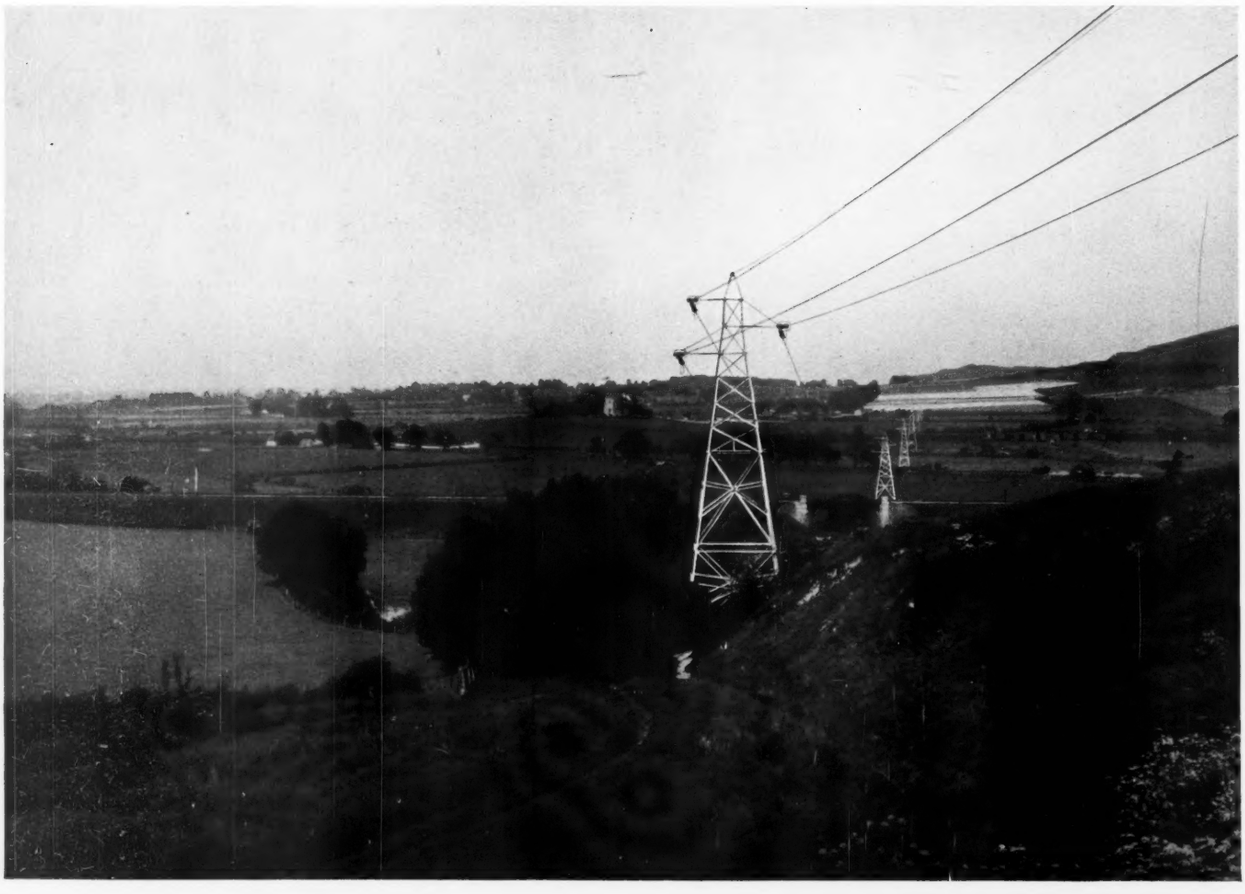
The New Channel

From **ENDYMION**
by **Benjamin Disraeli**
Earl of Beaconsfield

"My friends will not assist themselves by resisting the government measures," said Mr. Neuchatel, with his usual calm smile, half sceptical, half sympathetic. "The measures will do no good, but they will do no harm. There are no measures that will do any good at this moment. We do not want measures ; what we want is a new channel."

That is exactly what was wanted. There was abundant capital in the country and a mass of unemployed labour. But the markets on which they had of late depended, the American especially, were overworked and overstocked, and in some instances were not only overstocked, but disturbed by war, as the Chinese, for example—and capital and labour wanted "a new channel."

The new channel came, and all the persons of authority alike political and commercial, seemed quite surprised that it had arrived ; but when a thing or a man is wanted, they generally appear. One or two lines of railway, which had been long sleepily in formation, about this time were finished, and one or two lines of railway, which had been finished for some time and were unnoticed, announced dividends, and not contemptible ones. Suddenly there was a general feeling in the country that its capital should be invested in railways ; that the whole surface of the land should be transformed, and covered, as by a network, with these mighty means of communication. When the passions of the English, naturally an enthusiastic people, are excited on a subject of finance, their will, their determination, and resource, are irresistible. This was signally proved in the present instance for they never ceased subscribing their capital until the sum entrusted to this new form of investment reached an amount almost equal to the national debt, and this too in a very few years. The immediate effect on the condition of the country was absolutely prodigious. The value of land rose, all the blast furnaces were relit, a stimulant was given to every branch of the home trade, the amount suddenly paid in wages exceeded that ever known in this country, and wages, too, at a high rate. Large portions of the labouring classes not only enjoyed comfort, but commanded luxury. All this, of course, soon acted on the revenue, and both customs and especially excise soon furnished an ample surplus.

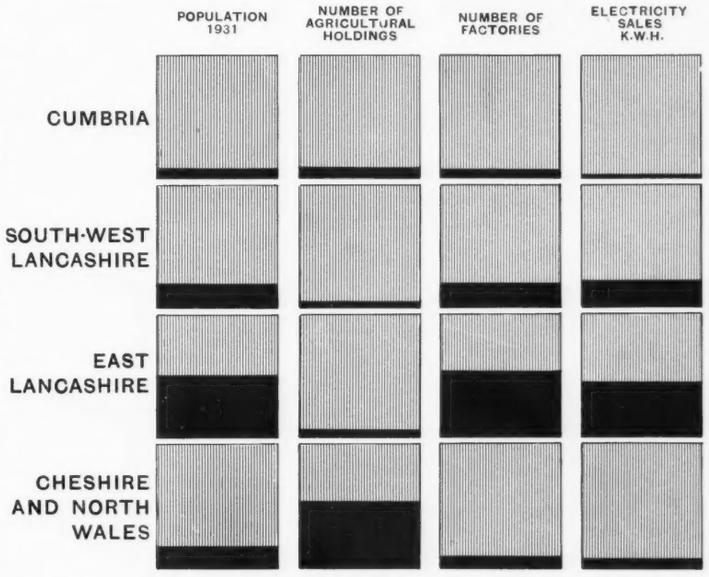


Near Lewes

SPECIMEN AREA

One hundred and twenty regional planning committees have been set up in England and Wales, and forty-five have issued reports giving their conclusions on the future development of their areas. After reading several of these it is difficult to escape from a feeling of futility and frustration which is strengthened by the patent desire of the committees for orderly progress and steady development. Regional planning could become a spectacular achievement, nothing short of the reconstruction of the whole country; at present, however, the movement is in danger of stopping short of its high objectives. Every report bristles with suggestions for electrification, whether of railways or of agriculture and the rural industries, or the need for drainage and pumping in which electricity would naturally be used; consequently it is for the electricity supply industry to pick up the work where it is left off by the planning committees. The supply industry should become the executive of the planning bodies. The fact, however, is that the supply industry, as at present constituted, is incapable of functioning as an executive to a committee planning for a much larger area than the individual units which, in aggregate, form the supply industry. This will be realized by taking the Manchester and district region as an example; in this regional area there were 42 electricity supply undertakings, most of which consisted of one or two local government areas which were governed by parish-pump policies; few had the same tariffs or the same policy in respect of assisted wiring or the hire and hire-purchase of appliances. Each undertaking jealously maintained its independence, and for this reason refused to co-operate amongst themselves to devise means of implementing the regional committee's report.

A close study of the varying conditions met by regional planning authorities in a large area was found essential, to see whether a solution to the problem could not be found. It was considered necessary for the present inquiry to start with one of the Electricity Board's areas, the Board being the body responsible for the production of electricity in the whole country. It was thought that North-West England would be more typical of conditions in the country as a whole, since South-East England is so largely influenced by the Metropolis.



The diagram illustrates the relative importance of each region to the whole of North-West England, which is represented in the outlined square. It will be noticed how the bulk of population and of factories is concentrated in East Lancashire, but it is significant that the sales of electricity are relatively lower. Cheshire and North Wales have the largest number of agricultural holdings; Cumbria has fewer holdings, but they are larger. Cumbria is the only area showing a decreasing population, in fact, during the last censal period only the towns of Carlisle, Whitehaven, Penrith, Shap, Kendal, Morecambe and Lancaster, the west ward of Westmorland showed any increase; the need for housing, however, is still unsatisfied as the number of families has increased.

North-west England includes the counties of Cumberland, Westmorland, Lancashire, Cheshire, the whole of North Wales to the southern boundary of Montgomeryshire, the northern part of Shropshire and a little corner of Derbyshire and Yorkshire.

Almost the entire scheme area has been covered in detail by eleven regional planning committees, nine of which have published reports. The Cumbrian scheme, running from the Border down to Millom, includes Cumberland and part of Westmorland. The report declares that vast improvement in transport is possible, especially in the coastal strip in the extreme north-west, and that there is an urgent need to speed up traffic. In other words, electrification of the railways is required, and this would give the supply undertakings a useful load as a nucleus to rural electrification, which in turn would benefit the quarrying and mining industries of the region by lowering the cost of power; most of the zinc, lead and copper mines of the area are at present closed down owing to foreign competition, but are capable of being worked as soon as favourable economic conditions are created. The electrical development of West Cumberland would do much, it is said, to revive existing and to attract new industries.

The Lake District regional scheme covers the area between the Cumbrian scheme in the north and the Lancaster and Morecambe region in the south, but excludes Kendal and the rural district of Ulverston on the west. Agriculture is the main industry; in the lowest dales the finest shorthorn cattle is raised, but only half the area is under cultivation, and only one-ninth is arable land. The principal manufactures in the area are small metal works, boot and shoe factories and textile mills; the boot and shoe industry is, in fact, a growing industry. Electricity, it is said, will help industry round Kendal and in the south-western area, and develop village industries which are at present moribund owing to the lack of raw material. A recent discovery is the existence of diatomaceous earth at Kentmere from which good bricks can be made; with the advent of electricity supplies the field could be opened and made to produce all the bricks required for the housing in the area.

Much of the land in the Lancaster and Morecambe region is liable to flooding and is unhealthy, and a large drainage scheme dependent on the public supply system is necessary. The report of the committee is exceptionally depressing: no development in the industries of Lancaster is expected, in Morecambe the future is dependent entirely on the town's attraction as a seaside resort, while the docks of Heysham, which are well equipped, are liable to silt up owing to the absence of trade. There is only one constructive proposal made, and that is the afforestation of the lower coastlands, as has been done at Formby and Freshfield; pine and fir could be planted on the sandy exposed land and become the basis of a certain industrial activity.

The North-East Lancashire regional report covers the area bounded by a line from Darwen to Colne in the south, and in the north it includes the whole rural districts of Clitheroe and Bowland and Skipton in Yorkshire. During the past decade a serious setback in the industrial expansion and development of the area has occurred, particularly in the coal-mining and cotton areas of the south, such as Blackburn, Burnley and Nelson. The area consists of a series of sordid and depressing towns, the buildings of which have deteriorated rapidly owing to the smoke pall. There is an urgent need for housing, and so far little has been done. Blackburn has the worst housing conditions; the infant mortality in 1926 was 158, as against 89 per 1,000 elsewhere, while the death rate in the worst district was 22·6, as compared with 12·9 per

1,000 elsewhere. This need for rehousing and a definite attempt to check the smoke nuisance is a striking example of the need for a strong electrification policy. Two positive proposals were made in the report —the need to build garden suburbs, for which the electricity, water and transport undertakings should co-operate, and the possibility of afforestation over hundreds of acres. The example of the Nelson Corporation is cited to show that the latter scheme is economic and that it creates new industries, such as wood pulp, paper and artificial silk.

The Manchester and district regional plan covers the whole of Lancashire, south of the Burnley-Colne line, and east of a line from Warrington to Chorley, the North-East of Cheshire from Warrington to the southern limits of the rural district of Macclesfield and a few small areas in Yorkshire and Derbyshire. Great stress is made of the need for cheap transport and suburban electrification is definitely proposed. Over two million people live within a 10 miles radius of Manchester, and 4½ million within 25 miles. The textile industry is predominant, but other large and increasing groups of industries are the metal trades, commerce, finance and transport, which together employ 400,000 persons. "The use of electricity for heating, lighting and power should be encouraged and required whenever possible," says the report in dealing with the question of atmospheric pollution.

The South-West Lancashire report impinges on the Manchester and District scheme at Warrington, branches off at Ashton-in-Makerfield and goes north-west, leaving the area from Wigan to Preston uncovered; the population of the area was 1,249,000 in 1921, was probably about 1,281,000 in 1931, and a population of 1,600,000 is expected in 1961. A great variety of industries and occupations have settled in this area; transport and dock services are the most important, followed by commerce, finance, textiles, paper, leather, woodwork, paint and chemicals, metal working and glass manufacture. A questionnaire was sent out to the principal manufacturers of the region, and from these it appears that electricity supply is a cause of dissatisfaction in the smaller northern districts. In fact, electrification has not made the progress one might expect, for of 320 firms answering the questionnaire only 233 used electricity. A section of the report is devoted to proposed new industries, and, in view of the present unemployment in the area, the electricity undertakings should have done all in their power to assist in getting the industries started. The report is illuminating on the question of road versus rail transport; the extent to which the railways have lost traffic to the roads is graphically described by numerous facts and reports from the Mersey Dock and Harbour Board, from the railways themselves and also from the special questionnaire. The supply industry should co-operate with the railways and by electrification increase the speed and frequency of the service, thus reducing the congestion on the main road arteries in this region.

The Mid-Cheshire planning report includes the Wirral Peninsula, extends south to Malpas and Nantwich and stretches across to Macclesfield, which was already included in the Manchester and District scheme. The region has large chemical works round Runcorn and Nantwich, which is the centre of the salt-fields, while brick fields and quarries are also worked. Dairy farming is principally concentrated in the south, and market and poultry farming in the north. Electricity is advocated to eliminate the smoke problem and to assist agriculture, and the electrification of the railways is proposed.

The close relationship between the regional planning committees and the supply industry is abundantly clear from this brief summary of the regional reports. The industry is greatly interested in the delimitation of areas for future residential or industrial development, since the schemes enable the supply undertaking to develop the area in advance—or at least prevent them from useless expenditure in providing mains along roads where ribbon development has been prohibited.

Fortunately, the areas of supply undertakings and of regional schemes are generally based on local government areas; this has made it possible to visualize four main regional distribution areas without infringing the limits of the regional planning schemes. All the supply undertakings affected by a regional scheme would coalesce, retaining their identity only for purely administrative and technical purposes; each undertaking would become a sub-unit, with the duty of executing the policy of the regional board and advising the central office of local developments. A uniform tariff for all domestic, small power and agricultural purposes could be enforced, while a uniform policy on the facilities offered to consumers for hire and/or hire purchase of apparatus, and the assisted wiring of premises could be extended to the whole region. The benefits of such a policy would be felt not only by the consumers, but by the electrical manufacturing industry, the distribution side of which is unnecessarily complicated at present owing to the diversity of conflicting tariffs; while, further, the object of regional planning would be one step nearer realization, for the decentralization of industry would be encouraged by the fact of the same tariff being available over the entire region.

The four proposed regional distribution areas and the regional planning areas are depicted in the map on page 175. It will be seen from these how similar are the boundaries of these two groups and how in the main they fit into the North-West England and North Wales Electricity Scheme. Cumbria covers the entire area of these regional planning schemes, together with three small detached areas that have so far not been included in any scheme. The East Lancashire distribution area includes the two regional planning schemes, North-East Lancashire and the Manchester and District areas. Conflicting boundaries are at their worst in this region, but the extent of the divergencies are relatively unimportant. The need to respect the present boundaries of supply undertakings made it impossible to include the whole of the Manchester and District region, an exception in favour of the Lancashire Power Company had to be made, and the borough of Chorley Adlington Blackrod, and the eastern part of Chorley rural district had to be excluded from the East Lancashire distribution area and transferred to the South-West Lancashire area, as also were the urban districts of Ince-in-Makerfield and Billinge in favour of the Wigan Corporation. In the south, Knutsford Urban District and part of Bucklow rural district were excluded from the scheme, although they formed part of the Manchester and District scheme, so as to safeguard the Mid-Cheshire company.

The South-East Lancashire distribution area covers the remainder of Lancashire, except of the borough of Widnes which is served by the Mersey Power Company. The principal regional area is that of South-East Lancashire, while there are two additional regions, Preston and district and the Fylde region, and a few areas not included in any regional scheme. The remaining distribution area of Cheshire and North Wales includes the whole of the Wirral regional scheme, Deeside, Chester and Mid-Cheshire, except that part of the latter which is enclosed in the rural district of Macclesfield, which also formed part of the Manchester district, and the urban districts of Congleton and Buglawton, which are not in the North-West England Scheme Area.

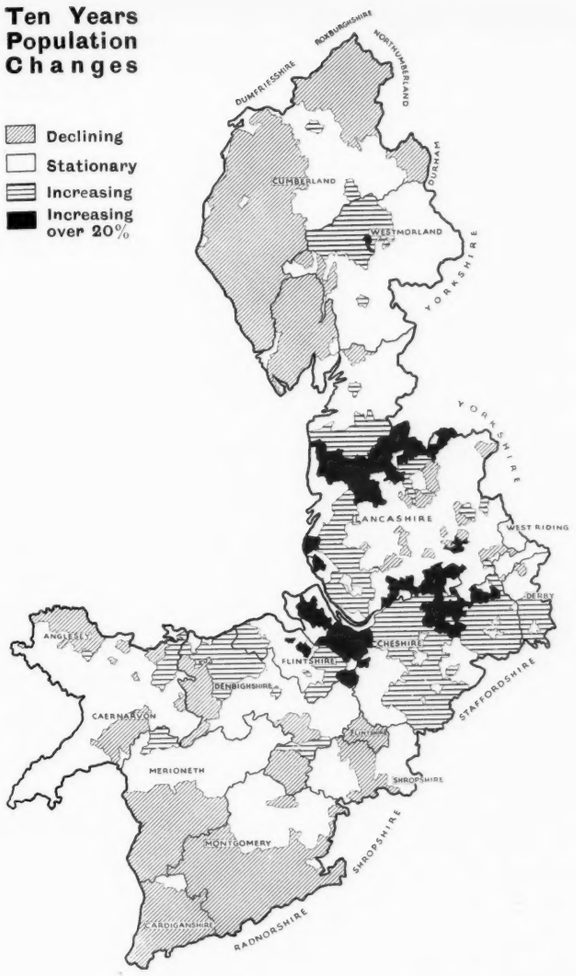
From a technical viewpoint the distribution areas can well be defended: the distribution and transmission networks of the undertakings seem to form a natural cleavage down the centre of Lancashire, with the exception of a 33,000-volt connection between Preston and Blackburn, and two 11,000-volt and 33,000-volt lines between Adlington and Farnworth. The two 33,000-volt lines can form no objection, since they form part of the transmission system of the industry in this area, and, in so far as they are already built, make it unnecessary for the Board to extend its system. The 11,000-volt line should more properly be regarded as a distribution line, and this forms the only difficulty, since its two extremities will be in different regional areas; the difficulty is, however, remarkably small considering the complexity of the Lancashire Power Company's area; separation in fact appears more artificial on paper than it is actually in practice, since the line traverses the area of supply of local authority undertakings which form a bottle-neck and prevent the two main areas of the company being considered as a single unit.

The Wirral peninsula should technically form part of the South-West Lancashire region, being connected with Liverpool by means of the grid cables in the Mersey Tunnel, and having otherwise no connection with the supply systems on the mainland. It is essential, however, that the peninsula should form part of the Cheshire and North Wales region, so as to give this area a greater economic balance and secure for the supply industry a steady industrial load, on the basis of which it could develop the rural areas in North Shropshire, Cheshire and North Wales. Further, geographically Wirral is closely dependent on Chester, road and rail transport naturally centres on Chester, and the opening of the Mersey tunnel is not likely to interfere with these.

The Grid scheme of interconnection of the most efficient stations and the transmission of electricity in bulk to the authorized undertakings, fits in perfectly with these new distribution regions. There is one central artery running from Crewe, where connection is made with Central England and the hydro-electric stations of North Wales to Runcorn and Warrington, thence due north to Preston, Lancaster, Kendal and Carlisle, where connection is made with South Scotland and the hydro-electric stations in Galloway. From Warrington, two primary lines set out, one on the east interconnects the supply undertakings in East Lancashire, forming a small power ring round Manchester and going northwards to form a second ring, Bolton-Blackburn-Padiham-Rawtenstall, and continuing from Padiham to Nelson, and on to connect the systems in Mid-East England. The other line from Warrington goes westwards to Liverpool and Birkenhead, then northwards to Southport and joins the main artery at Preston. The Grid at Preston makes use of a line belonging to an authorized undertaker, and thereby supplies the north-west of this area, Blackpool and Fleetwood. In Cumbria, the Grid forms two rings, one in the south supplies Barrow-in-Furness and Windermere from Kendal, while in the north Carlisle supplies Workington, Whitehaven, Cleator Moor, Keswick and Penrith.

R. D. H. DONALD

Ten Years Population Changes

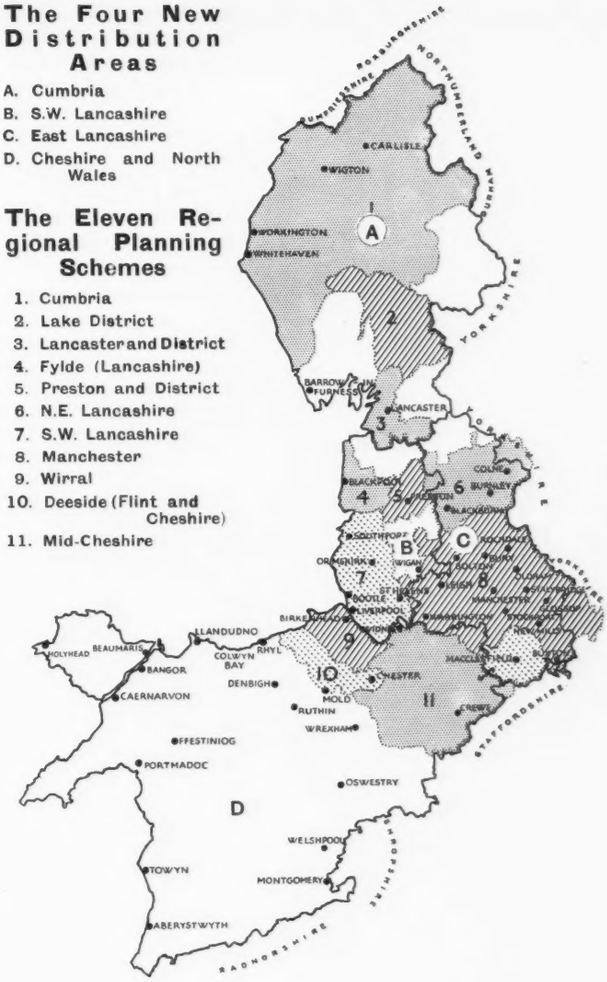


The Four New Distribution Areas

A. Cumbria
B. S.W. Lancashire
C. East Lancashire
D. Cheshire and North Wales

The Eleven Regional Planning Schemes

1. Cumbria
2. Lake District
3. Lancaster and District
4. Fylde (Lancashire)
5. Preston and District
6. N.E. Lancashire
7. S.W. Lancashire
8. Manchester
9. Wirral
10. Deeside (Flint and Cheshire)
11. Mid-Cheshire



The significant factors brought out by the left-hand map are the rapid decline in the populations of Cumberland, Westmorland and North Lancashire; the very rapid increase of a narrow belt running from Blackpool through Preston to the Yorkshire boundary; the slow depopulation of the cotton weaving and spinning areas and of the coal-mining districts surrounding and to the north of Wigan; the rapid development of Merseyside and Manchester suggests that the influence of the Manchester Ship Canal is still making itself felt even 40 years after its opening. North Wales shows a decrease in its rural areas and a large increase in the industrial regions of Denbigh and Flint.

There are 122 separate electricity supply undertakings in North West England and North Wales, and the map on the right illustrates an attempt at grouping these into four new distribution areas. The boundaries of these areas have been made to fit closely to those of existing regional planning areas (shown on the map by dotted lines). Cumbria has 17 separate supply undertakings, in South West Lancashire there are 16, in East Lancashire 54 and in Cheshire and North Wales 35. Here is a list of them.

A ***Cumbria.*** **Regional Planning Areas :** i, Cumbrian Regional Scheme; ii, The Lake District; iii, Lancaster and Morecambe. **Supply Undertakings Affected :** Carlisle Corpn.; Mid-Cumberland E. Co.; Workington Corpn.; Keswick E. L. Co.; Whitehaven Corpn.; Penrith E. S. Co.; Westmorland and Dist. E. Co.; Kendal Corpn.; Windermere and Dist. E. Co.; South Cumberland E. S. Co.; Barrow-in-Furness Corpn.; Millom U.D.C.; Ulverston U.D.C.; Grange U.D.C.; Cark and Dist. E. Co.; Morecambe Corpn.; Lancaster Corpn.

B ***South West Lancashire.*** **Regional Planning Areas :** i, Fylde District; ii, Preston and District; iii, South-West Lancashire; iv, A small part on the West of the Manchester and District Scheme. **Supply Undertakings Affected :** Preesall U.D.C.; Fleetwood U.D.C.; Thornton U.D.C.; Blackpool Corpn.; Preston Corpn.; Lytham St. Anne's Corpn.; West Lancashire R.D.C.; Southport Corpn.; Birkdale and Dist. E. S. Co.; Formby U.D.C.; Ormskirk E. S. Co.; Wigan Corpn.; St. Helen's Corpn.; British Insulated Cables (Preston); Liverpool Corpn.; Part of the Lancashire P. Co.; (the small remainder included in East Lancashire Region).

C ***East Lancashire.*** **Regional Planning Area :** i, North-East Lancashire; ii, Manchester and District (part only).

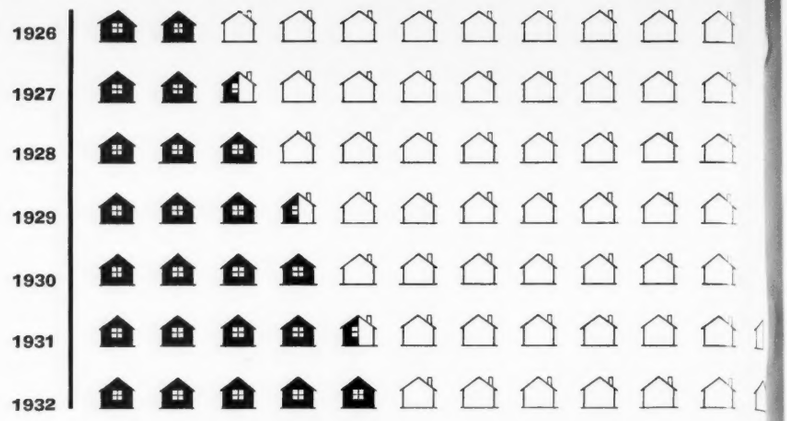
(N.B.—The Southern part of this area, viz., Macclesfield U.D. and Macclesfield R.D. were included also in the regional area of Mid-Cheshire.)

Supply Undertakings Affected : Clitheroe Corpn. (including part in Mid-East England Electricity Scheme); Colne Corpn.; Nelson Corpn.; Brierfield U.D.C.; Burnley Corpn.; Padiham U.D.C.; Accrington Corpn.; Blackburn Corpn.; Darwen Corpn.; Haslingden Corpn.; Rawtenstall Corpn.; Bacup Corpn.; Turton U.D.C.; Whitworth U.D.C.; Rochdale Corpn.; Littleborough U.D.C.; Milnrow U.D.C.; Heywood Corpn.; Bury Corpn.; Horwich U.D.C.; Bolton Corpn.; Farnworth U.D.C.; Radcliffe U.D.C.; Middleton Corpn.; Oldham Corpn.; Stalybridge, Hyde, Mossley and Dukinfield E. Board; Ashton-under-Lyne Corpn.; Urban E. S. Co. (Glossop Undertaking); Manchester Corpn.; Salford Corpn.; Stretford and Dist. E. Board; Irlam U.D.C.; Swinton and Pendlebury U.D.C.; Eccles Corpn.; Leigh Corpn.; Atherton U.D.C.; Hindley U.D.C.; Ashton-in-Makerfield U.D.C.; Newton-in-Makerfield U.D.C.; Warrington Corpn.; Altrincham E. S. Co.; Sale U.D.C.; Cheadle and Gatley U.D.C.; Stockport Corpn.; Bredbury and Romiley U.D.C.; Hazel Grove and Bramhall U.D.C.; Marple U.D.C.; New Mills U.D.C.; Trent Valley and High Peak E. Co.; Alderley Edge and Wilmslow E. Board; Buxton Corpn.; Electricity Co. of Macclesfield; nine scattered areas belonging to the Lancashire P. Co.

D ***North Wales and Cheshire.*** **Regional Planning Areas :** i, Mid-Cheshire regional scheme; ii, The Wirral Peninsular Deeside. **Supply Undertakings Affected:** Wallasey Corpn.; Hoylake and West Kirby U.D.C.; Birkenhead Corpn.; Caldy Manor Estate, Ltd.; Wirral R.D.C.; Mersey Power Co.; Mid-Cheshire E. S. Co.; Chester Corpn.; Crewe Corpn.; Electricity Distn. of North Wales; Wrexham Corpn.; Hawarden R.D.C.; Connah's Quay U.D.C.; Mold U.D.C.; Prestatyn U.D.C.; Rhyl U.D.C.; Ruthin E. S. Co.; Llanrwst E. S. Co.; Bettws-y-Coed U.D.C.; North Wales P. Co.; Colwyn Bay U.D.C.; Llandudno U.D.C.; Conway Corpn.; Penmaenmawr U.D.C.; Llanfairfechan U.D.C.; Bethesda U.D.C.; Bangor Corpn.; Menai Bridge U.D.C.; Holyhead U.D.C.; Asheton Smith (Port Dinorwic); Caernarvon Corpn.; Llangollen U.D.C.; Oswestry Corpn.; Borth and Ynys-las E. S. Co.; Chiswick E. S. Co. (Aberystwyth).

The Architect's Opportunity

A DISCUSSION



The large field that lies open to the supply industry is clearly illustrated in this diagram, for of the 12 millio houses only 5 million used electricity in 1932. A still large field for development lies in extending the uses of ele tricity. Most of the electrified houses only used electricit for lighting, and even in this sphere the standards were lo

SINCLAIR WOOD: What are architects going to do about electrical development?

JOHN GLOAG: That's one of those vague, general questions that hasn't got a direct answer. It's like asking anyone what they'd do if prohibition were introduced in England. Architects can't do anything spectacular and revolutionary now just because of electrical development. The increased use of electricity is going to make all sorts of things far-seeing and intelligent architects have been clamouring for, year in and year out, easier to attain, such as immunity from fumes and smoke, which will make buildings cleaner and, presumably, people healthier.

SINCLAIR WOOD: My question implied: what are architects going to do to get in tune with the new point of view the public will get as a result of electrical development?

JOHN GLOAG: Architects can't escape the public's point of view. Every architect has to work for a client, and the client has to be considered, or circumvented—that depends on the client.

SINCLAIR WOOD: I wasn't thinking of individual clients. I suggest that there will be comparatively little work done by architects for individual clients in the near future. Most of the big building activities will be concerned with housing masses of people; with the planning of residential areas and the replacement of slums. Whatever political party is in power, national attention will be focussed for years to come on this problem of providing saner housing conditions for the masses; it is an inevitable social tendency, only likely to be interrupted or turned aside by war or revolution—unless, as some hope, it is expedited by revolution. The interest of the architect therefore will be deflected from the man with three or four thousand pounds to spend on building a comfortable house in the country or in the suburbs, to the syndicate or the municipality or the public corporation with a hundred thousand pounds to spend on new streets of dwellings, blocks of flats and other large scale residential schemes.

JOHN GLOAG: That means that the client of the architect is no longer the person who is going to live in the place he builds.

SINCLAIR WOOD: Yes. But it also means that the architect must design for people who are very closely subjected to the influence of electrical development. I believe a lot is talked and written about architectural design as though it were something that was practised without reference to the habits and ideas and inclinations of the people it mainly affects: the people who have to live with it. To what extent do architects take into account things that are going to influence the ideas of the public?

JOHN GLOAG: No architect who knows his business ignores the public or refuses to observe the things that may be influencing them. The labour-saving movement is an example of something that has engaged the attention of architects very closely. As you know, for years the public has been deluged with propaganda about labour saving, not only by hundreds of articles in the home magazines and in the women's pages of the popular dailies, but by thousands of advertisements and by every hoarding. Nearly everybody with something to sell in connection with the home has cashed in on labour saving, until the modern housewife might be forgiven for thinking that her job is to sit down in an armchair contemplating the white, smooth skin and exquisitely delicate nails of her idle hands while the house runs itself. Architects have enormously simplified the labour-saving home.

SINCLAIR WOOD: Did architects initiate the labour-saving movement?

JOHN GLOAG: I don't know. They played a part in the general reaction from Edwardian complexity in making houses simpler in form, more compact in plan and easier to keep clean.

SINCLAIR WOOD: Yes, but what are the facts? You are generalizing about movements. I suggest that architects were compelled (unconsciously if you like) by the enterprise of manufacturers who invented labour-saving apparatus, to design labour-saving houses. Do you suppose the kitchen cabinet would ever have gained its enormous popularity if architects had known enough of their job to see that every house and flat they built had a properly equipped kitchen?

JOHN GLOAG: I think you are assuming that architects are responsible for furnishing the places they build. They haven't been since the eighteenth century, unfortunately.

SINCLAIR WOOD: No. No. The point I'm making is that when architectural design changes, the changes are imposed from without. All this talk that the bright young architects indulge in about the æsthetics of design——

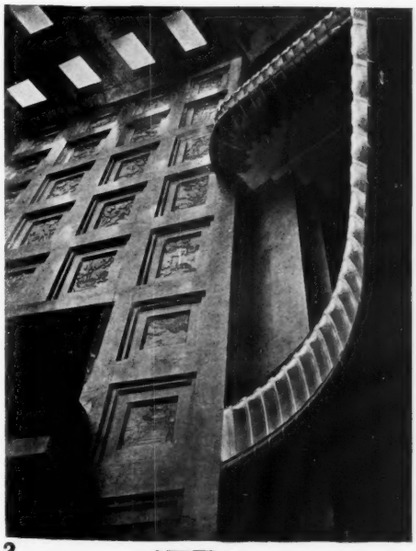
JOHN GLOAG: Excuse me; that's out of date. There's a lot of talk about functionalism—although

Lighting

1. The entrance hall of "St. Raphaël," Hornchurch, Essex. Architect, Stewart Lloyd Thomson. Domestic indirect lighting housed in a specially designed reflector abutting against a mirror, which reflects and doubles it.

2. Interior of the Savoy Theatre, London, as redecorated by Basil Ionides. The illustration shows the indirect lighting of the balcony fronts and the direct lighting panels, glazed with wired glass, which bridge the deep proscenium frame. This lighting has been carefully placed to give sharp shadow on the relief panels and coffers.

3. This room at the Italian Art Exhibition, Turin, 1929, is an example of the effective lighting of precious objects. Each display table is placed under a lighting canopy which lights the objects directly but conceals the source of light.



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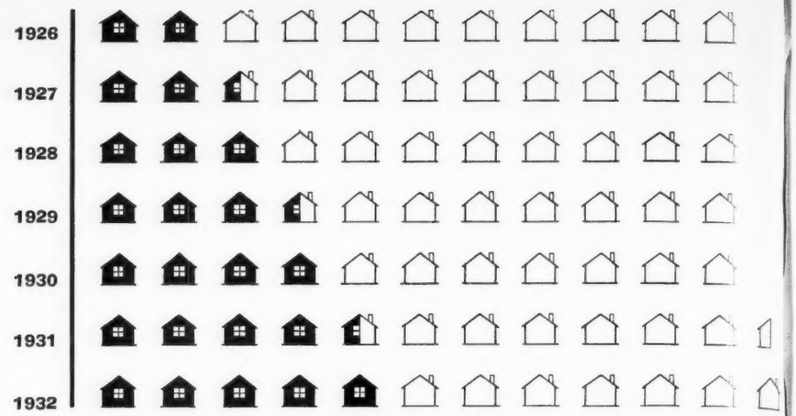
The Architect's Opportunity

A DISCUSSION



The large field that lies open to the supply industry is clearly illustrated in this diagram, for of the 12 million houses only 5 million used electricity in 1932. A still larger field for development lies in extending the uses of electricity. Most of the electrified houses only used electricity for lighting, and even in this sphere the standards were low.

SINCLAIR WOOD: What are architects going to do about electrical development?

JOHN GLOAG: That's one of those vague, general questions that hasn't got a direct answer. It's like asking anyone what they'd do if prohibition were introduced in England. Architects can't do anything spectacular and revolutionary now just because of electrical development. The increased use of electricity is going to make all sorts of things far-seeing and intelligent architects have been clamouring for, year in and year out, easier to attain, such as immunity from fumes and smoke, which will make buildings cleaner and, presumably, people healthier.

SINCLAIR WOOD: My question implied: what are architects going to do to get in tune with the new point of view the public will get as a result of electrical development?

JOHN GLOAG: Architects can't escape the public's point of view. Every architect has to work for a client, and the client has to be considered, or circumvented—that depends on the client.

SINCLAIR WOOD: I wasn't thinking of individual clients. I suggest that there will be comparatively little work done by architects for individual clients in the near future. Most of the big building activities will be concerned with housing masses of people; with the planning of residential areas and the replacement of slums. Whatever political party is in power, national attention will be focussed for years to come on this problem of providing saner housing conditions for the masses; it is an inevitable social tendency, only likely to be interrupted or turned aside by war or revolution—unless, as some hope, it is expedited by revolution. The interest of the architect therefore will be deflected from the man with three or four thousand pounds to spend on building a comfortable house in the country or in the suburbs, to the syndicate or the municipality or the public corporation with a hundred thousand pounds to spend on new streets of dwellings, blocks of flats and other large scale residential schemes.

JOHN GLOAG: That means that the client of the architect is no longer the person who is going to live in the place he builds.

SINCLAIR WOOD: Yes. But it also means that the architect must design for people who are very closely subjected to the influence of electrical development. I believe a lot is talked and written about architectural design as though it were something that was practised without reference to the habits and ideas and inclinations of the people it mainly affects: the people who have to live with it. To what extent do architects take into account things that are going to influence the ideas of the public?

JOHN GLOAG: No architect who knows his business ignores the public or refuses to observe the things that may be influencing them. The labour-saving movement is an example of something that has engaged the attention of architects very closely. As you know, for years the public has been deluged with propaganda about labour saving, not only by hundreds of articles in the home magazines and in the women's pages of the popular dailies, but by thousands of advertisements and by every hoarding. Nearly everybody with something to sell in connection with the home has cashed in on labour saving, until the modern housewife might be forgiven for thinking that her job is to sit down in an armchair contemplating the white, smooth skin and exquisitely delicate nails of her idle hands while the house runs itself. Architects have enormously simplified the labour-saving home.

SINCLAIR WOOD: Did architects initiate the labour-saving movement?

JOHN GLOAG: I don't know. They played a part in the general reaction from Edwardian complexity in making houses simpler in form, more compact in plan and easier to keep clean.

SINCLAIR WOOD: Yes, but what are the facts? You are generalizing about movements. I suggest that architects were compelled (unconsciously if you like) by the enterprise of manufacturers who invented labour-saving apparatus, to design labour-saving houses. Do you suppose the kitchen cabinet would ever have gained its enormous popularity if architects had known enough of their job to see that every house and flat they built had a properly equipped kitchen?

JOHN GLOAG: I think you are assuming that architects are responsible for furnishing the places they build. They haven't been since the eighteenth century, unfortunately.

SINCLAIR WOOD: No. No. The point I'm making is that when architectural design changes, the changes are imposed from without. All this talk that the bright young architects indulge in about the æsthetics of design——

JOHN GLOAG: Excuse me; that's out of date. There's a lot of talk about functionalism—although

Lighting

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1. The entrance hall of "St. Raphaël," Hornchurch, Essex. Architect, Stewart Lloyd Thomson. Domestic indirect lighting housed in a specially designed reflector abutting against a mirror, which reflects and doubles it.

2. Interior of the Savoy Theatre, London, as redecorated by Basil Ionides. The illustration shows the indirect lighting of the balcony fronts and the direct lighting panels, glazed with wired glass, which bridge the deep proscenium frame. This lighting has been carefully placed to give sharp shadow on the relief panels and coffers.

3. This room at the Italian Art Exhibition, Turin, 1929, is an example of the effective lighting of precious objects. Each display table is placed under a lighting canopy which lights the objects directly but conceals the source of light.

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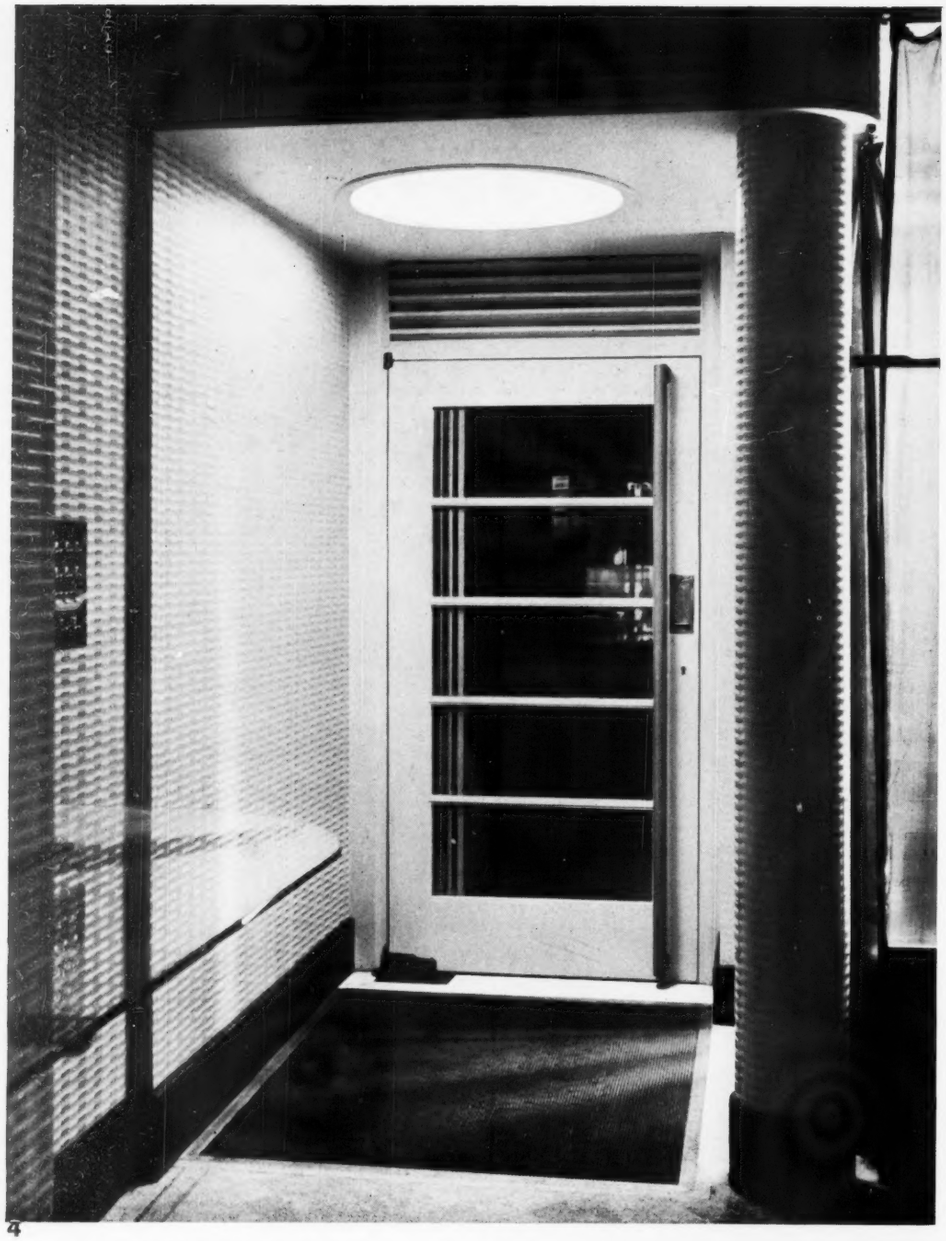
Lighting



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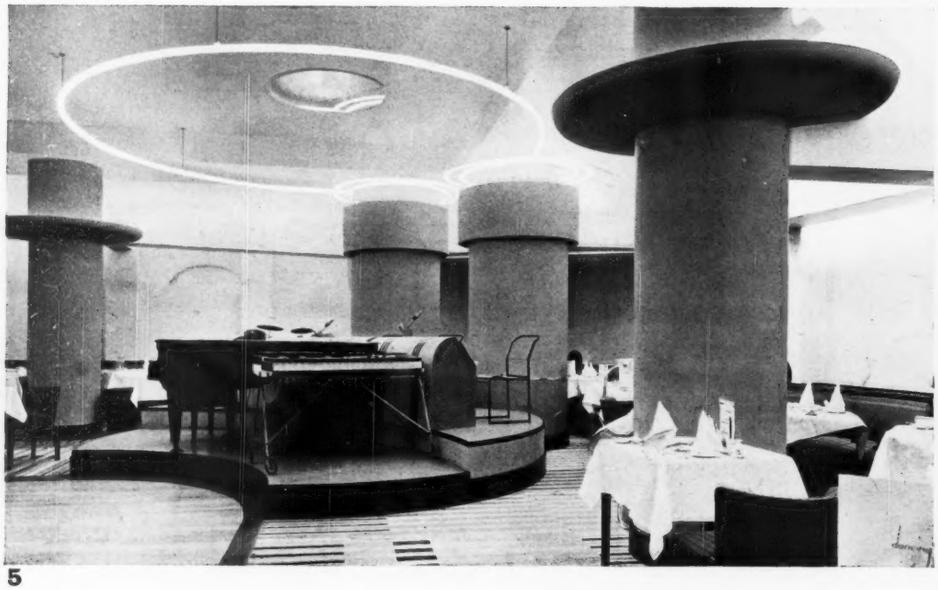
4. The entrance to the Kensington and Knightsbridge Electric Lighting Company's showrooms in Brompton Road, London. Architect, Raymond McGrath. An entrance accentuated by brilliant lighting from a flush panel glazed with flashed opal glass. The wallcovering has been chosen for its light-reflecting qualities.

5. The Band Rostrum at Fischer's Restaurant, Bond Street, London. Architect, Raymond McGrath. "Sunlight" nitrogen tubing is the principal lighting of the restaurant. The illustration shows the large circle of tubing which is suspended above the band rostrum like a halo. The columns are also encircled and the trays provide indirect lighting of a yellow colour contrasting with the pink light of the "Sunlight" tubes.

6. The Sudbury Town Underground Station. Architects, Adams, Holden and Pearson. Two special pylons have been designed to incorporate indirect floodlight reflectors and local direct lighting in the stems of the pylons. The intensity of light in this booking hall is 5 foot-candles.



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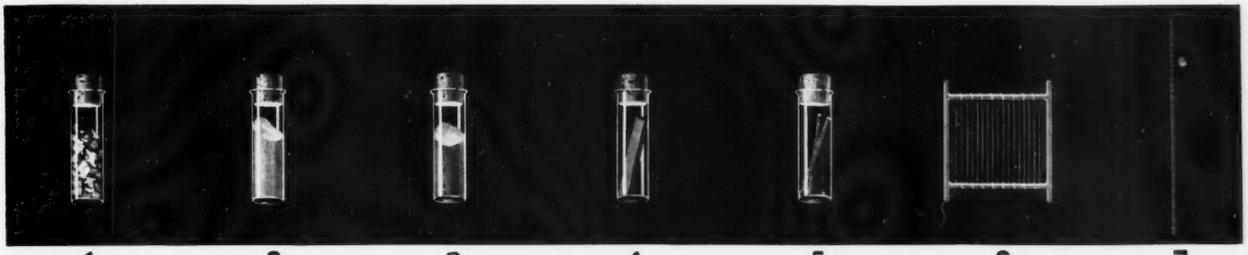

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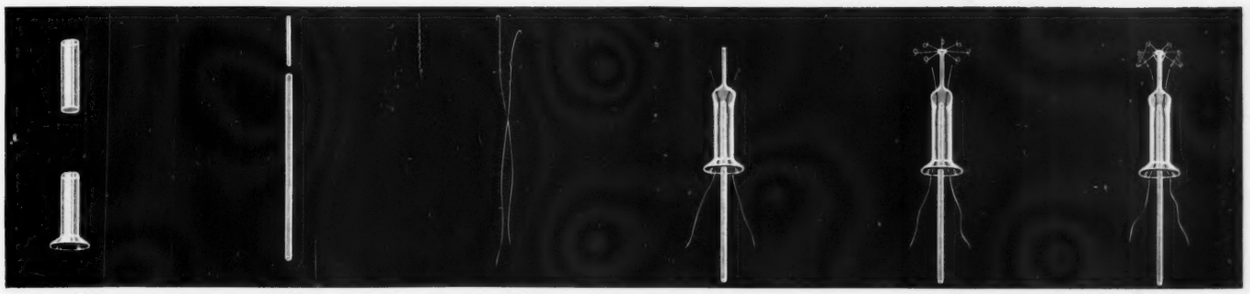

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that's getting a bit dated—but believe me, the bright young architects, as you call them, are really seriously concerned with problems of accommodation, social problems, all the practical problems involved in getting modern dwellings full of light and clean air. They don't, thank the Lord! babble of æsthetics.

SINCLAIR WOOD: Whatever name they give to their talking and writing I still suggest that their work is influenced by extraneous things. The labour-saving movement was launched and impressed upon the public by the propaganda of individual journalists and writers on architecture, like yourself, and by a great volume of commercial persuasion, released over a number of years in the form of advertising for washing machines, vacuum cleaners, kitchen cabinets, patent sinks and draining boards, easily managed stoves, smokeless fuel, and electrical apparatus of all descriptions. Which brings me back to my first question—which you have evaded incidentally: what are architects going to do about electrical development?

JOHN GLOAG: Clearly they're going to take advantage of the opportunity it provides for designing houses and flats that are very easy to run, and are more spacious. But even though the architect isn't building directly for the people who are going to live in what he builds, he must remember certain prejudices the Englishman possesses. Its no good putting up a block of residential flats if people are going to be mentally uncomfortable in them.

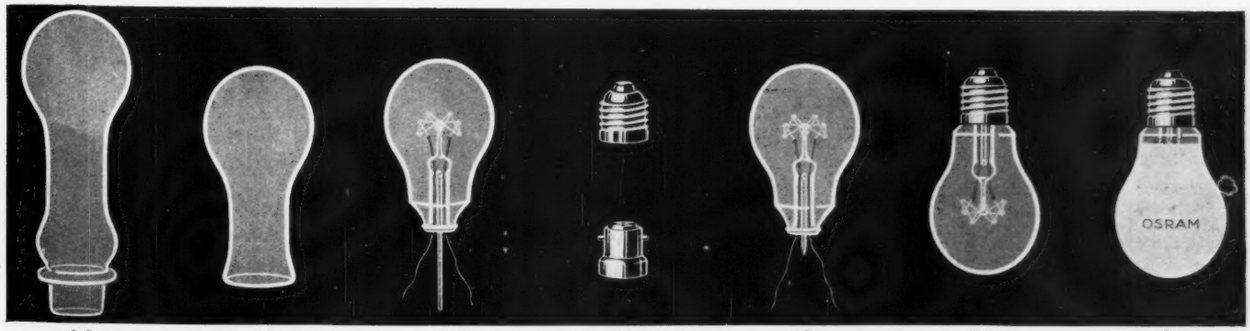
SINCLAIR WOOD: During the next ten years there will be a great volume of planned persuasion, which will change, or tend to change, the view of householders about the things they should have in their houses and the way those houses should be run.

JOHN GLOAG: Because of electricity and because of the abundant supplies of it that are going to be available. I wonder if people will become more mechanically minded about their homes. We are becoming a nation of car-owners, and you would have thought that some of the things people picked up about their cars would have been reflected in their attitude to their homes; but it hasn't, this car-owning habit, brought English people any nearer the ideals of M. Le Corbusier. I doubt if in England a house will ever be thought of as "a machine for living in."

SINCLAIR WOOD: To have compared the way their cars ran with the way their homes ran would have needed an imaginative effort. People don't make imaginative efforts. But when they are subjected to

Making a Lamp

1. Wolfram ore in its raw state. 2. Wolfram acid. 3. Wolfram reduced to powder. 4. Wolfram in block form. 5. Coarse Wolfram wire. 6. Smooth drawn Wolfram wire spun to the requisite gauge. 7. The same after the necessary spiral torsion. 8. The plate and plate-tube of an Osram lamp. 9. Its central glass rod and pump-tube. 10. Its current connectors. 11. The glass foot with the plate and plate-tube, central rod and pump-tube and current distributors attached to it. 12. The framework for the wire-mesh added. 13. The framework with its wiring completed. 14. The glass bulb of an Osram lamp on the end of the blow-pipe. 15. The rough bulb after its separation from the blow-pipe. 16. The framework, etc., fused into place within the bulb. 17 (Top). An Edison type lamp-socket. (Below) Swan type lamp-socket. The latter, an English invention, now prevails throughout the world. 18. The globe after being emptied of air by the vacuum pump. 19. The nearly finished product. The globe with its metal screw-socket attached. 20. An Osram globe of the Edison socket type after frosting and stamping with the Osram trade-mark. These illustrations are reproduced by courtesy of Allgemeine Elektrizitäts-Gesellschaft, Berlin.



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persuasive suggestions about the use of electricity in their houses, and the ease it can bring them, then there is some possibility of their state of mind becoming more receptive to the idea of the house being a machine for living in. As the idea of electrical convenience is put over to them, even if they do not avail themselves completely of all the peculiar gifts of electrical apparatus, they will become unconsciously intolerant of anything in the shape of old-fashioned inconvenience, anything which prevents their rooms from being efficient.

JOHN GLOAG : This suggests that architects may have what seems to be an ideal public to work for. There's a snag, of course. There always is. Although those people, the potential occupiers of the new flats and tenements of the near future, may be receptive as a result of the planned persuasion of the electrical powers that be, architects are not, as we've agreed, working directly for the occupier. The syndicates or municipalities who are the real patrons of these housing schemes may limit the architect : they may insist that the public will not appreciate the convenience and comfort of a machine-like flat. Those people, the civic authorities and the speculative financial people who are paying for the bricks and mortar, are far more likely to be out of touch with the public than the really progressive architect. They are far more likely to insist on residential schemes resembling exaggerated Tudor manor houses, or on cheap-jack classic, and to insist, too, on all the rooms having those totally needless excrescences in an electrified world, fireplaces and hearths. The enormously enlarged window areas that are pleasant and possible with controlled heating, such as electricity provides, may be curtailed by the traditional prejudices of commercial patronage. It's possible to have one wall of a room entirely of glass in an electrically warmed flat——

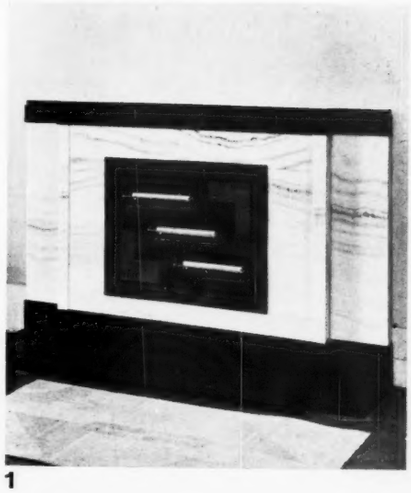
SINCLAIR WOOD : Don't let's mourn in detail a state of affairs which may never occur. Large scale rehousing will have to be planned, and planning implies people of imagination at the top. The planning mind is a paradox, for it represents restrained, controlled imagination. I think it is more than likely that syndicates interested in building houses and flats will have the wit to extract reflected benefit from the advertising done by electrical interests. The nature of such advertising must for many years impress itself on people's minds; and its function will be to associate always in people's minds the idea of electricity with cleanliness, comfort and ease and an absence of needless complexity in their rooms. If people find that new flats are burdened with old disadvantages in spite of electrical service, their inclination will be to ask why they cannot have the things they have been hearing about for years—the heaters and power services, untroubled by concessions to old-fashioned ideas. To put it another way : flats and houses that don't make the best of electrical service and which still harbour things like projecting fireplaces—what do you call them, chimney breasts?—when chimneys are no longer necessary, will be left empty. But again let me ask my original question : what are architects going to do about electrical development?

JOHN GLOAG : They should be now, of course, studying every form of electrical apparatus. They should also be making sure that decent apparatus is being designed, so they won't have their new buildings outraged by idiotic imitations of coal fires and log fires, when the clean, cheerful visible heating of a well-designed electrical radiator is available. They should be certain that the new electrical services are not going to masquerade in traditional costumes. They should remember that for years electric light was disguised rather than permitted to do its exciting and wonderful best for the illumination of rooms and theatres and public buildings. They should recall the early forms of shades, the electroliers, the fatuous lamps upheld by bronze figures : they should make it their business to examine what the electrical industry can show them in the way of apparatus, and in educating themselves regarding the possibilities of electrical services, they should extend the education of the manufacturers of electrical appliances in the matter of design.

SINCLAIR WOOD: And being organized they should insist on real organization in the electrical industry and bring about simplification, standardization, and cheapness. The price of many electrical appliances is still greater than the price of electricity itself, which is silly. Naturally it's only a matter of time before the public begins to lend a hand under the influence of advertising. At the moment, persuasion is sporadic rather than concentrated; but when it is nationally planned, as it should be, the architect may rely upon a receptive public for any application of electrified functionalism he can evolve. And, which may be even more helpful, he will have a receptive, organized, imaginative industry to deal with.

The interior of the Théâtre St. Georges, Paris. Architect, Charles Siclis. An excellent example of simplicity in theatre decoration and lighting. The lighting is entirely indirect, principally from the recessed ceiling panel where colour changes are provided for. By contrast with the intense lighting required in the film studio, the normal theatre auditorium requires only an intensity of four foot candles.

Forms for the heat unit



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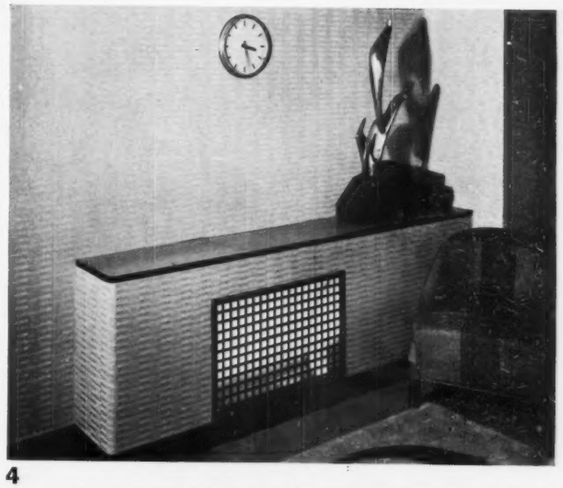

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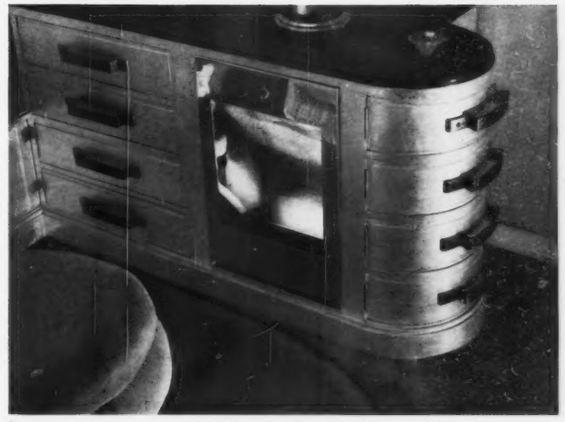

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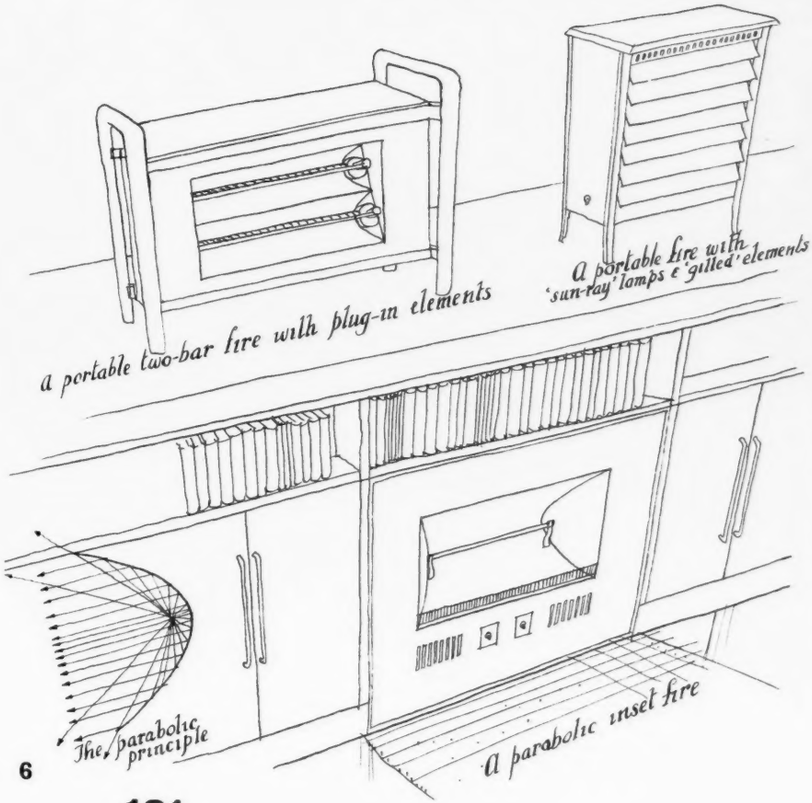

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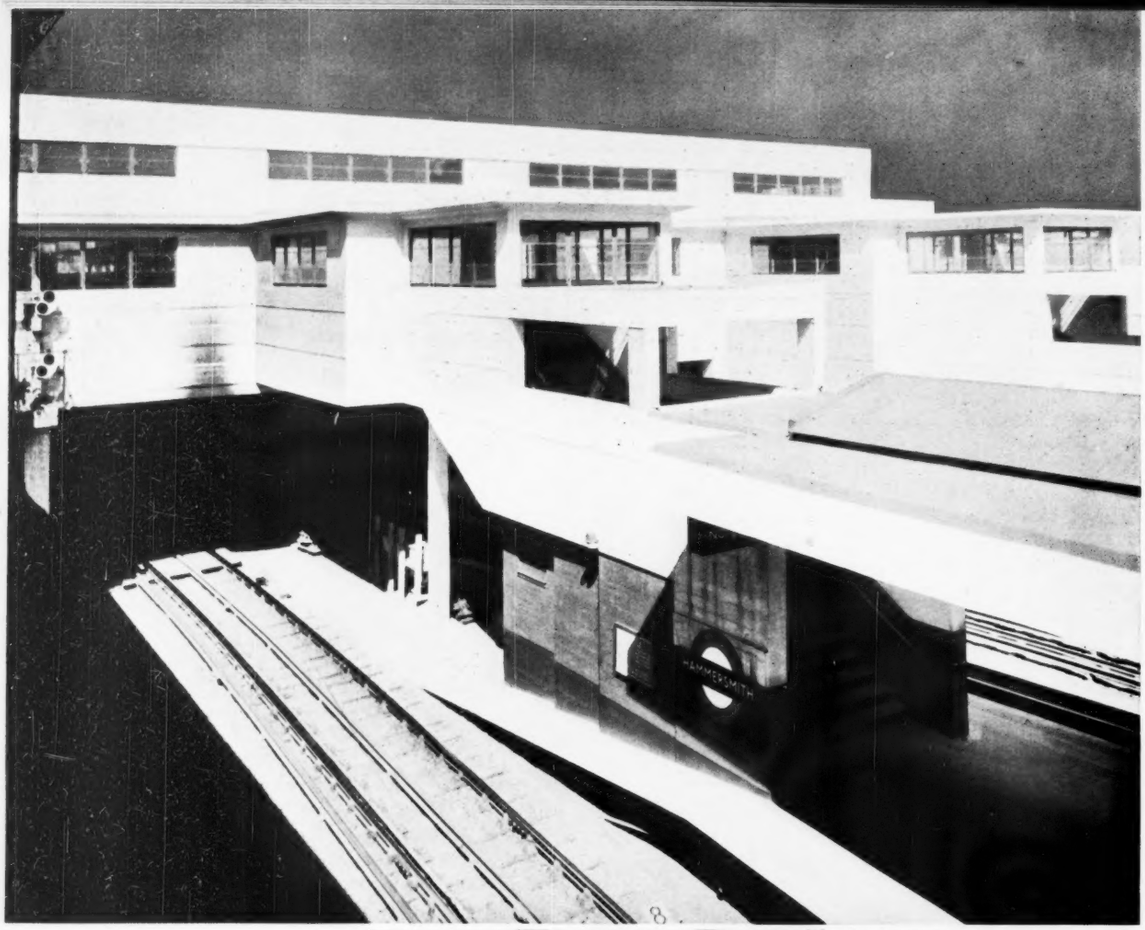
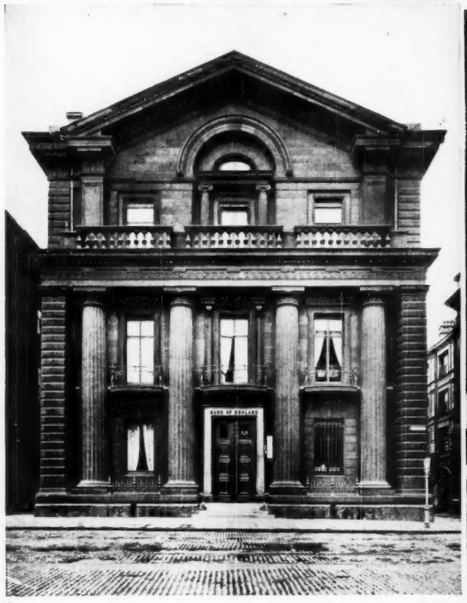
Illustration 1 is a three-element inset electric fire, with a marble surround, by Froy. 2. A tubular electric radiator in a factory at Welwyn Garden City, Hertfordshire, by Wells Coates. 3, 4 and 5. Three settings for electric fires by Raymond McGrath. 3 is a copper-fronted fire, fitted with "sun-ray" lamps and "gilled" heating elements, at Bell Moor, Hampstead. The two side panels are black glass, the panelling Australian walnut. 4. A decorative inset fire in a waiting room at Broadcasting House, London, and 5, an inset fire on the dressing table fitment of a bedroom. The floor on which the stool stands is 1 in. ground glass illuminated from below.



PERSUASIVE ARCHITECTURE



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Persuasive architecture is a thing that has been tried before and tried with success. Here are three examples of architecture created for practical purposes, but with a definite propagandist object in addition. In each case the building brings a clear message to the public, and the message is concerned with the setting up of an institution new to existing society. One of the greatest achievements of early nineteenth-century Britain was the building-up of the complicated structure of home and foreign banking and finance, which stood unshaken till the War. To build up this gigantic structure meant, in the first place, to persuade the public to accept the principle and practice of banking, and 2 shows one of the means by which this acceptance was secured. To this classic of early Victorian banking architecture (1845) most of the commercial buildings of the following decades owe much more than is generally realized. 3 is a piece of propaganda, French this time (1889) for the products of modern machine industry extolled in one international exhibition after another. With 1 we come down to the present day (1932) and watch the London Underground setting an example to all the world in the job of educating a metropolis in the intelligent use of suburban transport services. It would be difficult to find better examples of direct visual propaganda than these new station buildings, the pride of post-war London. "What is electricity going to do for architecture?" is a question asked by the writer of an article in this issue. Some people, on the other hand, are asking what architecture is going to do for electricity. Electricity as the begetter of a new architecture requires a new architecture for its own advancement just as much as did the three new "causes" that are preached in the designs illustrated on this page. Illustration 2 is from Richardson's "Monumental Classic Architecture."

NOTHING TO BE ASHAMED OF

About three weeks ago a friend of mine moved into a house in London. There was a previous tenant in possession, so the house had not stood empty, and electricity and other services were "on" from the first day. It was not long before my friend received a letter from the local electricity supply company enclosing a form of contract for his signature. My friend has not yet signed the contract and is curious to see what the company will do next. Why is he curious, and why am I detailing this very commonplace story? In order to forestall this question I here print some figures recently supplied to me by my friend, Mr. Parker of the Westminster Electric Supply Company. "It may be taken," says Mr. Parker, "that for the average working-man's flat the annual lighting consumption is approximately 90-100 units. For similar dwellings where all services are electrified, the average consumption varies from 1,500 to 2,500 units per year. In the case of a number of high-class West End flats the average figures are as follows: For lighting only, 819 units per annum; for all services, 8,178 units."

Now, the interesting thing about the house of which I am writing is that it is wired for lighting only. It is thus completely innocent of electric fires, cookers, kettles, irons and all those other devices that are covered by the special current charge for power. Here, then, is an opportunity for a very important local tradesman—namely, the local electricity supply company—to increase his business with a local household, not by a hundred or two hundred per cent., but by anything up to one thousand per cent. Does the company show any signs of wishing to make this addition to its trade? During the past few weeks the tradesmen's bell at this particular house has been rung incessantly by dairymen, grocers, mineral water merchants, bakers and other traders by the score, to make no mention of odd people asking to be given a garden to dig or windows to clean. To most of these tradesmen my friend means just the keeping of an old account. The electricity man alone, who has a chance of gaining far more than any of these others, maintains a dignified silence. The highly respectable doctor round the corner could not be more aloof.

No, it isn't that either my friend or myself want the electricity shop to launch a high-pressure salesmanship offensive against the inhabitants of the district. As for my friend, his habitual treatment of high-pressure salesmen is crude but effective. Their methods are not much use with such as he. But it happens that both of us have somehow got hold of the idea that electricity is important. In spite of all the secrecy in

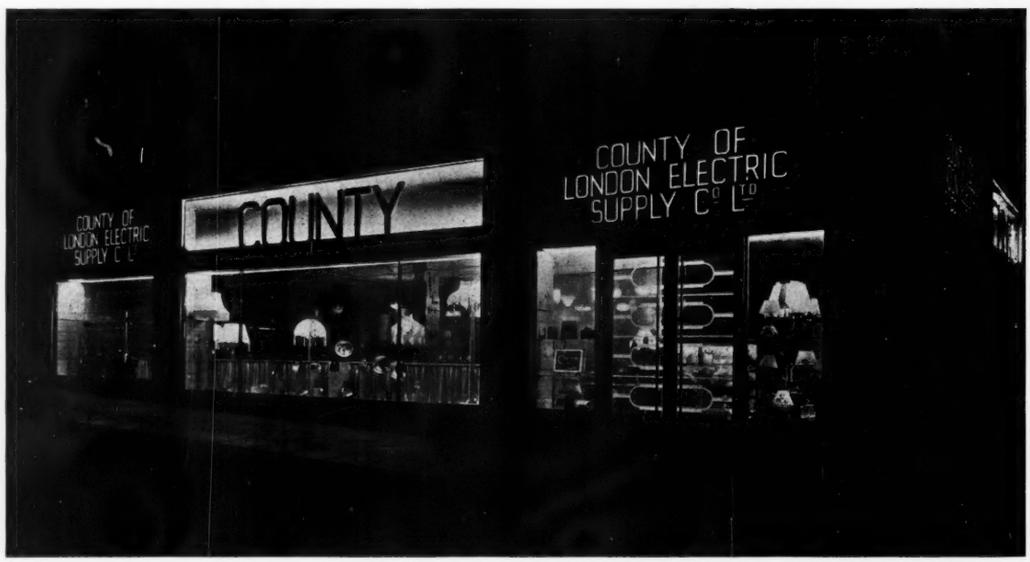
The headpiece to this page is a view in the showrooms of the Kensington and Knightsbridge Electric Lighting Company, Brompton Road, London, showing an interesting solution of the difficult problem of displaying small and mixed equipment intended for sale. Lighting is concealed and passes through plate glass shelves to the lower display level. Architect, Raymond McGrath.

which the subject is still wrapped by the electrical people themselves, we are convinced that the electrical age is in fact already upon us. Not one department of life, not many, but every single one without exception is, we think, about to receive new force and new direction from this fifth element, this newly-found world. For it is a world, nothing less, that has been conquered and pressed into the service of our race. It is the twentieth-century equivalent for the Indies and Americas of the past. As those enlarged and enriched us, so will this, and it will change us, too, as they did, only perhaps more profoundly. It used to be one continent discovering another; today the whole earth is the discoverer, and the earth will benefit. Electricity was discovered many years ago, but the people who discovered it had no idea what it was they had found. Like those other possessions, electricity has had to be not only discovered but conquered yard by yard before it could become a real benefit to our race. With electricity the end of such a conquest is just becoming visible. At last mankind seems to be getting hold of it and to be turning it into a settled possession, the most important thing since the discovery of fire and the domestication of the horse and cow.

Well, all this is far-fetched enough, and my friend, who is a very practical person, would never descend to such verbiage as this. But we often wonder, both of us, how many among the electricity people know how big, how splendid, is the thing they have to sell. Take this matter of showrooms, a crucial test. A number of electricity companies in our principal towns have already got showrooms of a sort. Some of them are quite decent showrooms, in which any ordinary business could be very conveniently carried on. But is electricity an ordinary business? "I often wonder what electricians buy one-half so precious . . . . " As for my friend's own district, the company there is housed in an office that suggests a decayed estate agent, or worse. It is true that a sign is hung out over the first floor windows, but the word "Lighting" is displayed in large letters as if to warn customers that when they enter they had better leave outside any fancy notions they may have about questionable new uses for electricity, such as heating, cooking or warming water, or anything equally bizarre. It seems just possible to us that if the electricity people were as keen about electricity as we are, their shop would be the most attractive, the most interesting and the most crowded of all the shops in the district. And the public would flow into the electricity shop as it now flows into the news theatre or the bargain basement. They would do this because in the electricity shop they would have a chance of seeing the one great force at work that is going to make a bigger and a more conspicuous difference in their lives than anything else that modern commerce has to give them.

No doubt there is practical, everyday work to be done in an electricity shop as in any other shop. No matter how dull this work may be, it has got to be carried out, and the shop must provide for it. Maybe you go into the place to buy a new lampshade or an iron. There is nothing very wonderful about that. You are simply using the electricity shop as you are using dozens of other shops in which goods are purchased over the counter. Or perhaps you have called in to see about your quarterly bill. That again is a piece of quite ordinary routine business. Thousands of people have all sorts of bills to pay from time to time. A person who comes to fix up a consumer contract may possibly be doing something a little more interesting; but, after all, contracts are signed every day for such matters as window-cleaning or hire-purchase bedroom suites, and we who sign them think little of it. Still there is nothing that raises the transaction above the everyday and the humdrum. And the bulk of the business done in the electricity shop is of this kind: all very unremarkable and very dull, and very like the business transacted in any other sort of shop. But there is something besides all this that an electricity shop can do, and that is to give some hint of what electricity may mean for you and me and all of us. Pretty obvious isn't it? and yet a moment's serious reflection will show you that not one in a hundred even attempts this simple task. How many electricity showrooms are there that give one the true feeling of something new and vast and full of incalculable promise? How many that suggest, at first glance, how unbearable would be our loss if we were to remain without electricity? Walking in out of the soot and the grime, the petrol fumes and the shattering roar of the present-day city, I expect to find an atmosphere reminding me of the cleanness and quiet, the health and sanity of an electrically-ordered world.

There is nothing impossible about this; it is a matter of clear

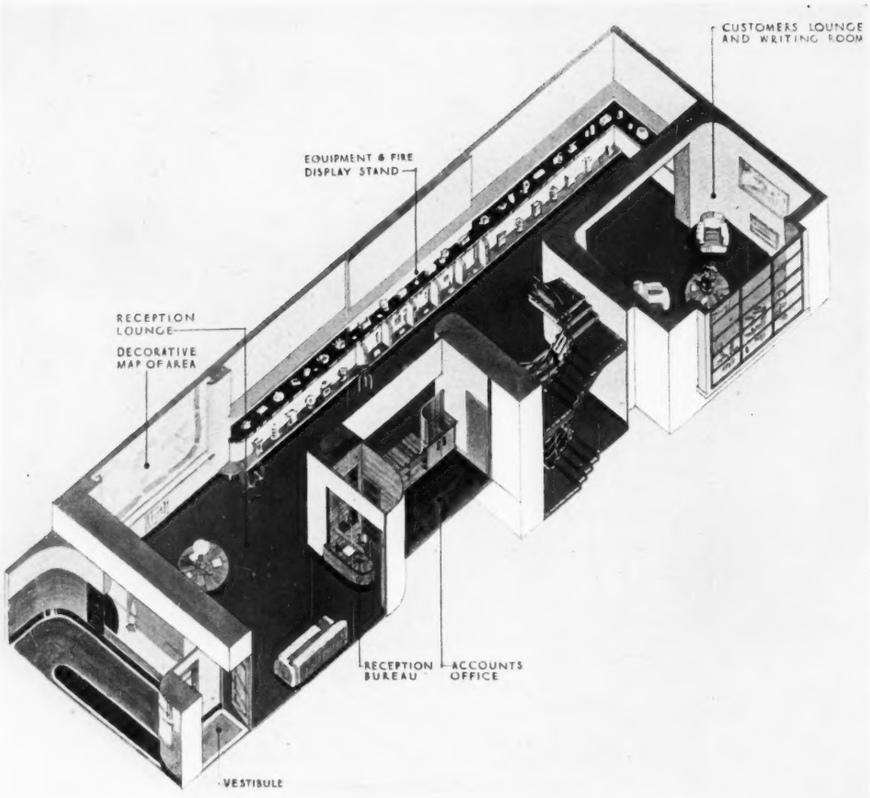


The shop front of the County of London Electric Supply Company at Streatham. Another confirmation of the principle that for electric supply companies the showroom itself is the best display possible. The window here is therefore of the non-reflecting type. Architect, G. Grey Wornum.

A curved window-bay in the entrance showroom of the Kensington and Knightsbridge Electric Lighting Company's premises in Brompton Road, London. There is a space between this curved window and the outer wall which allows artificial lighting to be manipulated in addition to the natural daylighting. Behind the glazing, which is sandblasted fluted sheet, there is a curved length of goliath 2 in. diameter neon tube as well as several floods.

and simple planning, of order, lucidity and restraint. The same job has been done for other new inventions. Once upon a time there was a new thing called banking; it became necessary to demonstrate the value of banking to business men in all parts of the country. Under designers like Cockerell the architecture of banks developed as a separate species admirably designed for its particular purpose, which was to establish banking in the minds of the people as an institution both stable and enterprising, with splendid traditions behind it, backed by enormous knowledge and skill, manned by workers of irreproachable honesty, and generally destined to play an important part in the country's affairs. Again, take the iron exhibition buildings from the Crystal Palace onwards, the object of which was to arouse public interest and confidence in the products of modern machine industry. Here are two kinds of architecture contrived for the express purpose of selling something new and unfamiliar to a large and miscellaneous public. Both, in their way, were enormously successful. Cannot electricity, which is at least as important as banking and factory goods, do as much for itself today? The language of architectural form is waiting once more to be used with skill and daring; when is electricity going to give it a chance?

Perhaps the worst problem of showroom design is in the apparatus that has to be displayed for sale. You can no more sell electricity without apparatus than you can sell wine without bottles. And the quality of design in electrical apparatus is, with a few exceptions, beneath contempt. What is one to do with such fatuous stuff? The question is an awkward one, but there can be no two answers: Make the showroom right and let the detail follow if you can. There is no reason why the general disorder should not be tackled here and now. The place may be a colonnaded hall, very grand, like a town hall vestibule. It may be only a dingy room in a dingy Victorian terrace house. But invariably there is a jumble of heating things on the floor and a jumble of lighting things on the ceiling. Among the heating things an oak-grained umbrella-stand and a mahogany-grained Queen Anne chair face each other forlornly. There is also a desk at which they write you out a receipt. Depending from the lighting things are innumerable lengths of flex bearing switches and bits of string bearing price tickets at the end.



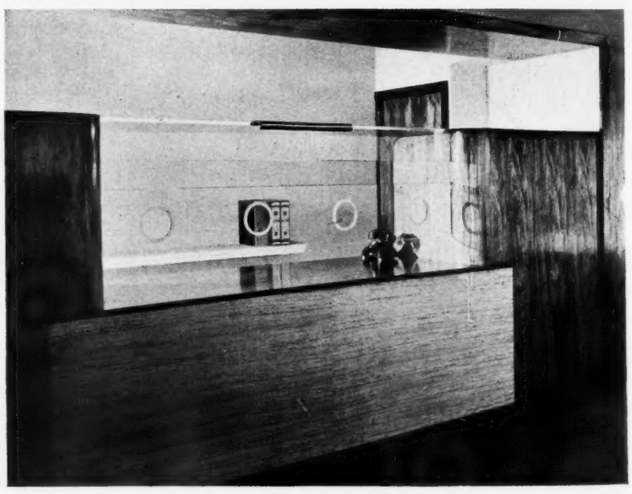
Left. Isometric view of the remodelled ground floor showroom of the Westminster Electric Supply Corporation's showroom in Victoria Street, London, showing certain side walls removed. The drawing shows the complete scheme.
Centre. The sale room on the first floor provides totally enclosed glass-fronted cases to preserve the metal work and allow of the adequate lighting of high polish on apparatus. Show cases are fronted in plywood and polished Indian Laurel wood, and provide ample storage space below display level.
Bottom. The cashier's office in plywoods and plateglass. Indian Laurel, English walnut and satinwood have been used for the skirting, wings, and counter front respectively. The counter screen in two sections is in ¼ in. polished plate, with its circular conversation apertures outlined in etched bands. Architects, Adams, Thompson and Fry.

I am going to compare electricity to a language. If a man takes up the study of a foreign language, it is usually because he is impressed with one or several concrete benefits to be derived from a knowledge of it. It may be that he wants to travel about the country; or he may be a professional or technical worker anxious to add to his learning or his experience; or he may wish to read one or more favourite authors in the original; or perhaps he is only a business man to whom another language means no more than another thousand or so customers added to his connection. But, in each of these cases, there is present some powerful motive other than the mere speaking or reading of a foreign tongue. The language by itself means nothing. Electricity by itself means nothing.

The ceiling above is a mass of iron rods and hooks, and of holes and markings left where something was suspended long ago. Most of the stock has been in the showroom too long, and much of it has been marked down. Clearly the place must be half warehouse and half rummage sale. You stumble up to one of the salesmen and ask to be shown a ceiling light fitting. As you crane your neck, trying to imagine what it would look like if hung in your dining-room, which is 8 ft. 6 in. high, instead of in a shop 12 ft. high, two or three dozen neighbouring fittings are clamouring for your attention. You frown and make up your mind you must concentrate. Hammered brass, gilt wood, oxidized silver, pinky-green all-glass modernistic, dance before your eyes. Enamelled cookers and Tudor basket grates encircle your feet. You stammer your order, and immediately feel sure you have made the most dreadful bloomer. As the door of the shop closes behind you, the difficulty of life lies heavily upon you and you wonder whether electricity isn't more trouble than it is worth, after all. Your faith has been sorely tried, and tried by the very place that should have made it blaze with redoubled ardour.

What are the chief requirements of a decent electricity showroom? First, it is quite certain that we want no more apologies for electricity. Too many of the showrooms today are trying to look like something else, as though electricity was something improper. Most of the fittings exhibited in these showrooms are trying to look as though they were coal or gas or candle fittings. I know there is a great deal to be said for coal and gas and candles, but I am unwilling to regard any of these fuels as essentially superior to electricity. I simply refuse to believe that it is necessary for electricity to masquerade as coal, gas or candles, or to gate-crash into our houses cleverly disguised as one of these.

Secondly, we want to be shown what electricity really is and can be. I am going to make what may seem a silly comparison:



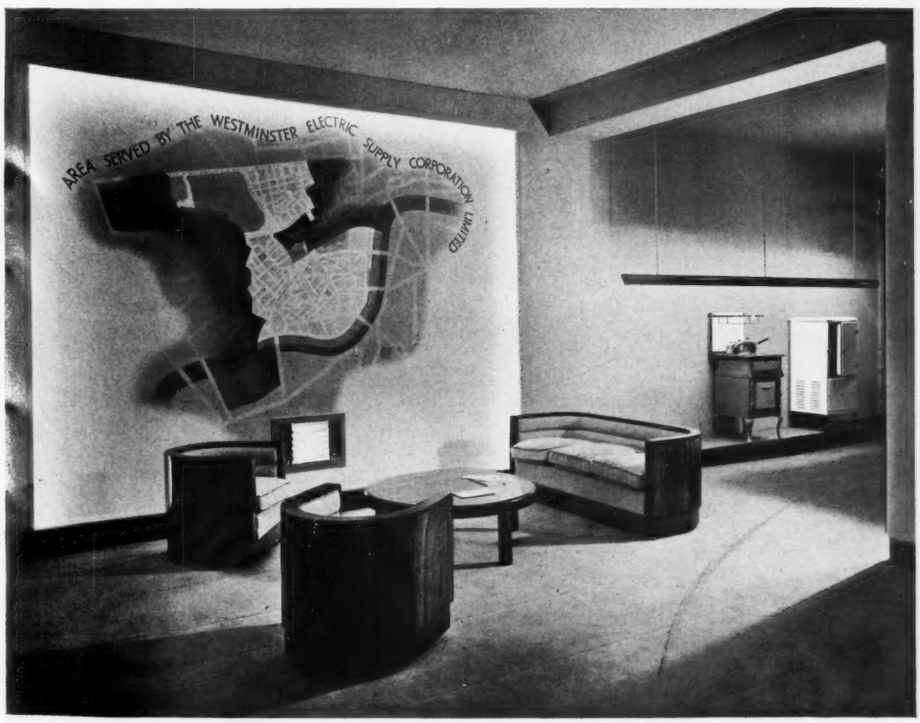
The Victoria Street front of the Westminster Electric Supply Corporation's showrooms in Victoria Street, with recessed non-reflecting window, giving clear views of the showrooms within. The front is metal faced plywood, painted light yellow and grey, with stainless steel framing members, black marble skirting, and yellow and grey rubber floor. The lettering is outlined in pale blue neon tube lighting, with the Westminster device in red.
The reception lounge, which is designed to be an introduction to the Main Sales areas, is dominated by a large scale map in colour of the Company's supply area, to the design of Mr T. Lee-Elliott.
The walls are a warm putty colour, the carpet grey, and a small proportion of vermilion in the map and furniture upholstery. The furniture in plywood and veneer used elsewhere in the showrooms was designed by the architects.

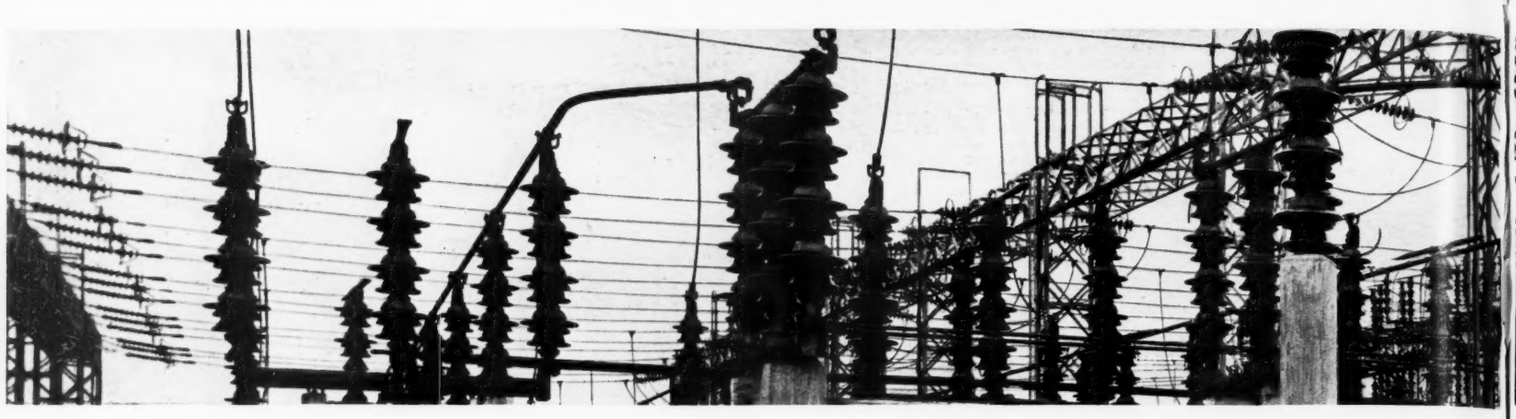
It is the uses to which both things can be put that rouse us from our indifference. The door opens into something big and exciting, and we pass through. A showroom that does not give us this further view is a showroom that is not carrying out its job.

Thirdly, we want to be able to choose the fittings and apparatus for our homes under reasonably pleasant conditions. There are many kinds of apparatus, and each of them is advertised as having properties that make it different from the others. In these days of branded goods advertising there is no such thing as the " just as good " substitute, and a stock has to be kept that includes all the well-known makes. But it is a short-sighted policy that pitches the customer headlong into this stock the minute he enters the building. It is a short-sighted teacher of languages who tosses a dictionary at his pupil's head. The wind of multiplicity needs to be tempered. A few types in one section carefully arranged with a maximum of space around it. The complete range in another section, and with a maximum of variety. The customer *studies* his types to learn the meaning and general working of them. After that he goes on to *consult* the complete repertory as he might consult a dictionary. Do what you will, the two jobs cannot be combined without an appalling loss of efficiency.

But the inferiority complex is the one thing that simply has to go. It is true in all shopkeeping that the customer is always right. But in the electricity shop the customer is a veritable Lazarus, a pauper in the house of a king. Twentieth-century England is still living in houses invented, if not actually built, in the pre-electric era. Remember, the majority of people in this country live in houses or flats or lodgings of which they thoroughly disapprove, and the furniture with which they are surrounded is always giving them away to the people they ask in. Electricity is going to do away with this. It is the thin end of the wedge, the harbinger of twentieth-century abundance. The maker of the first horseless carriage must have had an awkward moment when he first realized that there was no horse in front of his carriage. Electricity is having such a moment. Give us a few showrooms worthy of the name, and the moment will quickly pass.

CHRISTIAN BARMAN





Distribution and Distribution Today

THE value of the Grid to the community, as the first British prototype both of national replanning and planning well in advance of existing needs, depends on the progress made between now and 1943 in other fields of national re-equipment. There is the reorganization and expansion of industry and agriculture, the overdue electrification of the main-line railways (more particularly and immediately of the large suburban systems that still work by steam), and the urban redevelopment and rehousing that will result from the national campaign of slum clearance.

The final and most important phase in the Board's operations must lie, therefore, in the stimulation of electricity demand. We have already given the general economic perspective necessary for assessment of the national transmission system as a factor in the economic revolution which is now on us. We can now examine rapidly the possibilities before the Board of stimulating electricity demand, and, at the same time, furthering the industrial and general economic prosperity of the country.

The national transmission system plays a part already in the electrification of industry, the planning and the location of new industries, and the development of power resources which would have been impossible without it. Through co-operation with the supply undertakings, the Board has made a survey of all power plant in the country, and has been instrumental in accelerating the conversion of uneconomic private installation to the public system in a whole series of industries, such as automobile construction, rubber manufacture, artificial silk, textiles, iron and steel and cement, and with this conversion has been instrumental in widening and deepening the process of electrification within the factories themselves.

All this has meant a very considerable labour of assessment and costing on a scale hitherto not attempted by the supply industry, and it has already facilitated the close association between the board and industry, which will in future be one of the most valuable features of the national power scheme.

When the Act was passed in 1926, the criticism was made that it would be difficult for the Central Board to tap the sources of low cost energy which were available in the form of waste heat from the basic industries of the country, but the Board has probably had this element in front of it for some time. A great power area like the Mersey estuary, with its soap making and chemical industries, has already at its disposal reserves of low cost energy which, if transmitted into the national system, would provide the basis for new industries requiring energy at a minimum price and would only have been available in centres with abundant and easily developed water power resources. Hitherto, products of such industries have been almost entirely imported into this country. Similar possibilities exist in the West of Scotland and South Wales, and they are being examined. The Grid has made it possible in certain places for new industries to be established on an economic foundation as far as power requirements go. The new iron and steel installation at Corby, in Northampton, one of the most important of its kind, is receiving its energy from the Grid.

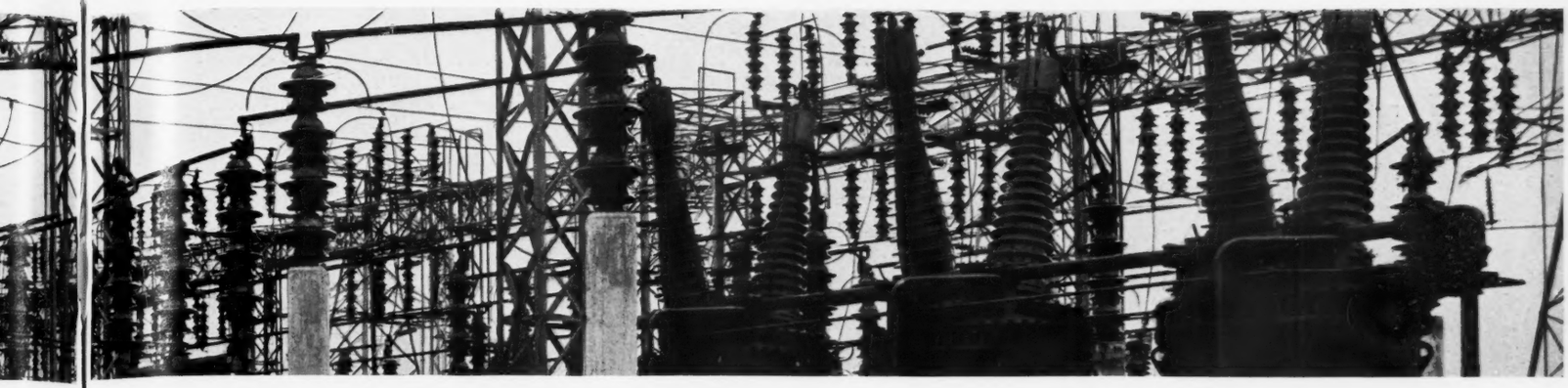
Such a work of conversion has been carried out without difficulty, and it already foreshadows a time when industrialists in this country will consider the location of new factories in conjunction with the Board, just as the Southern Railway, for example, in planning out its main-line electrification scheme to Brighton and Worthing, and presumably later to Hastings, has examined in close association with the Board's engineers

Distribution Today

CLASSIFICATION OF UNDERTAKINGS BY POPULATION.	NUMBER OF UNDERTAKINGS.	TOTAL POPULATION.	TOTAL AREA OF SUPPLY (ACRES)	TOTAL UNITS SOLD FOR PRIVATE LIGHTING AND DOMESTIC PURPOSES.	TOTAL MILEAGE OF STEEETS CABLED FOR ALL DOMESTIC PURPOSES.	TOTAL MILEAGE NOT CABLED.	UNITS SOLD PER MILE OF STREET CABLED.	POPULATION PER MILE OF STREETS.
A. 400,001 and above	6	4,389,781	291,579	393,548,242	3,037	1,539	129,585	959
B. 250,001 to 400,000	5	1,607,252	200,510	96,491,389	1,245	297	77,503	1,042
C. 200,001 to 250,000	4	922,872	438,703	78,896,363	503	48	156,852	1,675
D. 150,001 to 200,000	7	1,196,319	194,302	93,042,286	998	250	93,229	959
E. 100,001 to 150,000	12	1,440,392	483,991	104,488,628	1,157	191	90,310	1,069
F. 75,001 to 100,000	18	1,604,492	454,777	240,624,225	1,612	351	149,271	817
G. 50,001 to 75,000	15	897,550	482,927	63,050,087	798	177	79,010	921
TOTALS (50,000 and upwards)	67	12,058,658	2,546,789	1,070,141,220	9,350	2,853	114,454	988

The significance of the table showing the provision for electrical domestic services in urban areas lies in the fact that for the first time a serious attempt has been made to estimate the effective range of electrical distribution. The census relates to 67 undertakings responsible for 27 per cent. of the population, 4·5 per cent. of the total area and about 40 per cent. of the units sold for private lighting and domestic purposes in Great Britain. The sample is, therefore, large enough to merit serious consideration.

The total mileage of streets cabled for all domestic purposes for all 67 undertakings is 9,350, equivalent to about 78 per cent. of the maximum possible. Among the very large undertakings with population over 400,000, the percentage is about 66, with population above 250,000, 81 per cent. ; above 200,000, 91 per cent. ; above 150,000, 80 per cent. ; above 100,000, 86 per cent. ; above 75,000, 82 per cent. ; and above 50,000, 82 per cent.



Switching Station

The Norton-on-Tees 132,000 volt switching station, which acts as a main load transferring centre in North-East England. On the left, incoming circuits are shown; carried across post-type insulators to busbars in the centre and thence to the towers for transmission out of the station. On the right are shown insulator bushings on circuit-breakers for the control of energy passing through. The Norton-on-Tees is one of the largest of its type in the world.

nd Demand

and accountants the cost of electrical energy and its effect on railway transport.

Despite the rapid increase in factory electrification (it is estimated that out of about 160,000 factories, more than 120,000 are already consuming electricity for some purpose or another) there is a considerable gap to be filled up and comparatively few factories are as completely electrified as technical and operating conditions would allow. Such electrification depends, of course, on an economic price for energy, but it also depends on a careful study of modern manufacturing processes, so that in a sense modernization of British industry is in turn conditional on the progress of electricity. It is still true that in the industrial sphere alone the possibilities of electricity are as great as in all other economic activities combined, the only exception being probably railway electrification.

In estimating the future of rural electrification in this country, it is necessary to devote some attention to the economic effect of the Agricultural Marketing Act. Under this act, the main agricultural products will be vested in the control of Marketing Boards, and to ensure the efficient operation of those Boards special import regulations have been devised, in some cases taking the form of tariffs and in others of quotas. In wheat, for example, which is under the control of the Board, a guaranteed price for every quarter delivered to the Board by the farmer is made, and this guaranteed price is considerably above the world price, and is such as to give the farmer a fairly high margin of profit. Similarly, the entire milk and bacon production of the country is vested in Boards, which will, through their operations, ensure almost a guaranteed price to the farmer, while similar Boards are being evolved for potatoes, eggs, the principal fruits, and will in time cover all the main agricultural products which constitute the real agricultural wealth of the country.

Agriculture, through the operations of this Act, has ceased to be a prey to speculation and to internecine competition. It is influenced by nature, but the greater provision for intensive research will strengthen the hand of the farmer even in this respect, and arable land in Britain, after a period, will have a much higher productive value than previously.

The organization of the industry on a national marketing basis must improve its earning capacity and raise the real value of its final assets. It is too early yet to define the consequences of such a change, but it is clear that agriculture must become much more prosperous, the value of real estate must go up, and the standard of investment, particularly in rural areas, must be definitely improved. Such improvement may lead to enormous speculation in land values and in time cause a boom which may be followed by all the characteristics of over-production and inability to market surpluses efficiently, but in the first years at least it must cause such a change in relative values of real estate that schemes devised at the moment by regional planners may prove to be mistaken in their fundamentals.

If such a development takes place, then it must bring with it a very rapid acceleration in rural electrification, because it will broaden the basis of income and of assessment on which the cost of electrical energy must lie. It will increase activity in the rural townships, accelerate industrialization, render it more profitable for a great population to live on the land, and spread the earning capacity of distribution systems over wider areas and larger sections of the population.

Distribution systems of the largest undertakings are less developed than others. This may be due to the fact that in five of the six undertakings examined, notably Birmingham, Edinburgh, Glasgow, Leeds, and Manchester, the Corporation owns a gas, as well as an electricity, undertaking, and has in this way made it difficult for complete distribution schemes to be carried out. Thus in Birmingham Corporation less than half of the streets are cabled for all domestic purposes ; in Manchester 359 miles out of a total of 765 are not cabled, and Birmingham and Manchester together are responsible for the very poor showing made by the large municipalities.

Glasgow has only 75 miles left uncabled, Leeds 95, and Sheffield 90, out of a total in each case of more than 600 miles.

A number of towns with populations of from 150,000 to 400,000 have cabled all their streets, notably Birkenhead, Derby, Hull, West Ham, Battersea Borough Council, and Hackney. In this category, the most unsatisfactory towns are Bolton, Preston, and Stoke-on-Trent. Stoke-on-Trent has less than one-third of the total mileage of streets cabled for all domestic purposes. Preston less than half and Bolton not much more than two-thirds.

In the lower categories, from 50,000 to 150,000, towns with all streets cabled for electricity are Bath, East Ham, Grimsby, Guildford, Hastings, Ilford, Leyton, Luton, Rochdale, South Shields, Wallasey, Walthamstow, Wolverhampton, Willesden, York, Hampstead, St. Marylebone, Shoreditch, Stepney, Stoke Newington, and Chelsea.

It is difficult to find in this list examples of serious lack of development ; the only undertaking of any importance being Watford, where out of 211 miles of streets, 90 still remain to be cabled, and the area supplied by the Egham and Staines Electricity Company, where only 85 miles out of a total of 285 have been cabled for electricity.

The units sold per mile of street cables show an extraordinary diversity, but they indicate that if the depth of penetration in all 67 undertakings had been the same as in category C, namely, undertakings with a population of 200-250,000, the increase in units sold would have been of the order of 40 per cent. ; if all streets had been cabled, of the order of 80 per cent., so that even allowing for the present very modest scale of development the 67 undertakings, taken together would require to increase their sales of electricity for lighting and domestic purposes by about 80 per cent. before the first part of development would have been reached.

It is important to determine how great would be the ultimate increase, since the units sold *per capita* in those undertakings for all domestic purposes was less than 120 units. A reasonable figure would be not less than 500 units. Consequently, the process of levelling up and of completing distribution systems would increase the sales of electricity for private and domestic purposes by about 100 per cent., and the process of intensive electrification by a further 100 per cent.

Coal Consumption for Electricity

Category.	Generation of Electricity (Units).	Coal Consumption (Tons).
Public Supply	12,248,224,000	10,174,294
Railway, Tramway and Non-Statutory Undertakings	1,407,421,000	
Private Industrial Plants	5,100,000,000	7,700,000
Hotels, Cinemas, etc. ..	800,000,000	360,000
Total	19,555,645,000	18,234,294

These statistics of coal consumption by industry are for the year 1932 ; they are based on the average output per generating station and are probably too low, but it is almost impossible to obtain an exact figure owing to the use of steam for process purposes, with electricity merely as a by-product. Thus the census of 1930 gives the consumption of coal for power purposes at 26,286,000 tons and of coke at 634,000 tons, but only a portion of this would go towards electricity generation. The capacity of electric generators, namely, 2,834,000 kilowatts, was about 34 per cent. of the capacity of all prime movers. The margin of error would be between 7,500,000 tons and 9,000,000 tons and the total consumption of coal would range from 18,000,000 tons to 19,500,000 tons. As the national consumption of coal for all purposes was 149,500,000 tons in 1932, the generation of electricity accounted, therefore, for about 13 per cent.

This process of conversion may take several years. It may require perhaps ten years before it can give spectacular results, but the Agricultural Marketing Act, combined with the previous De-rating Act, must cause a fundamental, and, on the whole, a welcome change in agricultural economy.

It may in time be necessary, therefore, for the Grid to be extended even more on the secondary side to meet the revival of activity in agriculture. In doing so the Grid will probably serve the purposes of various Marketing and Agricultural Boards. The Milk Marketing Board, when it is building factories to deal with surplus milk and raw material for a number of industrial products, or designing central creameries for the production of butter and cheese; the Pigs Marketing Board in arranging for additional curing factories; and the Wheat Marketing Board in determining also the supplies for new milling concerns, can use the secondary system of the Grid, or, if necessary, its main transmission system with its allied distribution lines, in order to obtain the necessary electrical energy. They are not confined, therefore, to centres of population or to existing centres of industrial activity. The creameries, the factories, and the mills can be placed in the vicinity of agricultural supplies, and if this is done the effect on rural townships must be very great indeed.

Again, afforestation, if carried out on a large basis, particularly in Scotland and in Wales, may in time lead to the development of new industrial activities to deal with the crop of fully matured trees cut every year after the initial period of growth has terminated. The restricted range of operations of the Forestry Commission has not made afforestation an important factor in the development of economic resources, but the next great phase in agricultural development lies undoubtedly in afforestation. It is still too early to give any estimate of what the power situation will be in this country when the large scale developments in this connection are matured.

A third possibility of advance, in addition to industry and rural electrification, lies undoubtedly in slum clearance. Building, especially for the middle classes, has developed to an extraordinary degree since the War, so much so that saturation point may be reached in a few years' time, and the increase in value of agricultural land may bring closer the moment of saturation, so that there is probably little real possibility of active expansion in this direction for ten years, when the first houses built after the War begin to be uneconomic and are replaced by new and efficient types of dwelling.

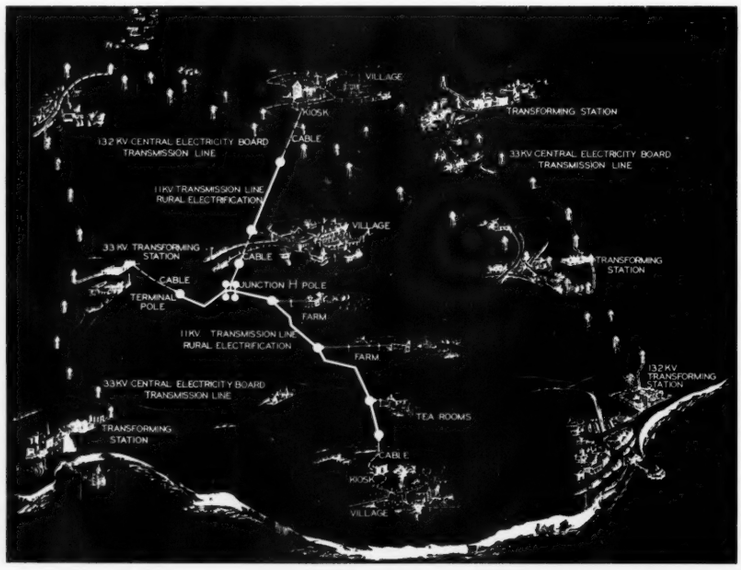
In slum clearance, however, lies the greatest single possibility of expansion in the building industry. The Minister of Health requested from all local authorities details of complete clearance schemes to be completed within five years from the end of September, 1933, and it is clear from the details already submitted that activity in building and housing is likely to be as great in the period 1934 to 1939 as it has been in the period 1919 to 1930.

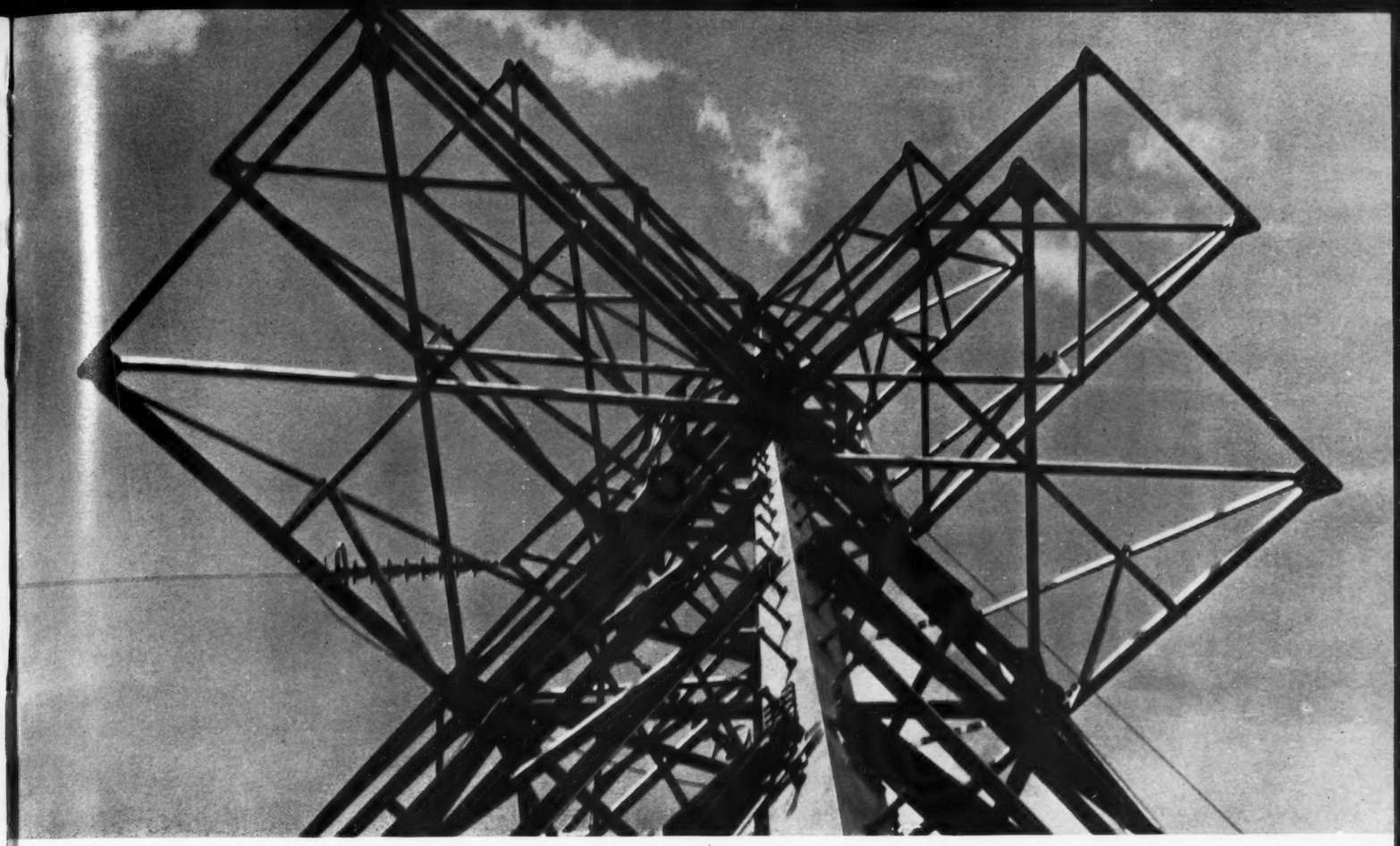
The electricity supply industry, through its organization on a wholesale basis and its distribution networks, can deal effectively and at an extremely low cost with complete all-electric housing schemes. It has the experience of similar schemes in other countries, such as the slum clearance schemes in Frankfurt, Bremen and Berlin in Germany, in Amsterdam in Holland, and in Vienna in Austria, to guide it. The electricity supply industry, if it treats the slum clearance proposals on a five years' plan and evolves low prices and low charges to meet the peculiar conditions governing costs and maintenance in the slum clearance schemes, has before it the possibility of securing a demand for electricity which cannot fall far short in this item alone of between 1,500 and 2,000 million units a year. Co-operation between the Central Electricity Board, public supply undertakings, and local authorities would ensure that in the new slum clearance schemes, Great Britain could set an example of independent and enterprising social achievement unparalleled elsewhere in the world.

The third phase of the Grid will be the most interesting and in some ways the most difficult of all, because it means the translation into practice of conceptions of national planning and national service which have been ventilated only by idealists and by men of vision. The desire for electricity is already so widespread that public opinion is in advance of the capacity of the industry to meet it, and the existence of this demand has ensured that even during a period of strong depression, the production of electricity in this country alone of the great countries of the world should have gone up without interruption since 1930.

R. B. MACFARLANE

The map illustrates the transmission and distribution of electricity from the Grid's primary sub-station to the consumer. The Grid lines run from the transforming station in which the current is stepped up from the generation voltage to 132,000 volts, at which pressure it is transmitted across the country to secondary transforming stations which reduce the pressure to 33,000 volts, a voltage suitable for the larger supply undertakings. The Board's secondary lines, whose main purpose was to open up undeveloped rural areas, operate at 33,000 volts and take their supplies from these secondary transforming stations. These lines can then be tapped to give supplies at 11,000 volts to any authorized distributor in the area, and he distributes the electricity from that Grid point right up to near the consumer, where it is finally reduced to the required voltage, generally about 220 volts for domestic purposes.



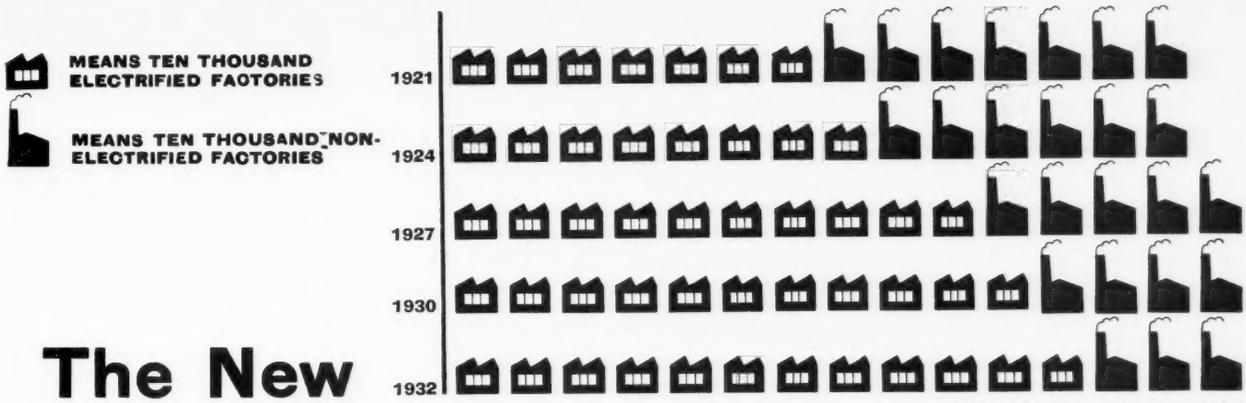


Forget six counties overhung with smoke,
Forget the snorting steam and piston stroke,
Forget the spreading of the hideous town;
Think rather of the pack-horse on the down,
And dream of London, small, and white, and clean,
The clear Thames bordered by its gardens green . . .

When William Morris wrote those lines in "The Earthly Paradise" he felt that only by turning back to the past could civilized amenities be preserved. That industry could ever be made orderly and clean and civilized never occurred to him; and perhaps in the days when Victorian individualism was unchained and raging any idea of tidying up industry may have seemed as hopeless as trying to make a country gentleman out of a Caliban. If William Morris had lived in these disillusioned times instead of in a period when industrial prosperity seemed so safe, so certain and so assured of progressive expansion, his conviction that mechanical production was wholly evil might have empowered him to start a really vigorous movement for its abolition. Living when he did, he only founded an escapist cult which has comforted a large number of nervous and ineffectual people ever since. In order to "forget six counties overhung with smoke" you went to the Cotswolds and did weaving or poker-work or practised some other handicraft suitably divorced from your own century. That English counties would cease to be overhung with smoke because of improved industrial technique, that new forms of power and new methods of conveying it to industrial plant would dispel the canopy of fumes that weakens English sunlight, simply did not occur to Morris and his innumerable disciples. Back to the land, back to the hand, they cried, and let machinery go to the Devil in its own smelly, smoky way; and upon these reactionary beliefs the escapists have been nourished for half a century.

It is perhaps only natural that these mild, artistic machine-breakers should be so violent about the steel towers that bear the power cables of the Grid. They only see a fresh conquest of machinery: they only see a ridge a little dwarfed by these marching shapes of slender metal or a quiet valley invaded by their purposeful lines. They cannot see the hills and valleys those towers and cables are saving from the defilement of smoke where industry may advance; they cannot see the possibility of a cleaner land where industry has already conquered the countryside, reasserting its colours as smoke is withdrawn and untainted sunlight returns.

A modern critic of architecture once wrote: "Those who abuse the cable-bearing trestles that stride over our hills and valleys might occasionally recollect their mission, which is to bring nearer an age of abundant power, in which the fuming factory chimney will become an archaic absurdity, and industry may regain its old prosperous levels and even surpass them, so that money can be found for the ultimate removal of the trestles and a decent burial for the cables . . ."



Electrification of industrial purposes is rapidly progressing, as may be seen from the above diagram. It may be said that every new factory built is nowadays automatically all-electric. It must be remembered, however, that there are still 30,000 old factories that do not use electricity even for lighting.

The New Industrial Plan

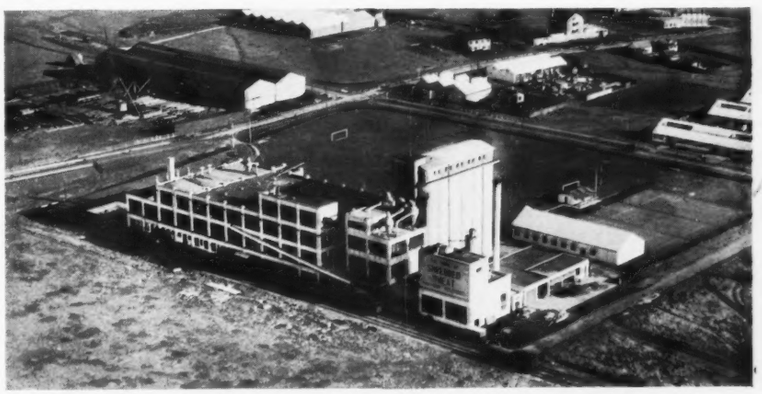
POWER dominates industrial location. Because this is so, the grouping of industrial development in Great Britain is being transformed by the construction of the National Grid. The degree of electrification of power machinery in most industries has reached very high figures, the necessity for adequate standards of lighting has made electricity supply essential, and new types of small industry have developed, depending upon electric motive power. The influence of the new power facilities and of these tendencies must bring about a certain release, a release from over-congested industrialism and unbalanced development of economic activity.

A primary objective of the national supply network is to enable a proper degree of decentralization of industry to be obtained through making cheap power available in all parts of the country. This spread of available power is encouraging the growth of rural industries and giving to relatively undeveloped provincial regions a higher economic status.

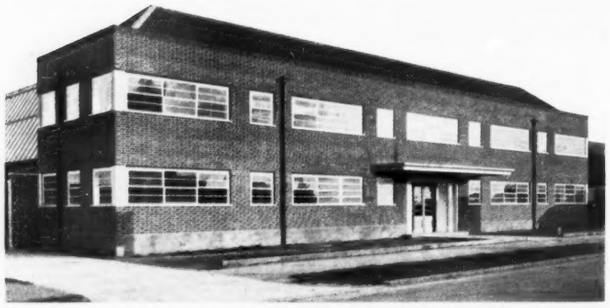
The nature of the change coming into operation, through the completion of the national power network, is therefore fundamental. Regional and local development can be planned in the knowledge that power supplies are available, rural industries will expand, and the growth of combined agricultural industrial plants which must be located in the country will increase. This type of production unit is represented by a well-known jam making firm in the Midlands, which operates fruit farms and large vegetable growing areas over 6,000 acres in parallel with a jam making and canning factory and a vegetable canning factory. This recent form of enterprise, the factory farm, will develop in rural districts, covering a wide range of agricultural produce, having its machinery driven by electric power available in ample quantity. This Midland factory is almost completely electrified, current being supplied by an electricity company, wholly dependent on the Grid.

This specific instance illustrates the importance of the Grid in its function of transforming agriculture into a finishing industry, through an extension of processes from raw food growing to food transformation into new products for consumption. This transformation of the agricultural function is efficient in that it cuts down waste to a minimum, and economically important in that it strengthens and extends the importance of the primary producer. In some instances, the conversion of the raw material into finished product, e.g., canning, is carried out by a separate company, which contracts in advance with the grower for his output, guaranteeing him a certain stability of demand.

An equally valuable effect of the Grid is the development of rurally located industries which is taking place in different parts of the country. At Asham in Sussex a new cement plant has been established at the foot of the Downs, on the site of its raw materials, and obtains its power supply from the Grid lines which run from east to west past this point. In this instance, a site had chalk and lime raw material undeveloped, it had adequate road and rail transport, but no productive development was possible until the power lines arrived. The local advantages of a large producing plant, apart from employment and taxation values, lie in the fact that its annual consumption of electricity (in this instance $2\frac{1}{2}$ million units) provides a valuable base load on which the local supply company is enabled



The illustrations to this article show various uses to which electricity has been already adapted in England. THE FOOD FACTORY. The Shredded Wheat Factory at Welwyn Garden City, Hertfordshire. Architects: A. W. Kenyon and L. de Soissons; is situated in the factory belt of a planned town. For Welwyn, a factory belt has no terrors, since the absence of smoke gives an industrial building the chance of being a feature of the landscape.



THE WIRELESS FACTORY. The Murphy Radio Factory in the factory belt at Welwyn Garden City. A. W. Kenyon and L. de Soissons, architects.

to build up rural electrification development of a scattered village area at a moderate cost to the consumer.

Similar developments have taken place in other parts of the countryside. In Lincolnshire a new cement plant has been set up near Boston, drawing its electricity supply from the Grid. In Wigtownshire, a district recently electrified by the Grid, the Bladnoch creamery is using electric power for its operation. In the Aylesbury rural district a producer of poultry appliances operates a plant using electric welding as well as electric power transmission for machinery. In this instance, the producer not only makes poultry appliances, but electric poultry appliances which are being applied to poultry raising in the Aylesbury District and in other areas of electric supply in the country. An important poultry raising establishment in the district is almost entirely electrified, using electric power for constructing its own chicken houses, and using electric incubators and hovers for raising the poultry.

The problem of rural electrification is not one of purely electrifying farming processes, farmhouses and villages, but of enabling the natural resources of the region to be more effectively developed by cheap and flexible power.

It is not easy to define the term "rural industry"; but we may include all those industries engaged in excavating and treating local products, those serving local needs and those engaged in crafts which have local establishment and traditions. In one group are sawmills and woodworking, production of clay, slate, stone and lime, brick-making, tile and pipe making, cement production, paper making and printing, food industries (milling and baking), drink industries (malting, etc.), boot and shoe making, small workshops occupied in marine, motor and locomotive engineering, and in some instances tanning, wool production and small metal trades. In the definitely craftsman type of industries are such occupations as wheelwrights, bowl turners, cabinet makers, potters, blacksmiths and rural textile makers, which form an important economic group, not only because they are in the aggregate valuable power users, but because they represent a traditional local culture and produce quality articles. It is estimated that of the existing local industries about 60 per cent. are electrified, and this proportion is increasing as new factories move out into rural areas.

The restoration of craft industries is being actively fostered by the Rural Industries Bureau, which advises rural craftsmen on machinery questions and on choice of raw material, supplies practical demonstrations and instruction in the local man's workshop and supplies designs at printing cost. Craft industries, such as bowl turning and cabinet making, are users of machinery, which can be operated flexibly by the electric motor as a form of motive power.

Reconstruction of economic life in rural regions depends largely upon agricultural policy, and the foundations are being laid today for building up a strong British agricultural body in the future. The setting up of the Pig Marketing and Milk Marketing Boards marks a new orientation in the planning and control of agricultural industry, and in the broad movement towards greater economic strength the increasing mechanization and electrification of farming processes is playing an important part.

The degree of electrification of the various branches of farming differs widely at present. Such branches as dairy farming, poultry farming and mixed farming have been electrified to a higher degree than arable farming, fruit farming and market gardening, because the applications of electric power have been more numerous and have proved themselves most efficient in obtaining improved results.

The townsman often forgets that agriculture is an industry, that it is cultivation and production, and agriculture is becoming more like other productive industries in its degree of power utilization. The modern dairy farmer controls a fully electrified unit, in which all operations are carried out by electric motors; the modern poultry farm owes its increased efficiency to the widespread use of electric light and electrical equipment, and the routine operations of the mixed farm, such as grinding, pumping, sawing, and rootcutting, etc., are becoming to an increasing degree electric power operations. In arable farming electrification is not so highly developed; but it is notable that over the period 1925–1931 the number of electric motors in use on farms in England and Wales increased by 210 per cent.

During 1932 electricity supply was made available to an additional 1¼ million inhabitants of rural areas, and the potential development is still enormous. At present not more than 5,000 farms are electrified in Great Britain out of a total number of 418,000, a proportion of 1.2 per cent., which compares unfavourably with 11.1 per cent. in U.S.A. In the past the farm load has remained undeveloped largely owing to the relatively high development costs and to the prospects of moderate returns in the initial stages of the work. However, the construction of the Central Electricity Board's main and secondary transmission lines has created new and more favourable conditions under which progressive supply companies can undertake exploitation of the farming load. In the experimental rural areas of the Corporations of Bedford and Norwich, electrification of purely rural communities has shown that long period planning, coupled with modern commercial methods, can be successfully applied.

The work of advanced electricity supply authorities, such as the Corporations of Chester, Aylesbury and Preston, the Yorkshire Electric Power Company, the Midland Electric Supply Company, and the Shropshire, Worcestershire and Staffordshire Electric Power Company, has established the fact that the farming community is generally alive to the value of electrification as a means of operating farm processes more efficiently, and that future development depends almost entirely upon cheap prices and adequate facilities. Of particular interest is the high value of the domestic demand in rural areas. On many farms domestic consumption of electricity is higher than purely agricultural consumption. This is significant because it implies the reduction of drudgery in the farmstead, and with that, the raising of standards of cleanliness and general household efficiency, and the increase of leisure hours, i.e., a social change in the farming community. For example, in the rural area of the Chester Corporation, nearly every one of the 300 farms connected has an electric kettle and an electric iron, and over one-third of these farms are using electric cookers.

It is evident that an economic change is taking place in the conduct of farming processes; a change which will become more intensified as farming becomes a more closely integrated industry.

THE CEMENT FACTORY. At Asham, Sussex, the output of cement has been doubled to 140,000 tons. The illustration shows the extensions now in progress.

In the process of reconstructing rural activity the farm of the future will constitute an important section of the power using community.

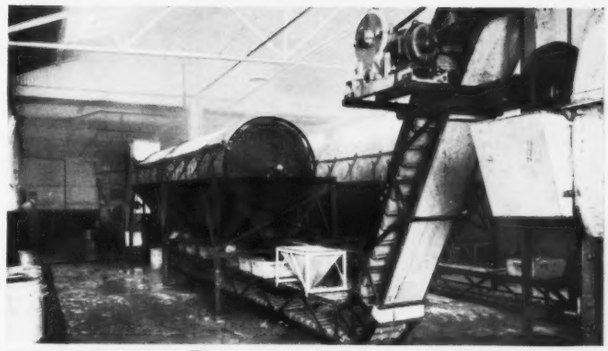
The growth of the industrial application of electric power is illustrated by the statistics of the Census of Production in 1924 and in 1930. During this period the proportion of capacity of electric motors to total capacity of all power equipment rose from 51.3 per cent, to 62.4 per cent., and the rapidity of electrification since 1930 is far in advance of the rate of growth over this six-year period. Of special significance is the figure showing the capacity of electric motors driven by electricity purchased from public supply. This increased by 53.8 per cent. from 1924 to 1930, compared with the figure of 27.2 per cent. for the increase in capacity of motors driven by electricity generated by private plant. One of the many disadvantages of the manufacturer generating his own electric power lies in his difficulty in gauging accurately what increases in power capacity are needed to deal with the probable output during the forthcoming year. The producer using the public supply is not faced with any problem of this kind, and it is evident that the important industrial growth in South-East England has been made possible largely through the ability of the public supply authorities to offer electricity supply at prices sufficiently low to make the construction of private generating plant unnecessary. Industrial electrification is now about 70 per cent. of total power capacity and the process is being accelerated by the rapid growth of moderate size production units which rely entirely upon electrically-driven machinery.

Considering recent industrial development in Great Britain during 1932, the Board of Trade shows that 646 new factories have been erected and 166 factories extended, employing about 45,000 men, while 355 have been closed down. Most of the new factories are electrically driven. An important transfer process is taking place from within London to its outer belt, particularly on the west and north-west outskirts, while there is very little evidence of any drift of industry from the north of England to the south, although population has moved southwards. There is still a strong tendency for new undertakings producing a certain class of goods to set up in areas in which local production of the same class of goods is highly developed.

In 1932 there were 51 instances of transfers from one district to another, but 80 per cent. of these transfers took place within the same regions, using the term region to denote a broad geographical area, such as Eastern Counties, London, the Midlands, etc. Half of these transfers took place within the London region, and all of these transfers, except one, were from within London to its outlying areas. The development of factory areas in the outer fringes of London has tended to group along the main traffic arteries, such as the Great West Road, where cheap electric power, good transport facilities and adequate labour are available close to the great London market for the chief types of product which are mainly consumers' goods, some luxuries and some on the luxury borderline. The distribution of the new factories is given in the Table printed below.

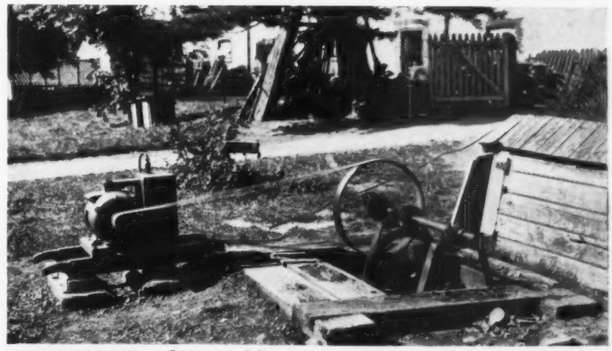
About 15 per cent. of these new factories, employing nearly 6,000 men, are located in predominantly rural counties across the southern area of England. The large proportion of the new factories which have been set up within the Greater London area is noticeable, amounting to 40 per cent. The proportion in the south-east of England is over 50 per cent., and the Midlands and Lancashire account for about 20 per cent. each. In the trade groups the industries showing the greatest number of new factories are clothing, textiles, engineering, timber, iron and steel, and food, drink and tobacco. In the instance of textiles, however, there were 122 factories closed down, compared with 108 new factories set up, so that a change in the character of textile product is evident.

The tendency has been for leather goods, hotel requirements and pharmaceutical products to be established in the south of England, mainly near London. Clothing factories have also concentrated in Lancashire, boots and shoes in the Midlands, hats in Luton, gloves in Wellingborough and the west of England, canning in Kent and Eastern Counties, cotton weaving in Lancashire, hosiery in Leicester, London and Lancashire, cutlery at Sheffield and in the Midlands,



THE JAM FACTORY. The pea canning process at Messrs. Chivers & Son's factory, Histon, Cambridge. Fruit and vegetables are kept, as far as possible, from contact with human hands.

THE FARM. Grinders and sifters worked by electricity on a farm in the north-east coast area. Electric plant installed without affecting the existing structure.

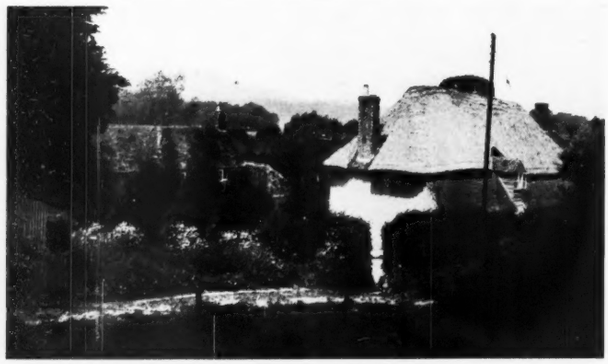


WATER POWER. A portable motor-driven water pump on a farm at Pavenham, Bedfordshire. Hitherto the pump was worked by a horse.

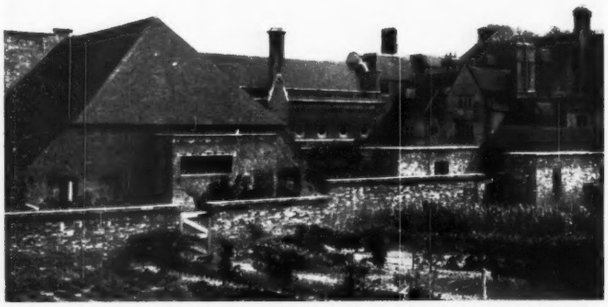
Location of new factories built 1932

District	New factories	Employees
Mainly rural counties :		
West of England	26	1,850
Bucks., Berks., and Oxon ..	26	1,100
Bedford and Hertfordshire ..	18	1,100
East Anglia	13	600
Kent and Sussex	10	1,150
	93	5,800
London	251	16,900
Midland Counties	107	8,750
South Essex	13	600
Lancashire and West Cheshire ..	115	9,300
Yorkshire	36	1,900
North-East Coast	11	400
Scotland..	20	1,400
Total	**646**	**45,050**

DISTRIBUTION. **A 20,000 volt line and pole transformer supplying electricity to farms in Northumberland.**



THE VILLAGE. **Litlington, Sussex, has all its cottages electrified, and the cables do not detract from its rural detachment.**



THE THEATRE. **A private all-electric opera house at Glynde, Sussex. Its seventy spot lights are controlled by one man. At Drury Lane Theatre there are only seven spot lights.**

while furniture, clothing, pottery, glass, paper, printing and stationery and miscellaneous products are widely spread over the country.

It is apparent that traditional manufacturing centres retain their grip on certain industries, and London as a great market attracts consumers' goods to her borders, but that there has been a very wide spread of industrial effort geographically as well as in product classes. This wide spread, and the character of the various new industries, indicates that the general availability of electric power has already exercised some influence in freeing new industries from any restricted establishment at definite points. If we search for a conscious planning of productive effort by an industry or planning of industrial location, we shall not find anything of this kind yet, apart from the two planned towns of Letchworth and Welwyn Garden City, which have taken a moderate share of new enterprise, and with the possible exception of Slough and Trafford Park, which come near to being planned industrial centres. Some twenty new factories have been established at Slough, four at Letchworth and four at Welwyn Garden City. The rapid industrialization of the area on the north bank of the Thames to the east of London is notable. Barking has six new factories, West Ham three, Southend three and Dagenham five extensions.

Of particular interest are the developments in East Anglia, an area of small industrial power. Here thirteen new factories have been established and five factories have been extended. Six new factories are canning establishments at a number of small population centres: Banham, Bardney, Ely, Hoveton St. John, North Walsham and Woodbridge. The industries of wood-turning at Brandon, and chip basket making at Wisbech, are interesting examples of a revival of craft industries.

In other mainly rural counties are to be found a number of new production centres, such as metal tinsel works at Hemel Hempstead, toys at Radlett, fruit canning at Tenbury Wells and Maidstone, electric bells at Aylesbury, rubber tyres at Melksham, bacon curing at Calne, and wooden boxes at Penzance. The diversity of place and product is considerable, and while most of these represent small plants employing between 20 and 200 people, they are contributing to the beginnings of better regional economic balance.

While south-east England has shown the greatest industrial expansion of any region, there may be a balancing-out process in the future, based upon the national power network. Accepting electrical power from a public supply system as an essential of new industrial undertakings, we may see other regions, such as north-east England and South Wales, becoming more and more independent of the products which they obtain from the south-east or from abroad. The Grid, in assisting the development of rural areas in these regions and in attracting new industries to them, will have the effect of developing more self-contained types of economic region, in which a renaissant, power-using agricultural community will play a strong part. This trend will be helped by the creation of more uniform costs of electricity supply throughout the country. In the future we may witness some co-ordinated form of regional planning in Great Britain, by which time a degree of industrial integration and control will be accomplished to develop the economic resources of each region intelligently. At present, the lack of co-ordination in industry—and between industry and other bodies—and the lack of a sense of the need for planning, are strong defects. Regional planning as so far practised in Great Britain has been aptly described as "prohibitive rather than constructive," and many planning men seem to have lacked a definite economic sense. Suggestions for preserving open spaces and for factory or commercial and residential reservation, while important, need to be completed by indications of the action to be taken by local authorities in collaboration with industrialists and agriculturalists to develop their areas in the most efficient manner. A real difficulty in planning, as at present practised, appears to be that most regions surveyed are too small to form balanced economic markets or major administrative units, and that small areas of local authorities are often controlled by people with a parochial outlook, who lack a community sense which can be applied beyond these areas. Further, it appears that closer contact with industrial bodies is needed in studying the economic potentialities of a region. Unfortunately, industries in general are not sufficiently integrated or organized to be able to discuss such matters as proper regional development, and new producers seldom study the problem of location of plant scientifically. It is evident that greater co-operation is needed among all parties interested, in order to formulate regional plans for constructive economic purpose as well as for amenity protection. The rapid growth of transport and electric power make this urgent, for one of the chief functions of the electrical power network is to make the task of planning feasible; it is an essential instrument. At present it can be seen to be making possible a decentralization of industries, more balanced regional industrial development, revival of activity in rural communities and districts, the greater industrialization of agriculture and the establishment of new factories to serve the needs of the population in the new areas of the power network. These are important effects. Economic planning has taken one important step nearer its goal in the construction of the national Grid.

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TOWARDS THE NEW HOUSING

THE present generation is deeply concerned about the rehousing of the workers, a task in which electricity will inevitably have to do its share. It is true that many women have succeeded in abolishing the grim kitchens and houses of the last century. Nevertheless it must be remembered that those same houses have not disappeared from our towns. Substandard and insanitary as they are according to our modern sense of decency, they are still used, divided and subdivided by innumerable poverty stricken families, who pass from one tenement to another, leaving the accumulated dirt of despair behind them. Not only have they to tackle, in most cases, the difficulty of running a multiple tenement on single family conveniences, but thousands of families live, sleep and do their work in those very basement kitchens under conditions which would be legally impossible in any public workshop or factory. In St. Pancras, the worst London borough in this respect, no less than 81·6 per cent. of the families share a single dwelling—the average per house for the area being more than two families.

One must get down to reality, therefore, and find a means of providing houses on the spot for the poorest class, so far scarcely touched by building schemes. One can leave the provision of higher rental houses, i.e., 10s. per week and over—very safely in the hands of private enterprise. It is this poorest class which has, until now, been neglected as an impossible proposition and they must be dealt with immediately and on a national scale. Architects, engineers, builders, municipal and parliamentary authorities must "get together" on the vital question of reducing the cost of erection in every way possible, thus lessening the gap between expense of production and what the tenant can pay. So far this has not been done, as the units of reconstruction have been too small.

There are two facets to this question :—

(i) Directed to the tenant.

(ii) To the community at large.

In all proposed economies the tenant must be borne in mind. It is useless to put a slum-dweller, as some building authorities do, into a shoddily constructed tenement, inferior in every way to present standards of household efficiency, and expect the houses to be anything but slums before many years pass. It is ridiculous to construct any new building on an ancient pattern or with shabby material. There are multitudes of existing houses in this state, worn out by waves of retreating gentility ; one should aim rather at reinforcement of the normal dwelling and avoidance of anything conducive of dirt and neglect, the elements of slumdom.

When it comes down to the actual buildings, large-scale operation can effect great economies in materials, fitments and installations of apparatus characteristic of modern life. During the past year of anti-slum campaigns the idea of a national housing board has been mooted in several quarters and one of the first considerations of such a body when it comes into existence, or, failing it, of groups of manufacturers themselves, should be the mass production of all articles and fitments common to flats. This would result in enormous economies, and a much higher standard of workmanship and product would be forthcoming. It is the rational outcome of present-day manufacturing practice and it would be in their own interest for manufacturers to look to this question.

Now in England it is possible to get electricity in most large towns, where working class flats are a necessity, at a price that is definitely economic—i.e., at ½d. per unit. Beyond 1d. it would be to the disadvantage of the tenant. To allow electricity to fulfil its true function, however, in the welfare of the community, all electrical manufacturers and undertakers must bring down their costs into line with their more advanced and far-sighted colleagues. As a consequence of increased electrification of working-class dwellings the whole country will benefit ; prices will fall as the load of the country increases and full use is made of the power at its disposal. From this it will be clear that it is to the advantage of both electricity authorities and their consumers to encourage complete domestic electrification of every new slum clearance scheme that comes along. It goes without saying that the lighting in these new schemes will be electric. This means added capacity to the generating stations and deeper troughs to fill in the graph of their daily operation ; and these troughs can be filled by domestic consumption, which is rapidly becoming the "bread and

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(ii) To the community at large.

In all proposed economies the tenant must be borne in mind. It is useless to put a slum-dweller, as some building authorities do, into a shoddily constructed tenement, inferior in every way to present standards of household efficiency, and expect the houses to be anything but slums before many years pass. It is ridiculous to construct any new building on an ancient pattern or with shabby material. There are multitudes of existing houses in this state, worn out by waves of retreating gentility ; one should aim rather at reinforcement of the normal dwelling and avoidance of anything conducive of dirt and neglect, the elements of slumdom.

When it comes down to the actual buildings, large-scale operation can effect great economies in materials, fitments and installations of apparatus characteristic of modern life. During the past year of anti-slum campaigns the idea of a national housing board has been mooted in several quarters and one of the first considerations of such a body when it comes into existence, or, failing it, of groups of manufacturers themselves, should be the mass production of all articles and fitments common to flats. This would result in enormous economies, and a much higher standard of workmanship and product would be forthcoming. It is the rational outcome of present-day manufacturing practice and it would be in their own interest for manufacturers to look to this question.

Now in England it is possible to get electricity in most large towns, where working class flats are a necessity, at a price that is definitely economic—i.e., at ½d. per unit. Beyond 1d. it would be to the disadvantage of the tenant. To allow electricity to fulfil its true function, however, in the welfare of the community, all electrical manufacturers and undertakers must bring down their costs into line with their more advanced and far-sighted colleagues. As a consequence of increased electrification of working-class dwellings the whole country will benefit ; prices will fall as the load of the country increases and full use is made of the power at its disposal. From this it will be clear that it is to the advantage of both electricity authorities and their consumers to encourage complete domestic electrification of every new slum clearance scheme that comes along. It goes without saying that the lighting in these new schemes will be electric. This means added capacity to the generating stations and deeper troughs to fill in the graph of their daily operation ; and these troughs can be filled by domestic consumption, which is rapidly becoming the "bread and

Four hundred and forty-eight Electricity Undertakings in Great Britain supply consumers under the two-part tariff scheme. The scheme is based on a fixed charge, summer and winter, plus a low rate for the current consumed, varying from 3d. a unit to under 1d. The manner in which the fixed charge is assessed varies : here are ten different methods :—

1, Based on the rateable value of property, varying from 7½ per cent. to 25 per cent., 125 undertakings. 2, Area of house : (a) number of rooms, 69 ; (b) interior, (c) exterior, and (d) size generally, 81. 3, Wattage of lamps, 38. 4, Sliding scale, according to number of units concerned, 11. 5, Tariff according to daylight hours, 1. 6, Rental, 1. 7, Water rate, 1. 8, Acreage (rural), 1. 9, Contract system, 1. 10, One-tenth assessed rental, 1. There are about 118 other unstated methods.

Although the chart shows a high percentage of undertakings supplying current below 1d. a unit, this measurement is necessarily approximate, because under the two-part tariff system each individual case is affected by the method of assessment employed for the fixed charge basis. But the chart does permit the assumption that unreasonably high charges are becoming rarer. The apparently unreasonable variations in the cost of current in localities that adjoin damages the credibility of the statement that electricity is economical : the area with the higher tariff will never be convinced ; and the imposition of a standard low charge for the supply of lighting and power based on a nationally adopted method of assessment for fixed charges, instead of ten known and an incalculable number of unknown and obscure methods, must inevitably be followed by a vast increase in the number of consumers.

butter " of electricity undertakings. With more continual operation prices will fall for all purposes. Some electricity undertakings have already realized this and are quoting to the new blocks of buildings tariffs which are sufficiently low to be economic to the impoverished tenants ; and they find that these pay.

The electrification of working-class homes is no mere theory of social amelioration ; it is already being practised by the most astute boroughs and building trusts, with economic satisfaction in practically every case to the tenant, where electricity is supplied at an economic price. By economic price is meant the charges in force, for example, in the Borough of St. Pancras—3d. per unit for lighting and ½d. for all heating and cooking ; Bethnal Green, St. Marylebone, Southwark, Stepney, Barnes, the areas under the London and Home Counties Joint Electricity Authority and such provincial towns as Glasgow, Leicester, Nottingham, Sheffield, Doncaster, Kingston-on-Hull, Leeds, Birkenhead, Bolton, Burnley, Liverpool, Manchester, Cardiff and Swansea, all of which have a unit charge of ½d. for cooking and heating. But generally speaking, to the ordinary layman, electricity charges doubtless seem a chaotic mess. It is useless to discuss it with friends who live elsewhere in the country, for indubitably the system under which they are charged will have some different basis of computation. In this way it is immensely difficult to compare domestic charges for electricity, but it is essential that one should do so, for cost is the only real barrier to complete domestic electrification in the near future. It may be well to attempt an explanation of this protean tariff growth.

Electricity undertakings commonly offer a composite tariff to consumers who take a supply for other purposes than lighting. Generally this is called a two-part tariff because it is composed of a fixed charge—that is, a yearly sum which guarantees a definite income to the undertaking—and a small unit charge. This fixed charge may be based on the rateable value of the house, on its external or internal dimensions, on the total wattage of the lamps in the house, on the number of rooms, and so on. Rateable value is perhaps the most common nowadays but it probably involves more difficulty than any other, since the percentage of rateable value which is demanded may vary from 5 per cent. to 25 per cent. ; rates, too, vary—among towns taken at random, Blackpool pays 7s. 6d. in the £, Bermondsey 15s. 10d. ; town and borough councils likewise change and with them local taxation. Instability on this basis is, therefore, inevitable. Variation in the fixed charge is infinite, but it can be reduced to the fact that the electrical undertaking wants to be sure of getting so much each year from its consumers—a sum equivalent to the cost of the lighting in the area, for all lamps are lit during the same hours, and the undertaking must have sufficient energy in hand to satisfy those hours of need. The generating station cannot store electricity ; its capacity must equal all emergencies, and the fixed charge in the two-part tariff ensures that the cost of providing this capacity is paid.

Then there is the running charge. This is a very low sum, ¼d., ½d., ¾d., 1d. and so on up to 3d. in backward rural districts, which the householder must pay for each unit of electricity consumed. Most of the " power " used in houses is used at times other than those of the lighting or industrial peak loads. The diagrams on pages 160–161 of this issue show the incidence of the loads of lighting, cooking and industrial power and will explain graphically why it is advisable and economic for the undertaking to encourage the use of electrical appliances at times when there is a lull in their operation ; why, for instance, they encourage water heating in storage tanks during the night at a mere fraction of a penny per unit. Except for some nocturnal industry, such as printing or baking, their electrical capacity would scarcely be taxed during those hours. The more active the generating station throughout the twenty four hours the quicker will prices fall.

Variety in the hours of use of its consumers is an immense asset for an undertaking, since the load of one balances the load of another. This is one reason why urban undertakings can supply, and will always supply, electricity at a lower price than those in country areas, which depend almost entirely on domestic consumers. There is less justification, however, for divergence of price between towns of similar size, and the time has come when the fixed charge of all undertakings should be reduced to a comparable and comprehensive form. A diagram is given above showing roughly some of the combinative tariffs arrived at among the 600 odd undertakings in Great Britain and the urgent need for immediate clarification of their charges.

Few people consider it advisable now to buy the larger appliances which they use—in fact, some undertakings definitely prefer to hire them out as it gives them a certain amount of control over their customers. Most often it is the charge for the hiring of apparatus, including generally a small amount for the wiring installation, which proves to be the greatest stumbling block in dealing with poor housing. What is an adequate hiring charge for the basic domestic appliances—a cooker, iron, kettle, radiant heater, occasionally a washing machine—presents different problems to different undertakings. More and more they look upon these poor consumers as an investment to provide steadily growing load and less as a public to be milked over hire charges. The more progressive

The illustrations on this page are of blocks of flats on two of the most notable housing estates in London. Above, part of the St. Pancras House Improvement Society's property and below, Levita House on the L.C.C. Ossulton Housing Estate in Somers Town. On both these estates special attention has been paid to low charges for their working-class tenants for electrical apparatus. St. Pancras Housing Estate provides apparatus (including washing machine and water heater) for 2s., while the Ossulton Estate's charge works out at about 1s. 8d. with boiler included. Although these figures may not appear high in some people's opinion, if one considers that, in spite of a charge of only ½d. a unit, the electricity bill will run into from 1s. 6d. to 2s. 6d. a week, on top of rent at 13s. to 15s. a week, for a three-room flat, the total soon looks rather formidable. With the greater use of electricity, these figures will perhaps be lowered.

ones consider that it pays them to hire out apparatus at a cost which just covers their expenses.

The most notable housing schemes in London which have installed electricity for all purposes are to be found in the Borough of St. Pancras, where one may perhaps get a glimpse of the future configuration of a planned London. Here a vigorous benevolent society, the St. Pancras House Improvement Society, and the London County Council have commenced to build with a comprehensive plan, in view of turning the neighbourhood into a miniature garden estate. The Housing Society aims at rehousing exactly those inhabitants who are displaced by the demolitions, and their rents are, in consequence, fairly low. One, two, three and four-roomed tenements are available and 4s. 6d. per room is charged, with rebates for large families. Three blocks have already risen, dwarfing and emphasizing the meanness and misery of the small black houses upon which they are encroaching. Eventually, when demolition is complete, there will be a fair open space forming a garden in the centre with blocks of flats around. In one particular this Society goes beyond the others in vision; on the top of the St. Christopher flats a nursery school for the children of its tenants living on its three estates has been opened and when the adjoining block rises, its roof is to form a playground attached to the school. This is one of the sanest methods of preventing slum recurrence, for here the children are given the opportunity of developing naturally in cleanliness and beauty, instead of in the gutters and pavements or in homes where play is an impossibility. Social education depends on the breeding of good habits in early days, and those planning any reconstruction of London in blocks of flats would be well advised to consider the possibility of raising the playgrounds of the future tenants from the streets to the roofs.

After inspection of the adjacent L.C.C. estate, which was an electrical experiment, the Housing Society decided that from every point of view, electricity would be more economic and convenient for their own poorer tenants especially. They therefore fitted each flat with electric lighting, cooker, iron, copper, kettle, an electric radiator of the portable type and what is called a calorifer—an arrangement for heating water for both the bath and the sink. For the use of all these appliances the tenants pay 2s. per week and this covers maintenance and repair. This, in addition to the cost of electricity consumed, is too much to expect slum tenants to pay out of their meagre weekly wage. Another electricity experiment in Stepney provides the apparatus at about 2s. 6d. per week with a few pence more according to the size of the flat. This also is too high. More reasonable hire charges have been found possible in Wimbledon and Fulham and on the Ossulton L.C.C. Estate. The latter charges 1s. 4d. per week, Wimbledon charges less than 1s. per week for hire, and Fulham about 1s. 3d. (varying slightly according to size of flat and appliances used). Something below 1s. 6d per week is all that such tenants can pay for hire charge; other undertakings in London and big cities would do well to examine these figures, which have proved quite economical to the undertakings in question, for they must see clearly that high charges for wiring and apparatus is a poor policy, and that cheaper prices must, and can, be quoted for general electrification of slum areas. What one big city undertaking can do is possible for another.

Another question they must tackle at once is that of metering. The poverty rampant in the slums does not permit of many shillings-in-the-slot. Generally by the middle of the week there is none left, and if a variable coin meter is impracticable (although used certainly by gas companies) penny meters are best.

Close to the St. Pancras scheme illustrated here, there is, in Somers Town, another experiment in electricity, owned by the L.C.C. This is the most pleasing set of buildings put up by this body, built on the plan of a gigantic military cross, with spaces between which form playgrounds and can boast of trees. The rents here, as is customary in L.C.C. tenements, are a good deal higher than in the dwellings erected by private companies and would be far beyond the reach of the poorest sections of the population. The cost of electricity is, however, remarkably cheap, even less than in the St. Pancras Society's estate. The weekly charge for fitments is 1s. 4d. and the average cost of current seems to be in the region of 2s. or less per summer week and 3s. per winter week. The L.C.C. installed a central water heating plant, so that one must subtract from the tenants' weekly budget any expenditure on bath water, washing-up water or laundry water, as hot water can be drawn from the tank practically at boiling point. From the landlords' point of view this has proved a rather expensive arrangement, and it is perhaps better to allow tenants to pay for the hot water which they actually need. In both cases, the tenants are eminently satisfied with the arrangements and scarcely one uses the coal fire for cooking, as the electric cooker has proved much cheaper than coal and easier to handle.

Similar electric systems have been tried out in other parts of London, notably in Stepney Green, Fulham, Wimbledon, Willesden, Shoreditch and Paddington.

Hull has provided a good example of the potentialities of the small working-class house apart from slum clearance blocks. These are tenanted by families with an average income of £200. The enterprising electricity authority there realized that the additional capital outlay for cables would be easily covered by the increased consumption of electricity and greater diversity in the load of the undertaking.

To the tenants the arrangement is quite economic. They pay 15 per cent. on their £12-15 assessments and a unit charge of ½d. Seven lamps, a kitchen plug, a cooker and a wash-boiler constitute their electrical apparatus; of which the wash-boiler is purchased outright by the tenant and the cooker by the landlord. For this the tenant pays a small weekly sum along with the rent. The average weekly charge for the tenants works out at 1s. 8d.—giving an annual bill of £4 6s. 6d. for electricity, to

which must be added the hire charge for the cooker, namely, 12s. per year, giving a total of £4 18s. 6d. The undertaking finds it advisable, and economic, both for the tenants and themselves, to have a coal fire and boiler installed in each house, as this ensures a good load in the summer when fires are not in use and gives the tenant cheap and comfortable heating in the winter and plentiful hot water. This experiment has proved the value of the working-class market and further economies still could be made in block dwellings on account of wiring simplification.

When electric cooking appliances have been installed in rural slum clearances by enterprising companies, the same thing has resulted. New semi-detached cottages have been put up at Bidford-on-Avon, for instance, to house the poorest class of farm labourer, with wages at about 30s. a week, supplemented in the summer by the fruit and vegetable picking earnings of the woman of the house; other members of this colony had lived in miserable and appalling quarters in the town. In every case they found that electricity was cheap and, to them, peculiarly convenient owing to their matutinal habits of life.

While it is recognized that electricity can go far in reducing the ultimate cost of building in both upkeep to the landlord and weekly budgeting to the tenant of this class of house, it will be essential for electricity undertakings to co-operate with building authorities in their arrangements for installations and collection of payments. Close agreement between these two servants of the community is an absolute necessity. Whenever possible, the rent should be inclusive of the hire charge for electrical appliances and the cost of the wiring installation, since those are really characteristic and necessary fitments of any modern house, and there is no reason why the tenant should pay for them apart from the rent. One used not to pay separately for the coal range. It should be remembered too, that if the hire charge goes on indefinitely great reductions can be made. In most cases it is too high.

These are all serious considerations which must be gone into scientifically before the millions which are to be expended in the next ten years on slum clearance are spent; for, from the many pronouncements of those in authority the idea of slum clearance, as a national necessity, has gone beyond the point of platform oratory. It is absolutely essential that the instigators of these schemes should not spend their money in a blind or sentimental manner, since successful slum clearance depends rather on the close study and satisfaction of the actual needs of the people inhabiting them than on mere amassing of thousands of houses.

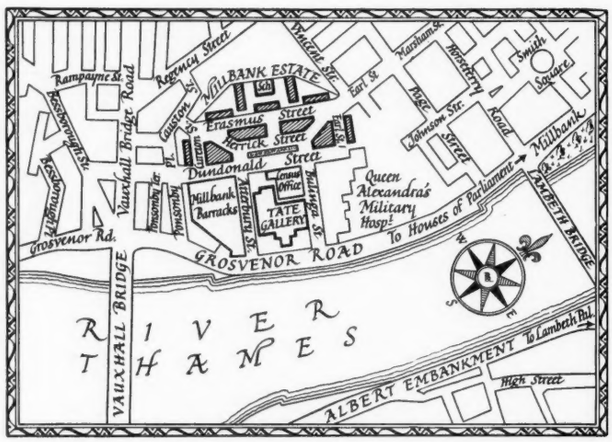
Late in July, for instance, it was announced by the Housing Committee of the L.C.C. that they proposed to tackle immediately and on a gigantic scale the problem of slum clearance in the East End; £35 million are to be spent in rehousing some 250,000 people, and the scheme is to be spread over ten years. Actually the L.C.C. will not be allocating much more than their average yearly housing sum for this scheme, but the attack is to be concentrated on the eastern boroughs of London, in particular Stepney, Bethnal Green and Shoreditch, where the intense overcrowding of both houses and people makes development difficult. "We propose to explore," says the Housing Committee, "every possible avenue, including the erection of high buildings, in order to make the best use of any sites which it may be possible to obtain." Buildings of at least five storeys almost go without saying in areas seriously cramped in two storeys. In those quarters the L.C.C. will have to face the fact of many non-economic tenants who, if they are to be displaced, must be considered and rehoused on the spot. In her recent report, the Medical Officer for Stepney pointed out, "Stepney has a large number of dock workers, either casual or regular, and it is most important that these men should be housed near their work." She suggested that if the L.C.C. undertook slum clearance on a large scale in Stepney "the danger would lie in the fact that the Council was not compelled to rehouse Stepney people only; some might be drafted to outer boroughs while other people were brought in." "Like residents of other districts, Stepney people like to remain in Stepney because of their old associations and upbringing." This is true of all the other boroughs concerned.

The normal L.C.C. rents are prohibitive for these people, and unless a low average rental, possibly even subsidised, is adhered to, the districts will quickly be deserted for neighbouring boroughs, earning for them in turn the reputation of being the most distressingly crowded and miserable in London.

Bearing in mind the general poverty of their future tenants and the fact that the houses they erect must not be temporary measures of alleviation but permanent homes, practically impossible to reduce to slums again, the L.C.C. and other bodies who are to be stirred into activity in the next decennium have a great opportunity to show their wisdom and capability in approaching the problem of slum cure and prevention. They have money and power to acquire large areas for development and can do everything on a big scale. They can consider leaving sufficient areas between the blocks to provide playing grounds for the children and "sitting" grounds for their parents—remembering that these boroughs have the least available open space of any London district; Shoreditch with 9 acres only per 100,000 people; Stepney with 19; Bethnal Green more fortunately with 92 and Poplar with 64, in comparison with the other two eastern boroughs, Greenwich and Woolwich, with 411 and 378 acres respectively—they can now afford plenty of air and sunlight, and remembering that the concentration of many families in blocks means further concentration of bad atmosphere due to smoke and quick deterioration of property, they must consider the cheapest, cleanest and most civilised method of lighting and heating, namely electricity.

The L.C.C. has experimented already on these lines in its Ossulton Estate, and the result is known to be satisfactory to the tenants. They have also the example of the St. Pancras Society before them, so that mistakes should be avoidable. To many it will seem ridiculous that tenants of slum property, raised in the misery and the filth of a one-roomed tenement, should be transferred to quarters that are decent according to every modern standard. This is, however, the only sensible and long-sighted thing to do. Once the slums are abolished they should not return; stories told of them should be relics of a barbarous age. No one with the best intentions can carry on for any length of time in overcrowded rooms lived in and slept in. Decent life in them is frankly impossible. All but a small group are intensely proud of their new homes and are anxious to do their part in keeping up the standards given them; and this they will do, unless unemployment or illness or casual labour steps in. Until relative security is given them in the form of a sure habitation—as a kind of public investment—the backsliding into fresh slums is inevitable. Good conditions make decent people, if not in one generation then in two.

For too long poverty has been blessed on earth, nurtured perhaps by the pious hope of many mansions in heaven; but few people have the intelligence or understanding yet to be materially poor without degradation. Housing, and good housing, then, is the immediate problem, the forerunner perhaps of a little leisure and of the more Epicurean and noble poverty. ***ISMAY GOLDIE***



For the first time on record in this country an electricity supply company is investing a considerable capital sum in wiring municipal dwellings. The case in point is the L.C.C.'s Millbank Estate, which occupies about half the site of the old Millbank prison. This was purchased from the Treasury by the Metropolitan Board of Works, the predecessor of the L.C.C., in 1896, for £22,242, for the rehousing of the population displaced in the clearance of a slum area two miles distant, under the provisions of the Housing of the Working Classes Act of 1885. The Millbank Estate consists of blocks of L.C.C. tenements, containing approximately 900 dwellings in all. The Westminster Electric Supply Corporation have set a good example by arranging with the L.C.C. for the hire purchase of electric wiring and fittings that will be installed in these dwellings at the company's expense—lamps and shades, cookers, fires and irons—at a charge to the tenants varying from 1s. 6d. per week, according to the number of rooms wired. Current will be supplied for all purposes at a flat rate of ¾d. per unit, collected by domestic slot meters. These hire-purchase instalments will be collected with the weekly rent. The first canvass showed that over 50 per cent. of the tenants concerned were anxious to have an immediate supply.

IN THE KITCHEN

1. The electrical equipment of low-rented dwellings is undoubtedly a step in the direction of labour saving and smoke prevention, while the tiled surround to the sink, the double draining boards, the painted dado, the hinged flap table, all show consideration for the needs of a working woman. But this illustration also shows how lamentably we lag behind our continental brothers in the design and arrangement of equipment for this exciting new form of power. While as for our plumbing. . . !

2. Various useful apparatus are combined in this kitchen electric clothes dryer, cooker and water heater, double sinks and draining boards with tiled surrounds and shelves beneath. But the practical woman will sigh at the dust trap crevice between sink and drying cupboard, at the thought of sweeping under all those shelves, round all those legs.

A glance at the "minimum kitchen" demonstrates the orderliness achieved by alignment of apparatus and by built-in cupboards.

3. Kitchen of the Minimum Flat, designed by Wells Coates. The overall size of this room is 5 ft. by 4 ft. 8 in., the housewife has one square yard of space to move in, yet she probably has more actual "room" than in many kitchens twice the size. Electricity is here an ideal medium for cooking, because it will not make the room unduly hot, and for preserving food since a refrigerator does not need ventilation through an outside wall. Note the cupboard below the sink; the built-in drawers; the relation between stove, sink and larder. The equal height of these three ensures economy of movement, all are well lighted, and the top of the refrigerator forms a convenient table. The wall cupboards provide ample storage space, while things in constant use can be taken quickly and easily from the one open shelf. The draining board catches drips from the plate-rack, there is an anti-splash surround to the sink and the walls are of washable paint. An admirable example of compact planning and utilization of modern labour-saving equipment. This kitchen was exhibited at the recent exhibition at Dorland Hall.

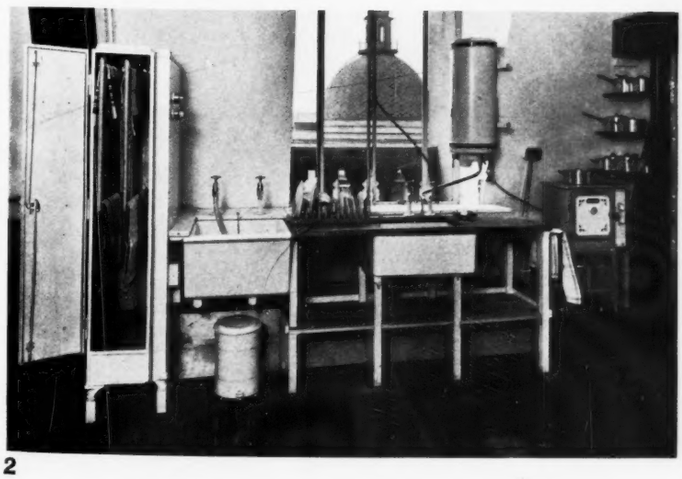
4. The latest electric cookers are both decorative and efficient—cleanliness, simplicity and cheerfulness are their watchword. The one illustrated has ample space for roasting, boiling, grilling, and for heating plates.

The well-lighted double sink and draining boards with cupboards beneath, the water heater and refrigerator, are other convenient features in this kitchen designed by Raymond McGrath. A clever arrangement is here suggested for a long and narrow space.

5. (See page 200.) This looks like one of Heath Robinson's inventions. It is actually an extremely efficient washing, wringing and ironing machine. The washer and wringer consume ½ unit per hour and the iron 1½ units.

6. One of the most up-to-date small cookers, with ample

1



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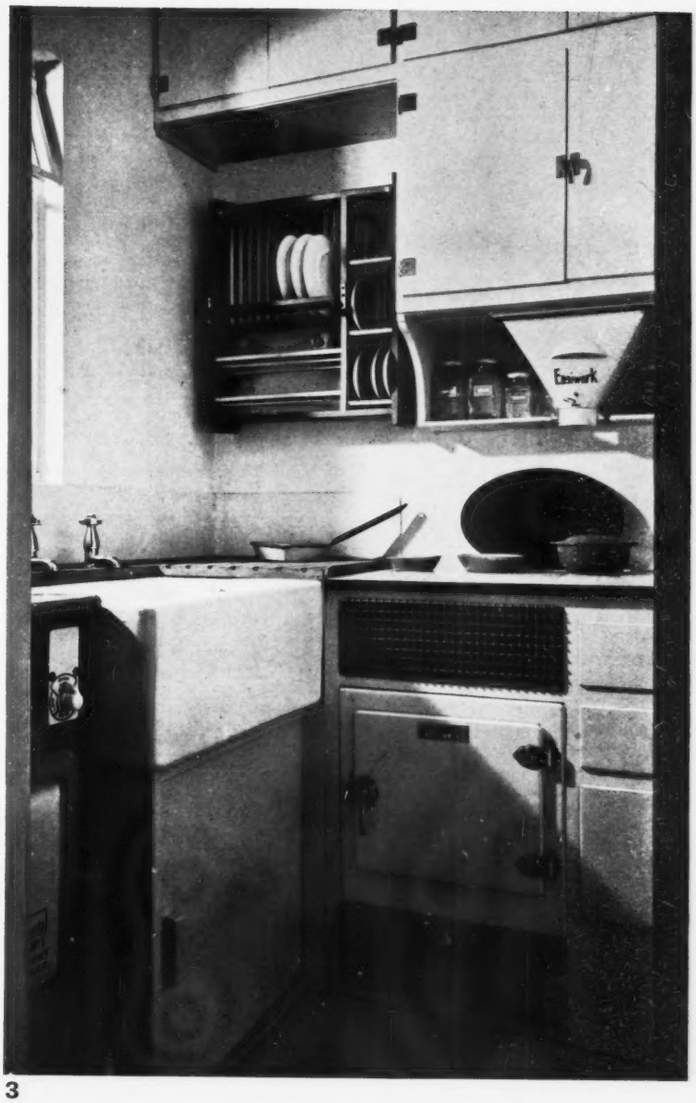

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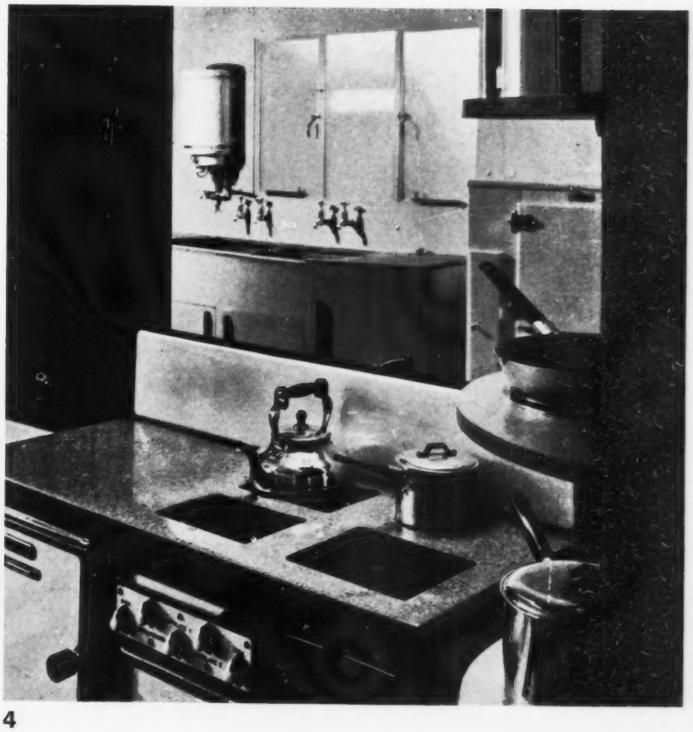

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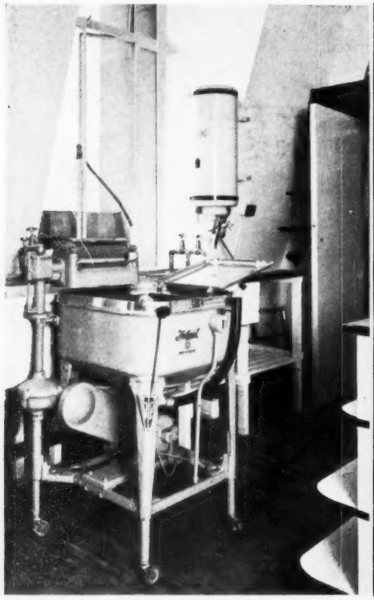

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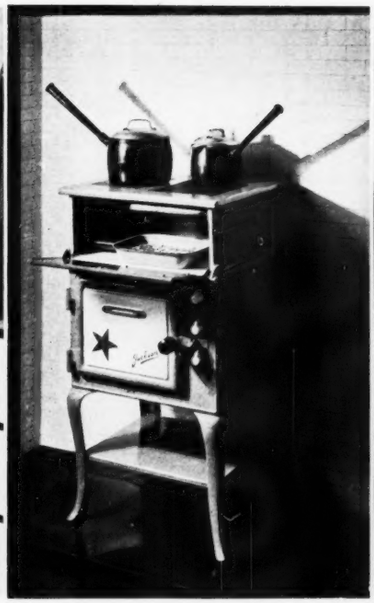

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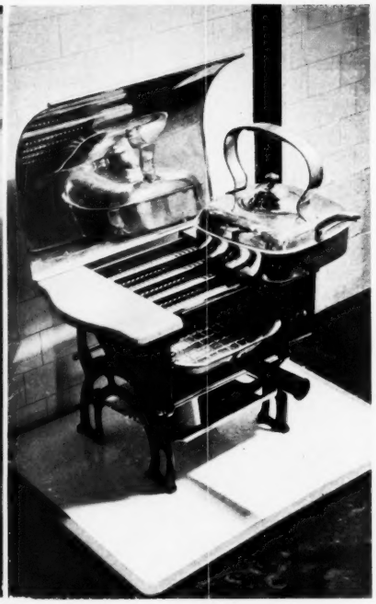


7

space for roasting, grilling, and boiling. The pan shelf is a good idea, as is the thermometer in the oven door. But it is difficult to *like* those cabriolet legs, and another oven would be more useful.

7. The advantage of this combined electric fire and cooker are self-evident. It is small, it is portable, it is obviously extremely efficient both for cooking (two hobs, a griller and a shelf for keeping an additional pan or for warming plates) and for heating (note the reflector for throwing the heat into the room).

Criticism is æsthetic. The design is cumbersome and follows the traditional coal hot-range far too closely. When a model is evolved which also takes advantage of the economy and simplicity of line obtainable in modern materials, this fire-cooker will be irresistible.

8. An admirable combination of stove, refrigerator, cupboards and drawers in convenient and logical sequence. The amount of table space above the larder and again in the dresser—both the same height—and the toe space below the larder should be noted.

9. An excellent working table has been obtained by combining cupboard and refrigerator into one fitting. The cupboard uses every inch of space to the floor, but the refrigerator creates a fine dust trap beneath its spindly legs!

ELIZABETH DENBY

8

9

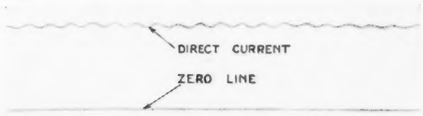
Some Apparatus and Running Costs

	Wattage	One unit lasts	Cost per hour at (per unit) ½	1	1½	Purchase Cost (Approx.)
FIRE	1 kW.	1 hour	½d.	1d.	1½d.	12/6 — 35/-
	2 kW.	½ hour	1d.	2d.	3d.	£1 .....
	3 kW.	⅓ hour	1½d.	3d.	4½d.	Varying according to design of fire.
IRON	330 W.	3 hours	1/6	1/3	1/0½	From 10/6
	500 W.	2 hours	¼d.	½d.	¾d.	upwards.
COOKER	3 to 5 kW. Suitable for average family, 4 or 5 persons	About a unit a day per person	Cost per day, per family 2d.	4d.	6d.	Great variety but rough average £10—£15 (for 4—5 persons)
KETTLE	2 pint size	6 boilings per unit, 1½ hours	1/3	2/3	1d.	From £1
VACUUM CLEANER	250 W.	4 hours	¼d.	½d.	¾d.	£5—£20
WASH-BOILER	3 kW.	20 minutes	1½d.	3d.	4½d	From £10
WATER HEATERS	3 kW.	2 gals. water to boiling pt. by 1 unit		—		From £5
TOASTER	500 W.	2 hours	¼d.	½d.	¾d.	From 13/9
IMMERSION HEATER	(various) 500 W.	2 hours	¼d.	½d.	¾d.	From 22/6
LAMPS Great variety of types and wattages.	25 W.	40 hours	Very small fraction of 1d.			Various
	40 W.	25 hours				
	60 W.	17 hours				
	100 W.	10 hours				

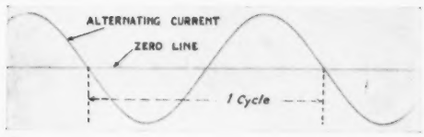
Electricity and Architectural Practice

By WALTER GOODESMITH

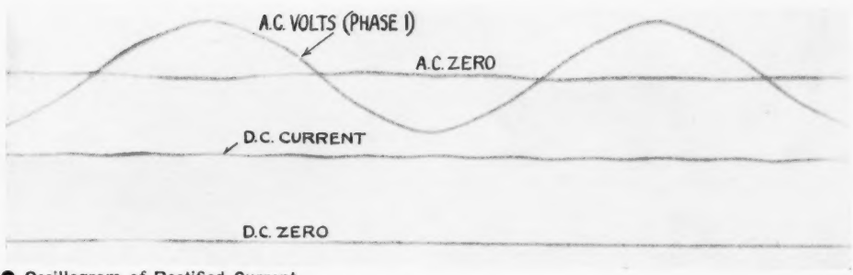
- •1 General and Supply
- •2 and •3 Installation and Equipment.
- •4 Lighting.
- •5 Lighting Scheme.
- •6 Special Structures.
- •7 Data and Bibliography.
- •8 Graphic Symbols.



1 Oscillogram of a Direct Current supply.



2 Oscillogram of an Alternating Current supply.



3 Oscillogram of Rectified Current.
Current wave-form, inductive load. Three-phase supply.

POWER CONSUMPTION OF ELECTRICAL APPLIANCES

BLOWER 160 w.

CHAFING DISH : 3 pints 500 w

CIRCULATING WATER HEATERS (for existing hot-water systems): 2-6 Kw.

CLOTHES WASHER Electric :
2-8 blanket size 250 w.

DISH AND FOOD WARMERS
Hot plate type :
12 X 12 ins. 160-170 w.
20 X 12 " 250-300 w.
30 X 15 " 400-500 w.

GEYSERS :
24 gall. per hr. at 100°F. 3 Kw.
32 " " " " 4 Kw.
40 " " " " 5 Kw.
60 " " " " 7½ Kw.
80 " " " " 10 Kw.

GLUE POTS : 1 pint 100 w
2 pints 400 w
4 " 650 w

GRILLS : 8 X 6 ins. 750-1000 w
18 X 12 ins. 3000-4500 w

HAIR DRIER : 550 w.

HOT PLATES : 5 ins. dia. 700 w.
7 " " 900 w.-1000 w
8 " " 1300 w.-1400 w
13-14 " square 1600 w.

HOT-WATER TANKS and WASH BOILERS †
8-10 gall. 3 Kw.
12 " 4½ Kw.

IMMERSION HEATERS :
6 ins. long 250 - 500 w.
7 " " 500 - 750 w.
10 " " 750 - 1000 w.
16 " " 1500 - 2000 w

IRONS (laundry and tailoring) :
3 lb. 250 w
4 " 280 - 300 w
5 " 350 - 450 w.
6 " 400 - 500 w.
7 " 500 - 600 w
12 " 600 - 700 w
20 " 800 - 850 w

JUGS :* ½ pint 275 w
1 " 400 w
2 pints 550 w

KETTLES :* ½ pint 275 w
1 " 300 - 400 w
2 pints 450 - 650 w
3 " 800 - 1000 w
4-6 " 1000 - 1400 w

SMALL MOTORS :
Drilling : 3/16 in. hole 200 - 250 w.
7/16 " " 350 - 400 w
1 " " 750 w
1½ " " 1500 w
grinding 6 x 3/16 wheel 750 w.
8 x 3/4 " 1250 w.
10 x 3/4 " 2250 w.
tube cleaning : 2 in tubes 750 w.
4 " " 1750 w.

OVENS :
14 x 14 x 12 ins. inside 1½ Kw
12 x 12 x 16 " " 1½ Kw
14 x 14 x 16 " " 2 Kw

PROPELLER FAN 100 w.

RADIANT "FIRES" :
Small bowl 600 w.
Medium and large 1-3 Kw.

REFRIGERATOR CABINET : 100-1000 w

SIMMERING PLATES :
8 x 12 ins 550 - 700 w.
24 x 12 " 1000 - 1200 w.

SOLDERING IRONS : ½ lb. 60 w
1 " 120 w
1½ " 200 w
2 " 275 w
3 " 450 w

TOASTERS : 1 slice 350 - 550 w.
3 slices 1750 w.
5 " 2500 w

TOWEL RAIL : 3 ft 250 w

URNS : 1 gall 1000 w.
2 " 1400 w
3 " 1500 - 1750 w
4-6 " 2000 - 2500 w

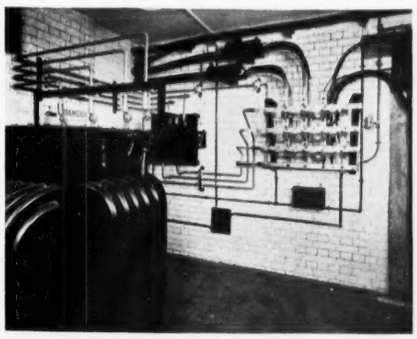
VACUUM CLEANER :
Usual domestic 200 w.
High power 300 - 600 w.

* Boiling time in minutes = $\frac{\text{pints}}{\text{watts}} \times 3850$ (approx)

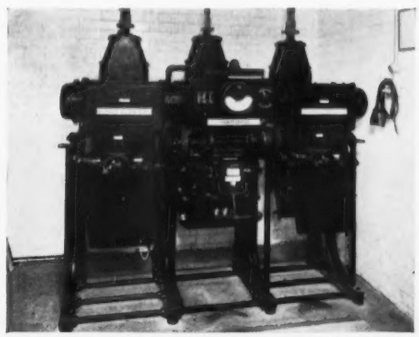
† Allow 4 to 5 w. per pint raised 10°F per hr; the higher allowance per pint being needed when the "pints per hour" is low.

‡ About half these quantities at 150°F.

4



5 The model sub-station at the Building Centre is part of the electrical service, as well as an exhibit.



6 A close-up of the transformer and H.T. feeders in the model sub-station.

Electricity, the dynamic servant of the modern architect, is extending its sphere of influence daily. So rapid, in fact, has been its development that many architects, especially those less technically inclined, have failed to become electrically minded. Gone are the days when electrical apparatus was pushed into any odd corner that happened to be available, and unnecessary chasing of walls and floors is avoided by attention to problems of installation before the commencement.

It is important that the architect should look upon the electrical installation of his building as a whole instead of as a collection of services. The use of a "Checking List" containing all possible electrical equipment in a building is of great help, as there is so much cross reference necessary in arriving at the total electrical load required.

If a consulting electrical engineer be employed, the architect's worries on general electrical matters will be very much lessened, but, in any case, as the initiation of the various electrical problems is the architect's responsibility, it behoves him to obtain as thorough an insight into the subject as possible and to attempt to plan ahead whenever an opportunity arises, for it is obvious that structures will not become less complicated electrically.

All authorities and persons concerned with the electrical installations should be consulted early and a round table meeting held on the site, for their number is often larger than at first imagined. It is possible to have a consulting electrical engineer, supply authority engineer, L.C.C. Fire Brigade engineer, electrical contractor, secondary lighting contractor, and special tube lighting contractor concerned with one building. Lift and other electrical equipment may also be involved.

In this country the electricity supply is now being standardized at 3-phase, 50-cycle alternating current with a pressure of 400 volts between phases and 230 volts between phase and neutral, the former being suitable for power, and the latter for lighting, 3 phase indicating that three leads are taken from the generator, along each of which, in turn, travels the pulsations at a third of the time of a complete cycle.

A.C. can be generated at high pressure much more easily than D.C., and A.C. has the added advantage that the voltage can be raised or lowered by the use of a static transformer which adjusts the incoming high voltage main supply to the required voltage for use.

•2 INSTALLATION AND EQUIPMENT

It is sometimes necessary to convert A.C. to D.C. or vice versa. This has been done in hospitals where there is trouble with speed regulation and "hum" of electric motors. In cinemas the projectors run better on D.C. There is, in fact, much electrical equipment which requires D.C. The methods of conversion are by use of a motor generator and in some special cases a motor converter, or by the more usual rotary converter in the case of large amounts.

The architect should be familiar with the I.E.E. "Regulations for the Electrical Equipment of Buildings." Although these regulations are not law, they are authoritative, observed throughout by all concerned with good class work, and are accepted by most Supply Authorities and Insurance Companies. (For further authorities see Bibliography, page 207.)

WIRING.

Four systems of wiring are in use:

a. Conduit with heavy gauge, screwed, welded or brazed joints or solid drawn lengths, which should be galvanised or sherardised for damp or external positions. This is the system which should be used wherever possible.

b. Soft metal sheathed (lead covered) which consists of cables insulated with rubber and covered with soft metal skin. Should only be used for surface wiring where not liable to damage.

c. Cab tyre sheathed.
Cables insulated in rubber and covered with tough rubber on outside. Similar use to "*b*," but will resist damp.

d. Wood case and capping.
This system is now redundant.

The modern method of wiring allows for the building of conduits in with floors and walls, with ample supply of draw boxes to provide full facilities for inspection and re-wiring; care should be taken, however, in positioning these draw boxes, for they do not add to the appearance of a finished surface.

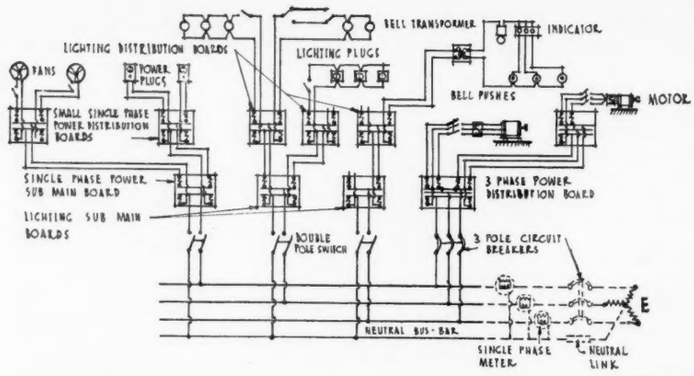
Vertical wall and horizontal floor ducts provide an excellent and readily inspected housing for the main wiring, an ideal floor duct consisting of the full length and width of the enclosed upper portion of corridor space, with ample inspection traps, from which the local wiring is fed to adjacent spaces as required.

Most buildings are now wired on the "distribution board" method which collects all fuses together.

The G.P.O. have issued an excellent guide, complete with drawings, photographs, diagrams, etc., for all concerned with the installation of telephones in buildings.

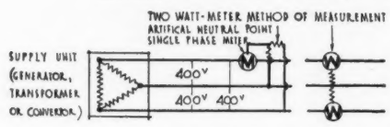
Electric heating may consist of electric radiators, exposed element, tubular, etc., electrically heated water radiators, low temperature electric wall or ceiling panels or paper, thermal storage with water or oil as the medium.

The electric kitchen is dependent for its success upon a low tariff from the supply company. It is now possible to



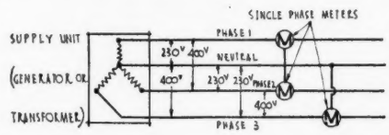
(Pallot)

7 Typical diagram of connections for power and lighting from the bus-bars of a switchboard for three-phase, four wire alternating current which is now the standard for low tension supply.



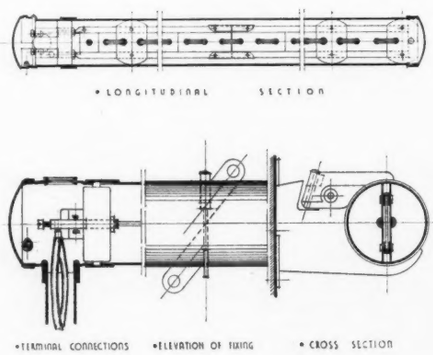
(Pallot)

8 Three-phase supply connections (delta-connected) are more dangerous and there is greater risk of breakdown.

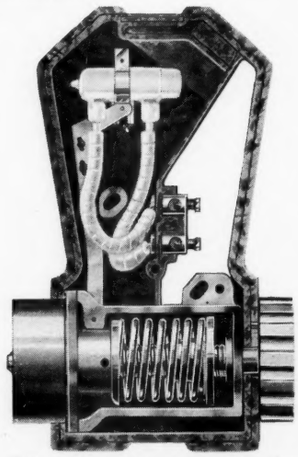


(Pallot)

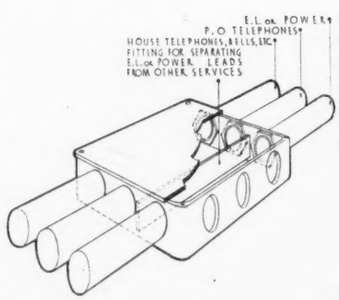
9 Three-phase, four wire supply (star connected). The standard system of low tension distribution.



10 Details of low temperature tubular heater. The clean lines of the design and simplicity of fixing are clearly shown.



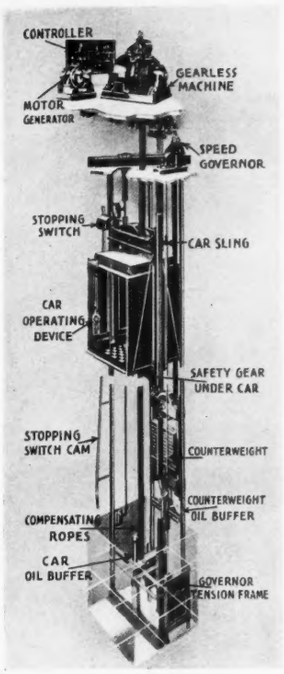
11 A Unity thermostat for the control of tubular heaters and low temperature panels.



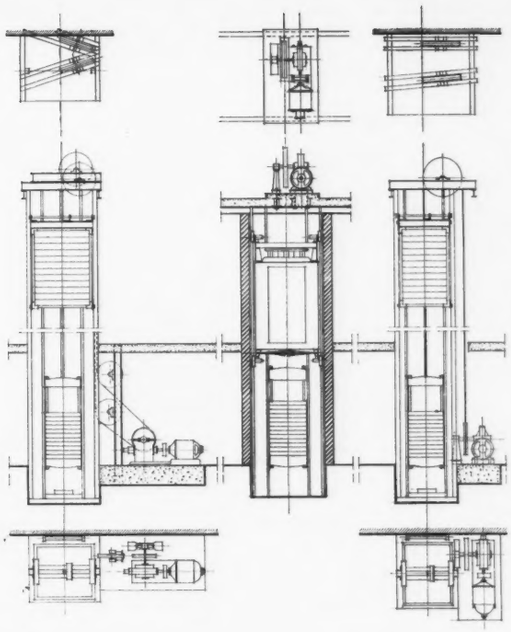
12 Cast-iron Floor Draw Box. Sizes 6″ x 6″ to 12″ x 12″.

12 Left.
A suggestion from the book "Facilities for Telephones in Buildings" by the G.P.O. in which electric light or power is linked with P.O. telephones and house telephones, bells, etc., in a three-way circular steel conduit system together with draw box.

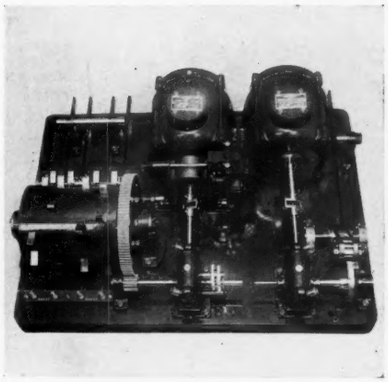
13 A new type of fan in which the usual metal blades have given place to ones made of specially woven fabric which permits the elimination of the conventional guard.



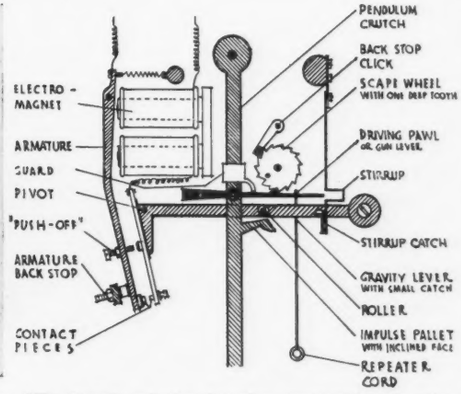
14 Explanatory diagram of typical lift installation.



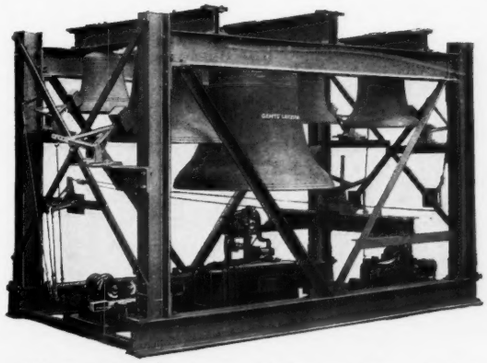
15 Typical lift layouts.
Left: typical arrangement with winding engine at the foot of the lift-shaft and parallel with top sheaves.
Middle: winding engine above the lift-shaft, recommended in all cases where practicable.
Right: winding engine at the foot of lift-shaft and at right angles with top sheaves.



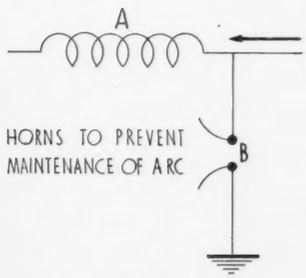
16 An automatic electric striking gear for turret clocks by "Synchronous" system.



17 Detail of the impulse transmitter in the impulse system of electric clocks.



18 Electric motor driven, chiming and hourly striking gear for bells.



19 Lightning arrester in which a normal current of low frequency passes round coil "A" but a lightning surge jumps across the air-gap to earth through "B."

have a completely electrical kitchen, with vertical or table type cookers, grills and boiling plates, storage type water heater, refrigerator, ice cream freezer, vacuum cleaner, floor polisher, drying cabinet and numerous appliances.

The modern scullery can also be all-electric with washing machine, including ironer attached; if required, water heater, wash basin, etc.

Electric oil thermal storage boilers are used on larger structures for hot water service. The immersion type of boiler operates by means of electrodes immersed in the water. Existing hot water tanks can also be fitted with immersion heaters. Electric geysers provide the solution for bathrooms where a hot water system is not in operation.

When planning a structure the problem of electric lifts is one calling for early attention and considered opinion. Their position on plan, speed of travel, top or bottom drive, to mention but a few important points, vitally affect the success of the finished structure.

The cost of high speed lifts rises rapidly with the speed increase, the expensive item being the acceleration and deceleration equipment required.

The economic speed of passenger lifts according to Pallot, is :—

5 floors,	130–200 ft. per min.	single speed.
6–10 ,,	200–350 ft. per min.	two speeds to 300 ft.
above 10 ,,	400 ft. per min.	three or four speeds above 300 ft.

London has recently seen the installation of a passenger lift which can develop a speed of over 400 ft. per minute between two intermediate floors.

In America high speeds of 700 ft. and 800 ft. a minute have been reached with an acceleration period of 3 seconds and there are examples of two lifts working in one shaft, one serving the lower, and the other, an express lift, the higher floors.

Goods lifts run at much lower speeds, up to 100 ft. per minute for reasons of economy. Automatic single speed lifts do not usually exceed 160 ft. per minute. Diagonal guides, though necessary in some cases, are not good practice as they result in a tendency to uneven loading with consequent binding on guides.

Wide and shallow cars provide quicker traffic than deep and narrow ones, although extra cost is entailed for the car.

The position of machine room is important and should, when possible, be placed above lift, it being less costly, besides entailing less wear on the ropes than a basement drive. The length of rope is also reduced to about a third. On the other hand the basement position ensures a quieter running lift, there being less vibration on superstructure.

Two main types of electric clocks are in use. The impulse worked from a standard seconds pendulum on master clock, and the synchronous motor clock, worked off the lighting mains and depending upon the standard frequency of the current for its accuracy.

•4 LIGHTING

It is in lighting that the architect has the greatest opportunity for expression electrically.

By the use of one or more systems of lighting—Direct, Indirect, or Semi-Indirect, together with colour and dimmer control, any desired effect within reasonable limitations can be obtained, and by the proper application of available tables and data the whole scheme can be planned on paper beforehand.

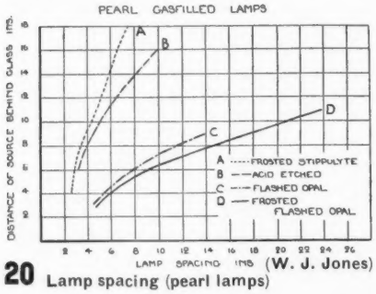
The present-day lamp is filled with an inert gas, the Pearl, in which the bulb is frosted internally, and the Opal, which has a thin veneer of opal glass flashed on to the outside of the clear glass bulb. Colour sprayed lamps are also available. Tubular lamps (Tungsten filament), though sometimes too low in their wattage per foot run, are very valuable in restricted places, such as very shallow lighting troughs and fittings. Continuous end to end tubes are now available in straight and curved lengths, and offer further possibilities.

Gaseous tubes (Neon, etc.) in various colours are generally in 20 ft. lengths, together with a 5,000 v. A.C. transformer and a converter for D.C.

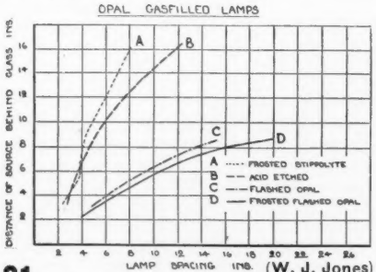
Sunlight (nitrogen gas) and Daylight (carbon-dioxide gas) tubes are the latest developments in high tension tube lighting, 20,000 v. being required for some circuits. It is some 2 in. in diameter, and, unlike Neon tubing, which is completed at the factory, Sunlight and Daylight tubes are joined together, exhausted and charged with gas on site.

As in Neon tube installations, each circuit of Sunlight and Daylight tube has a pair of electrodes, which, being fed with high tension voltage from the transformer, cause the tube to become luminous.

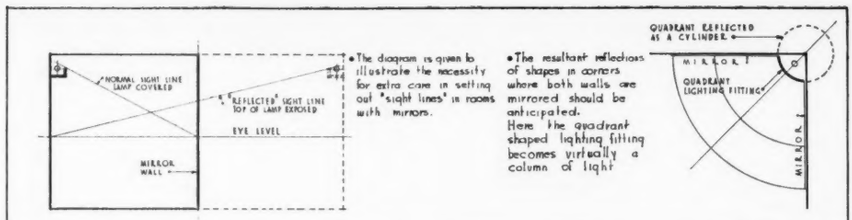
The design of lighting fittings has improved enormously during the last few years. A functional simplicity expressed æsthetically sums up the attitude of the modern designer.



20 Lamp spacing (pearl lamps) (W. J. Jones)



21 Lamp spacing (opal lamps) (W. J. Jones)

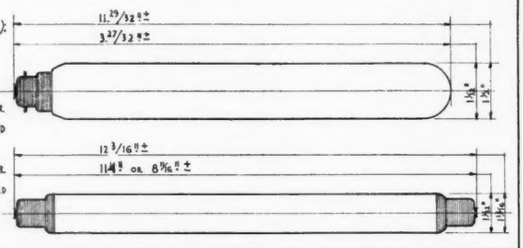


•The diagram is given to illustrate the necessity for extra care in setting out "sight lines" in rooms with mirrors.

•The resultant reflections of shapes in corners where both walls are mirrored should be anticipated. Here the quadrant shaped lighting fitting becomes virtually a column of light

•DIMENSIONS OF TUBULAR LAMPS (APPROX.)

TYPE	WATTAGE	MILLIMETRE DIAMETER	MILLIMETRE LENGTH	OVERALL INCHES	STANDARD FINISHES CAPS (E.S. = EDISON SCREW.) (B.C. = BAYONET CAP.) (C.C. = CENTRE CONTACT)	
SINGLE ENDED	25	26	1⅛	98	3 27/32"	E.S. B.C. OPAL, CLEAR OR
	40	38	1½"	302	11 29/32"	E.S. B.C. COLOUR SPRAYED
	60	38	1½"	302	11 29/32"	E.S. B.C.
DOUBLE ENDED	30	26	1⅛	221 / 284	8 11/16" / 11 1/4"	98" C.C. CLEAR, OPAL OR
	60	26	1⅛	284	11¼"	98" C.C. COLOUR SPRAYED
	100	46	1¾	309	12 3/16"	34" C.C.



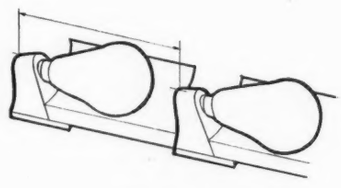
•VOLTAGE•WATTAGE•LENGTHS

Suitable for A.C. or D.C. from 100 to 250 volts

35 watts per foot or roughly 120 C watts per 4ft. tube

200 to 250 volts 4 ft or 100 to 130 volts 2 ft about ½" tolerance.

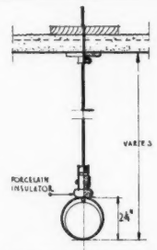
Bends and angles are taken out on respective voltage lengths.



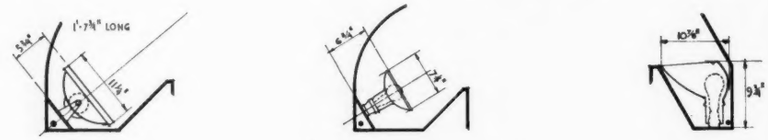
CORNICE LIGHTING

STRIP length of unit 6" 9" or 12"

•UNITS of 6" 9" or 12" may be built into runs, maximum length of each run - 5'-0" Wattage may be varied from 15 to 75w.



•FIXING for "SUNLIGHT" nitrogen tube : Fischers' Restaurant.



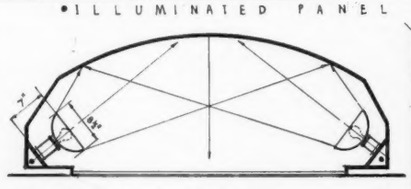
REFLECTOR takes two 100 watt or 150 watt lamps.

REFLECTOR takes one 100 watt lamp.

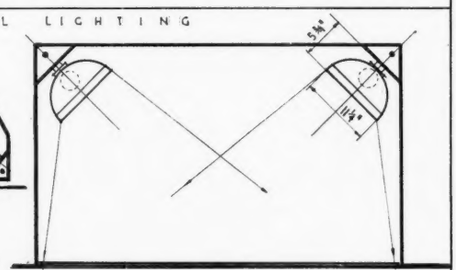
REFLECTOR takes one 150 watt lamp.

•TYPES OF REFLECTOR FOR CONCEALED LIGHTING

•ILLUMINATED PANEL LIGHTING



•LAY LIGHT GLASS PANEL WITH "X-RAY" REFLECTORS.

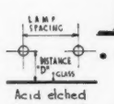


•LAYLIGHT GLASS PANEL

ILLUMINATED PANELS

Lamp spacings required for even illumination.

Extract from the illuminating Conference Report 1932.



Distance "D" (in inches) of lamp behind glass	Type of glass: Frosted Stipolite	Acid Etched sheet	Flashed Opal	Acid etched flashed opal
	Lamp spacing in inches.			
4"	3"	3"	5½"	6"
6"	3"	3¾"	8"	9½"
8"	3½"	4"	12"	15"
10"	3¾"	5"	17"	21½"

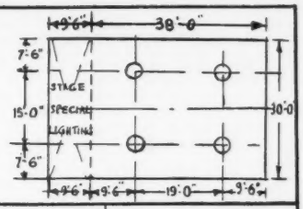
NOTES : Acid etched sheet does not give such even brightness as others. Wattage of lamps appears to be immaterial in regard to uniformity of light and spacing of lamps. If lamps are unnecessarily far from the glass the general efficiency is reduced.

W.G.

A — GENERAL INFORMATION

BROADCASTING . STUDIO.
FOR GENERAL PURPOSES.

CEILING SURFACE	PLASTER
WALL SURFACE	"INSULWOOD"
FLOOR (FOR THIS CALC)	38'x30'
HEIGHT OF CEILING	18'-6"
" ABOVE PLANE OF WORK	16'-0"
VOLTAGE	230 V.



B — RECOMMENDED FOOT-CANDLE ILLUMINATION

TYPE OF ROOM	FOOT-CANDLES RECOMMENDED	REMARKS
ART STUDIO	15 - 20	DAYLIGHT LAMP USEFUL.
AUTOMOBILE SHOW ROOM	15 - 20	
BANK	11 - 13	
BROADCASTING STUDIOS	4 - 6	VARY WITH REQUIREMENT. (SPECIAL LIGHTS ADDED AS REQUIRED
● DO. GENERAL PURPOSES		

C — CHARACTERISTICS OF LIGHTING UNITS

LIGHTING UNIT	relative illumination on the horizontal plane	relative illumination on the vertical plane	freedom from direct glare	freedom from reflected glare	softness of shadows	maintenance	favourable appearance of room.
DIFFUSING SPHERE ●	G.	G.	EX	G.	G.	G.	G.

D — SPACING — MOUNTING HEIGHT direct lighting unit including semi-direct and general units

MOUNTING HEIGHT OF UNIT above plane of work (H)	MOUNTING HEIGHT OF UNIT above floor (F)	MAXIMUM DISTANCE BETWEEN POINTS (D)	MAXIMUM DISTANCE BETWEEN POINTS AND SIDE WALLS: in usual locations where aisles & storage are next to wall (W)	MAXIMUM DISTANCE BETWEEN POINTS AND SIDE WALLS: in offices or where work benches are next to wall (W)
14	16½	21	10½	7
15	17½	22½	12	7½
● 16	● 18½	● 24	● 12	8
18	20½	27	13½	9

E — ROOM INDEX

room width (feet)	room length (feet)	DIRECT, SEMI-DIRECT AND GENERAL UNITS — height of fitting above plane of work in feet: 5	10	14	18	22	26	30
	140	D	C	B	B	A	-	-
● 30	30	E	C	B	A	-	-	-
	● 60	E	D	B	● B	A	-	-
	100	E	D	C	B	A	-	-
	140	E	D	D	B	B	A	A
	40	F	D	C	B	A	-	-

F — COEFFICIENT OF UTILIZATION

LIGHTING UNIT	room index	ceiling / walls: fairly light (40%) / fairly dark 25%	fairly light (40%) / fairly light 50%	very light (70%) / fairly dark 25%	very light (70%) / fairly light 50%
		COEFFICIENTS OF UTILIZATION			
GENERAL ENCLOSED DIFFUSING FITTINGS	A	·20	·24	·23	·28
	● B	·23	● ·27	·26	·32
	C	·29	·32	·33	·38
	D	·32	·36	·37	·43
	E	·38	·42	·44	·49
	F	·43	·46	·50	·55

G — LUMENS RATINGS OF GAS FILLED LAMPS

wattage	VOLTAGE — HIGH: 200, 210, 220	HIGH: 230	HIGH: 240, 250	LOW: 100, 115, 110	LOW: 115, 120, 125, 130
	RATED INITIAL LUMENS				
150	1920	1920	1920	2130	2130
200	2660	2660	2660	2960	2960
300	4260	● 4260	4260	4770	4770
● 500	7700	● 7700	7700	8700	8700

H — DIMENSIONS OF GAS FILLED LAMPS

WATTAGE	BULB DIMENSIONS: overall length m.m.	BULB DIMENSIONS: diameter m.m.	light centre length m.m.	standard caps
150	160 ± 4·5	80 ± 1	120 ± 4	B.C.
200	178 ± 5·5	90 ± 1	133 ± 5	E.S.
300	233 ± 7	110 ± 1·5	178 ± 6	G.E.S
● 500	267 ± 8	130 ± 1·5	202 ± 7	G.E.S.

NOTE: ● INDICATES SELECTED VALUES, IN CONJUNCTION WITH CALCULATIONS, IN NEXT COLUMN. THIS SKELETON CHART COMPILED FROM EXISTING TABLES (E.L.M.A.) ILLUSTRATES THE USE OF TABLES IN DESIGNING A LIGHTING SCHEME. W.G.

LIGHTING SCHEME ●5

The steps in designing a lighting scheme should be read in conjunction with the skeleton chart in the adjoining column. This method of designing is known as the Lumen method, and is fully explained in the E.L.M.A. handbook No. 2C.

There are four steps in the design:

1. Decide the foot-candle illumination required.
2. Select the most suitable type of lighting unit.
3. Determine the location of points, the mounting height, the number of lighting units required.
4. Ascertain the size of lamp which will provide the foot-candles required.

Proceeding in the above order:

1. From Table B the foot-candle required is 5.
2. The type of fitting selected is a sphere table C.
3. Table A gives lengths, widths, heights and spacing. (Referring to table D for spacing, it is seen that the layout of points is well within the maximum spacing.)

The area per unit in sq. ft.

$$= \frac{\text{Total floor area in sq. ft.}}{\text{Number of units.}}$$

$$= \frac{38 \times 30}{4} = 285 \text{ sq. ft.}$$

4. Lamp lumens required per unit.

$$= \frac{\text{Foot-candles} \times \text{Area per unit in sq. ft.} \times \text{Depreciation factor}}{\text{Coefficient of Utilization.}}$$

Depreciation factor is the allowance made for depreciation due to dirt, dust and deterioration of reflecting value of the walls, and is taken as 1·43.

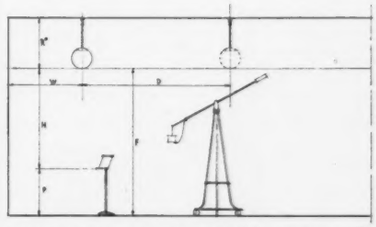
Coefficient of utilization, i.e., the proportion of the light produced from the lamps which reach the plane of work, is obtained by reading the Room Index from table E, which in this case is "B." Then the corresponding "B" in table F under "fairly light ceiling and wall," gives a final coefficient of ·27.

Continuing the calculation and substituting

$$= \frac{5 \times 285 \times 1{\cdot}43}{{\cdot}27} = 7{,}547 \text{ lumens.}$$

Referring to table G under column for 230 v. a 500 watt lamp with a lumen rating of 7,700, is found to be satisfactory.

The dimensions of lamp are given in table H.



24 Spacing-Mounting Height diagram D. The plane of work (P) is assumed to be 2½ feet above floor. If higher or lower, neglect column (F) and work from column (H). The minimum allowance for (R) is usually 1 foot.

●6 SPECIAL STRUCTURES

HOSPITALS

Lighting plays such an important part æsthetically as well as practically in the life of a hospital that the standards of lighting must be carefully studied to obtain the correct foot-candle requirements for various parts.

The most vital piece of lighting equipment is always the operating table lighting fitting. Many ingenious attempts have been made to produce a lamp without shadows and a number of models are at present on the market. Authorities differ in their opinions on the foot-candle requirements at table level of the operating table, the figure varying from 200 to 1,200 foot-candles.

It is necessary to instal an emergency system of lighting in case of electric supply failures, and a trickle charge chloride battery system is quite satisfactory.

Signal systems are installed to facilitate control and speed, and generally consist of a nurses' call system, and a paging system to locate doctors. Besides hot cupboards, hot towel-rails, etc., special equipment in the nature of electric sterilizers, radiant heat lamps, ultra violet apparatus of a clinic nature are required.

CINEMA—THEATRES

Electricity is the life of the modern cinema.

An Intake Room at least 10 ft. square is required for the sole use of the electrical supply authorities and must have direct access to the street and be vented to the open air. In it the supply companies' mains are fed to a transformer and accompanying switchgear.

In addition to this, rooms a little less in size are required to house—

(*a*) low pressure switchgear, meter for stage lighting, other meters,

(*b*) auditorium lighting supply, power for ventilation motor, generators, advertising lighting supply,

(*c*) the secondary system of emergency lighting.

The general method of lighting the stage is by means of light battens which should not be further apart than 6 ft., together with gas-filled flood units and gas-filled projector lamps for "spotting" artists. If there is a stage manager, it is best to place the controls in the wings, but in the case of smaller cinemas it is placed in the projection room.

The auditorium lighting generally consists of three or four colour circuits controlled by a dimmer switchboard.

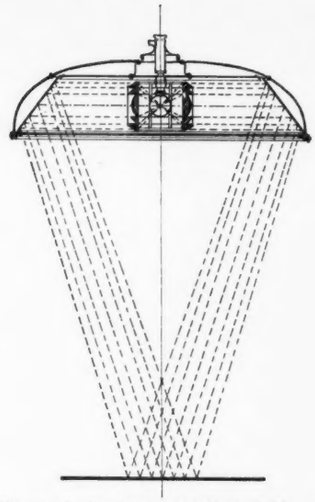
An emergency system of lighting is compulsory in the public portions of the theatre-cinema (Section 67, Places of Public Entertainment, L.C.C.) and one of the most satisfactory solutions is the installation of a chloride floating battery system.

FILM PRODUCTION STUDIOS

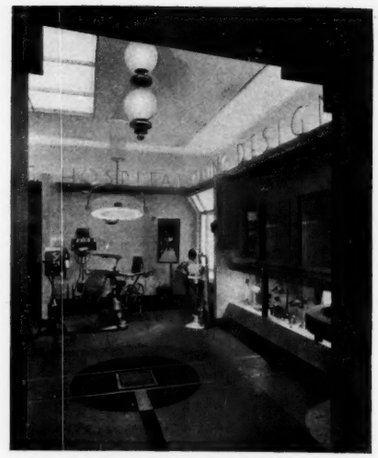
Enormous loading is the important feature of the installation. Batteries of spots are fixed either to overhead travelling cranes or fly galleries.

BROADCASTING STUDIOS

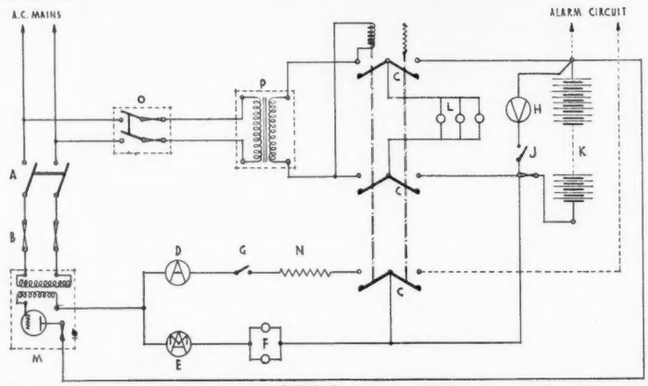
Special features of the installation are the floor wiring ducts, removable microphone skirtings, signal light systems, house telephones and synchronous clocks.



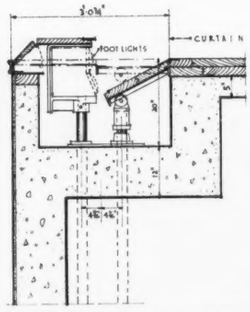
25 Many shadowless operating table lamps are on the market. The original principles of Professor Verain resulted in the first successful model detailed above.



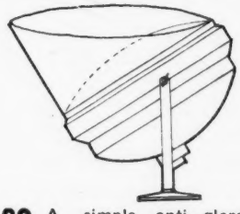
26 A view of the Hospital and Clinic section of the E.D.A. exhibit at the Building Centre.



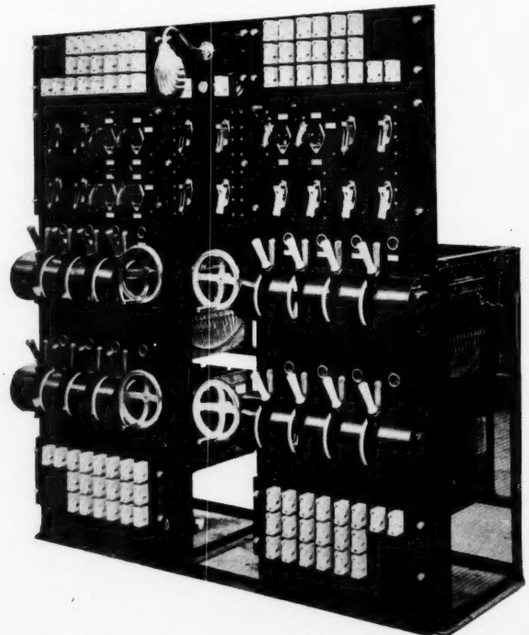
27 The problem of the secondary system of lighting in hospitals, places of public entertainment, and other buildings is solved by a chloride battery system. The above diagram illustrates a special cinema lay-out using trickle charge storage batteries.



28 An ingenious solution of the problem of disappearing stage footlights.



29 A simple anti-glare shield used on flood-light-projector to control light from the front of the lamp.



30 Dead front type dimmer switchboard showing self-releasing clutches on dimmer operating handles.

DATA

GENERAL

VOLT — Is the unit of electric pressure and is assumed to be constant.

AMPERE — Is the unit of electric current and must vary in direct proportion to the load since the voltage is constant.

WATT — Is the unit of electric power, being the product of volts and amperes, *i.e.*, 1 volt × 1 amp = 1 watt. 746 watts = 1 h.p. or 33,000 foot pounds per minute, 1,000 watts = 1 kilowatt.
1 kilowatt × 1 hour = 1 kilowatt hour, which is the Board of Trade unit.

OHM — Is the unit of resistance, and is used for testing the insulation value of the wiring.
Ohms law states that with 1 ohm resistance, a current of 1 ampere can be passed with a pressure of 1 volt.
One million ohms is called one "megohm."

LIGHTING

LUMEN — The lumen is the unit of light flux. It is the total amount of light intercepted by or falling upon a surface of one square foot, every point of which is at a distance of one foot from a point source having an intensity of one candle. The total flux emitted from a uniform light source of one candle is 12·57 lumens.

FOOT-CANDLE — The degree to which a surface is illuminated is measured in foot-candles. One lumen will light a surface of one square foot to an average illumination of one foot-candle.

Note.—Surface illumination is simply a measure of the incident light, and should not be confused with "surface brightness," which largely depends on the power of reflection of the surface illuminated.

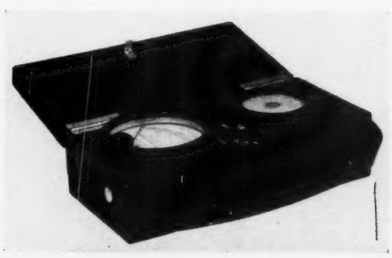
ROOM INDEX — The amount of light that reaches the plane of work from a unit is affected by its height above the plane of work and the size and shape of the room. For the purposes of design calculations, rooms are classified according to their dimensions, and each classification given a letter; this letter is known as the *Room Index*. The plane of work, unless otherwise specified, is ordinarily considered to be horizontal, and 2½ feet above the floor for desks and counters and 3 feet for industrial benches.

COEFFICIENT OF UTILIZATION — This is the proportion of the lumens produced by the lamp which reach the plane of work. It takes into account the losses due to light absorption by the walls, ceilings, and the fitting itself.
The above losses also vary with the dimensions of the room, so the Coefficient of Utilization varies with different Room Indices.

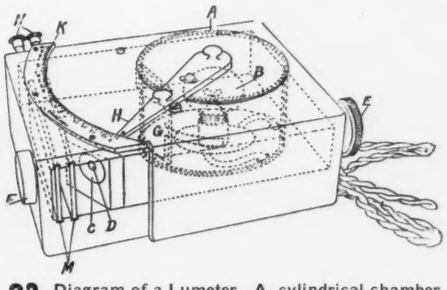
DEPRECIATION FACTOR — This is a factor which allows extra initial illumination to compensate for the falling off in reflecting efficiency of the reflectors, walls, and ceilings, due to deterioration and the collection of dirt and dust. A depreciation factor should always be applied, since the foot-candles illumination given in the tables are the average values during service. This factor does *not* allow for inefficient maintenance. A drop of 30 per cent. is allowed, giving a depreciation factor of 1·43.

STANDARDISATION

Standardisation is extremely important in electrical work, and much has been done in this direction. The work of the B.S.I. Committees is well known, reports covering the whole field of electrical activity having been published. The report on Graphic Symbols, which covers the whole electrical industry, indicates the thoroughness which is being brought to bear upon the problem. There is, however, still much room for improvement in the direction of design generally.
The permanent electrical exhibition at the Building Centre by the Electrical Development Association is a noteworthy effort, and is a representative collection of general electrical requirements in building from the Transformer Chamber to electric light fittings.



31 A portable photometer. A very handy instrument for direct readings of foot-candle illumination.



32 Diagram of a Lumeter. A, cylindrical chamber. B, comparison lamp. C, photometric screen. G, rectangular aperture covered by a diffusing screen illuminated uniformly by the lamp inside. H, pointer. K, scale.

BIBLIOGRAPHY ●7

I.E.E.	Regulations for the Electrical Equipment of Buildings. Journal of Proceedings. Special Papers.
L.C.C. 2606	Regulations with regard to Places of Public Entertainment.
SUPPLY AUTHORITIES	Electricity Supply Authorities. Special Regulations (varying in different locality).
HOME OFFICE	Memoranda.
FACTORY REGULATIONS	Various Government Regulations applying to Factories.
B.S.I.	General List of Standards Publications.
B.S.I. 108–1933	Graphic Symbols for General Electrical Purposes.
B.S.I. 447–1932	Graphic Symbols for Interior Electrical Installations.
B.S.I. 398	Classification of Symmetrical Light Distributions from Lighting Fittings.
G.P.O.	Facilities for Telephones in New Buildings.
CENTRAL ELECTRICITY BOARD	Information on the Grid Supply.
N.P.L.	National Physics Laboratory. Numerous reports on illumination, etc.
ELECTRICAL CONTRACTORS' ASSOCIATION	Electrical Installation Work.
A. C. PALLOTT	The Engineering Equipment of Buildings.
E.D.A.	The Architecture of Electricity (Review of Building Centre Electrical Exhibition). Electric Home Wiring Specification. Other handbooks.
E.L.M.A. ..	Electric Illumination Handbooks. Other handbooks and papers. Lighting Conferences held annually. Lighting Service Bureau.
B.C.	Building Centre (Leaflets can be obtained).
SYLVESTER AND RITCHIE	Modern Electrical Illumination.
I.E.S.	The Illuminating Engineer. Journal of the Illuminating Engineering Society.
C. H. WAGHORN	Electricity for Architects.
H. B. LEIGHTON	Small Domestic Electrical Installations (R.I.B.A. Technical Series).
MECHANICAL WORLD	Annual Electrical Pocket Book.
ARCHITECTURAL PRESS (Chatterton)	Specification.
A.A.	The Architects' Diary and Technical Reference.
B.B.C.	A Technical Description of Broadcasting House.
R. B. MATTHEWS	Electricity for Everybody
JOURNALS GENERALLY	Electrical Journals (various).
GENERAL ..	Handbooks and Catalogues published by Electrical Firms.
CINEMA	Cinema and Theatre Construction Journal, Information Bureau.

•8 STANDARD GRAPHICAL SYMBOLS FOR ELECTRICAL WORK

CURRENT direct DC or —	1 CEILING point, lighting.	26 DISTRIBUTION fuseboard without switches, lighting
Alternating AC or ∿	2 Ceiling point, power	27 Distribution fuseboard with switches, lighting
A.C., Single-phase 1Ph ∿	3 Floor point, lighting	28 Distribution fuseboard without switches, power
A.C., Two-phase 2Ph ∿	4 Floor point, power	29 Distribution fuseboard with switches, power
A.C., Three-phase 3Ph ∿	5 Bracket point, lighting	30 BELL push
POLARITY Positive +	6 Fan point	31 Pear push and rosette
" Negative —	7 Synchronous clock point	32 Bell
Neutral D.C ± OR ±	8 Special purposes point	33 Bell indicator (N = no of ways)
Neutral A.C. N	9 LIGHTING wall socket	34 Indicator and bell
Earth E	10 Lighting wall-socket & switch combined	35 Bell-ringing transformer
Equaliser Connection =	11 Power wall-socket	36 TELEPHONE point, public service
GENERATOR (G)	12 Power wall-socket & switch combined	37 Telephone board, public service
MOTOR (M)	13 1-WAY switch	38 Telephone point, internal
2D3 MANHOLE	14 2-way switch	39 Telephone board, internal
3J2 CURRENT transformer	15 Intermediate switch	40 FIRE push
5F2 IMPULSE electric clock	16 Pear switch for lighting	41 Automatic alarm
5F3 Synchronous electric clock	17 MAIN fuseboard without switches, lighting	42 Fire gong
5G1 TIME switch, electrically driven	18 Main fuseboard with switches, lighting	43 Fire indicator
5G2 Time switch, mechanically driven	19 Main fuseboard without switches, power	44 Remote control push
5K1 LIGHTNING arrester	20 Main fuseboard with switches, power	45 SPECIAL purposes push
5K2 Horn-gap lightning arrester	21 Main switch, lighting	46 Special purposes indicator (N = no of ways.)
5L2 ELECTRIC horn	22 Main switch, power	47 Loud-speaker outlet
7D2 TELEGRAPH or telephone pole T	23 Main cut-out, lighting	48 MASTER clock
7M4 HEATER	24 Main cut-out, power	49 Secondary clock
NOTE: The symbols in this column are selected from GRAPHICAL SYMBOLS No 108-1933	25 Meter	50 Earth point.

The above graphical symbols agree with British Standards Institution publications 108-1933 and 447-1932. Symbols numbered 1-50 are specially collected together in the latter publication for interior electrical instalations. W.C.

ANTHOLOGY

STORM CLOUD

Electricity has cleared the air of the smoke cloud—the storm cloud—in which nineteenth century industrialism wrapped it. Ruskin was a more despairing prophet in the lines quoted below, written in his old age. William Norris, quoted elsewhere in this number, saw that the smoke storm was temporary.

In healthy weather, the sun is hidden behind a cloud, as it is behind a tree; and, when the cloud is past, it comes out again, as bright as before. But in plague-wind, the sun is choked out of the whole heaven, all day long, by a cloud which may be a thousand miles square and five miles deep.

And yet observe: that thin, scraggy, filthy, mangy, miserable cloud, for all the depth of it, can't turn the sun red, as a good, business-like fog does with a hundred feet or so of itself. By the plague-wind every breath of air you draw is polluted, half round the world; in a London fog the air itself is pure, though you choose to mix up dirt with it, and choke yourself with your own nastiness.

Now I'm going to show you a diagram of a sunset in entirely pure weather, above London smoke. I saw it and sketched it from my old post of observation—the top garret of my father's house at Herne Hill. There, when the wind is south, we are outside of the smoke and above it; and this diagram, admirably enlarged from my own drawing by my, now in all things best aide-de-camp, Mr. Collingwood, shows you an old-fashioned sunset—the sort of thing Turner and I used to have to look at—(nobody else ever would) constantly. Every sunset and every dawn, in fine weather, had something of the sort to show us. This is one of the last pure sunsets I ever saw, about the year 1876—and the point I want you to note in it is, that the air being pure, the smoke on the horizon, though at last it hides the sun, yet hides it through gold and vermilion. Now, don't go away fancying there's any exaggeration in that study. The prismatic *colours, I told you, were simply impossible to paint; these, which are transmitted colours, can indeed be suggested, but no more. The brightest pigment we have would look dim beside the truth.*

I should have liked to have blotted down for you a bit of plague-cloud to put beside this; but Heaven knows, you can see enough of it nowadays without any trouble of mine; and if you want, in a hurry, to see what the sun looks like through it, you've only to throw a bad half-crown into a basin of soap and water.

Blanched Sun,—blighted grass,—blinded man.—If, in conclusion, you ask me for any conceivable cause or meaning of these things—I can tell you none, according to your modern beliefs; but I can tell you what meaning it would have borne to the men of old time. Remember, for the last twenty years, England, and all foreign nations, either tempting her, or following her, have blasphemed the name of God deliberately and openly; and have done iniquity by proclamation, every man doing as much injustice to his brother as it is in his power to do. Of states in such moral gloom every seer of old predicted the physical gloom, saying, "The light shall be darkened in the heavens thereof, and the stars shall withdraw their shining." All Greek, all Christian, all Jewish prophecy insists on the same truth through a thousand myths; but of all the chief, to former thought, was the fable of the Jewish warrior and prophet, for whom the sun hasted not to go down, with which I leave you to compare at leisure the physical result of your own wars and prophecies, as declared by your own elect journal not fourteen days ago—that the Empire of England, on which formerly the sun never set, has become one on which he never rises.

What is best to be done, do you ask me? The answer is plain. Whether you can affect the signs of the sky or not, you can *the signs of the times. Whether you can bring the* sun *back or not, you can assuredly bring back your own cheerfulness, and your own honesty. You may not be able to say to the winds, "Peace; be still," but you can cease from the insolence of your own lips, and the troubling of your own passions. And all* that *it would be extremely well to do, even though the day* were *coming when the sun should be as darkness, and the moon as blood. But, the paths of rectitude and piety once regained, who shall say that the promise of old time would not be found to hold for us also?—"Bring ye all the tithes into my storehouse, and prove me now herewith, saith the Lord God, if I will not open you the windows of heaven, and pour you out a blessing, that there shall not be room enough to receive it."*

From THE STORM CLOUD OF THE NINTEENTH CENTURY
by JOHN RUSKIN Lecture 1 1884

MARGINALIA

AN APOLOGY FOR THE POEM

The poem, which starts in the next column and goes on for such a long time in the others, must not be taken as a declamation against the benefits of electricity. It serves to show the old-fashioned abuses of electricity. Within the last ten years electricity has made such vast strides that the old shams of mediæval electric lanterns, mediæval electric log fires, mediæval electrically lit beams have passed away. This is an old-fashioned poem on an old-fashioned theme. Antiquarians will appreciate it as such; those who see in electricity a new and beautified life and landscape for England will understand its salutary message.

THE ELECTRIFICATION OF LAMBOURNE END

A POEM IN THE MANNER OF

The Rev. George Crabbe

The Subject Proposed—"The Tranter's Load"—its gate hinge—and remoteness—Albert Sparke—Scoggins, Boggins and Higgs—their legs prodded—lighting-up time—the dart board, etc.—the by-pass road—death of Boggins—illness of Higgs—desertion of Scoggins—electrification of Albert Sparke—owner drivers from Woking attracted—Albert Sparke possibly an old Harrovian—encomium.

How Albert Sparke has licences to sell
Both beer and spirits in his new Hotel:
How he, who once sold paltry pints of beer,
Now profits in Martini shall appear.
My muse shall show how small the changes are
Which make a palm court of a public bar.
How Albert's income rose from night to night
From fifty pounds to fifteen hundred quite
Largely because of *the Electric Light.*
Far from a railway or a turnpike road,
Embowered in elm trees, stood "The Tranter's Load."
A neat, square building, elegant not great
(On this side hawthorns and on that, the gate).
It looked, when men return'd from making hay,
The jovial part that it was meant to play.
The squeaking hinge, worn bright by constant twirls[1]
Would warn the host of slow approaching churls.
With bar well sanded and a counter clear,
The beaming Albert sparkled like his beer.
Scoggins would come and Boggins Higgs would bring
And o'er their modest halves of bitter sing,
Till Albert jokingly would prod their calves
And say their wives were their more modest halves.
The lonely traveller, listening to the din
Beside the wicket, would be tempted in
And further fun and riot would begin.

[1] By this I do not mean to imply that the hinge itself twirled round but that the *gate* twirled round on the hinge, thus imparting, by the aid of friction, a high polish to the metal.

And when the sunset, flattening on the hills,
Brought in its train a sullen evening's chills
Then Albert shut the day's departing out
With two-barred shutters fastened in a grout.[2]
And next, to brighten up the sons of toil,
He lit the lamps which kept alight through oil.[3]
Say, did you see in yonder cupboard stored
A heavy, deeply-pitted, elmwood board?
And did you on its ancient surface trace
Enlarging circles round a central space?
This, once the solace of all rustic hearts,
Alas! now used no more, was used for darts.
And, reader, on the palm court ceiling look,
Do you not notice one belated hook?
From that, when Boggins, Higgs and Scoggins sung
The old oil lamp would rattle as it hung.
How changed this once familiar rustic sight?
'Twas largely due to *the Electric Light*.
On June the seventh, nineteen twenty-four,
They made a by-pass pass by Albert's door.
Boggins, when crossing to "The Tranter's Load"
With slow, uneven pace athwart the road,
Ere yet the hinge could squeak his long'd approach,
Was killed by a "Delight of Bournevill[e]" coach.
And Higgs is leaving Lambourne End for Zion,
While Scoggins now goes over to "The Lion."
So people pass, customs and custom too.
And what, please Heav'n, is Albert Sparke to do?
The fifth of April, nineteen twenty-five,
Saw two tall pylons[4] near the Inn arrive.
By June the seventeenth did Albert Sparke
Have more than just his name to light the dark:
Then see his swift prosperity begin
From "Bass on draught" to "Here's a good pull in!"
And thence to "Teas and Good Accommodation."
A pleasant outlook on the petrol station
Tempted the chauffeur; while, to please his master,
Black beams were painted on "The Tranter's" plaster.
And in electric bulbs the tale was told:
"This house is over seven centuries old."
What matter if 'twas six whole centuries out,
When Albert Sparke knew what he was about?
A floodlight on the front brought hundreds here
And spirits rose while downward went the beer.[5]
See, how the new and mediæval porch
Is lighted by an imitation torch!
Meanwhile, within, what changes Albert made!
Each glowing bulb has its appointed shade—
A lantern this, and in the drawing-room
More modernistic notes dispel the gloom.
Now to "The Tranter's Load" in crowds appear
Those whose delight is just to sit and leer.
With hair as shiny as their cars outside,
They chaff and riddle, chortle and deride.
Pleas'd to hold forth, with pleasure they defend
The rights of Woking, here in Lambourne End.
Who is that man with Old Harrovian tie,
Enliven'd footwear and commercial eye?
That prosp'rous, gentlemanly business shark?
Why that, fond reader—that is Albert Sparke.
See what *Electric Light* with transport's aid
Has brought to him who understands his trade.
The signboard is repainted o'er the door:
Not "Tranter's Load," but now "Le Nuit d'Amour."[6]

[2] *A grout* is a slot for receiving the small portion, generally measuring 2½ in. by 1⅜ in., which projects from one end of an iron shutter bar.

[3] Oil lamps.

[4] See frontispiece.

[5] There is a triple meaning intended in this line.

[6] French.

* * *

A SHADOWLESS ROOM

Although shadows may be desirable in domestic rooms, in an office every odd corner should be visible. This illustration shows a shadowless office lit by G.V.D. cornice lighting. 112-15 watt lamps were previously used here, where there are now 16-75 watt lamps, saving 25% in current consumption and giving a definite increase in foot candles—from 4½ f.c. to 10½ f.c. There are four lamps on each side of the room. Notice the complete absence of shadows, even under the desk. The architects of the room were Yates, Cook and Derbyshire.

ELECTRICAL STATISTICS IN WELWYN GARDEN CITY

1—*A SMALL HOUSE*

A small rented house (100, Parkway) of standard design is very fully equipped electrically. In addition to lighting, supply is used for cooking, water heating, domestic heating and refrigeration

The following table, which has been kindly supplied by the electrical engineer to the supply authority, Mr. A.T. Bullen, A.M.I.E.E., shows a specimen year's running cost, based on the current tariff:—

	Quarter ending			
	March.	June.	Sept.	Dec.
	Average daily consumption in units.			
Lighting and sundry ..	3·0	2·2	1·7	2·9
Cooking ..	5·1	4·4	4·3	4·8
Water heating	—	7·3	5·7	3·3
Refrigerator ..	0·5	0·8	1·0	0·6
Heating ..	11·6	3·7	2·3	8·6
Total daily average	20·2	18·4	15·0	20·2
Approximate total quarterly units.. ..	1,840	1,670	1,365	1,840
Average price per unit (pence)	1·12	0·67	0·84	1·12

Average for year—0·93 pence.

2—*A MEDIUM-SIZED HOUSE*

Electricity is used for lighting, heating, water heating and refrigeration. A specimen year's consumption, for a small household (3 or 4) with a number of periods with the house empty, is as follows:—

ESTIMATED UNITS CONSUMED.

Qtr. ending	Cooker.	Water Heater.	Refrigerator.	Heating.	Lighting.	Totals.
March	119	550	50	4,009	200	4,928
June	500	1,900	100	1,583	100	4,183
Sept.	283	1,150	100	500	100	2,133
Dec.	196	800	50	2,276	200	3,522
Totals	1,098	4,400	300	8,368	600	14,766

The average price paid over the year is ⅝d. per unit.

3—*A FACTORY*

The Murphy radio factory is interesting in that the thermal storage heating is successfully used. The installation is used to heat 229,000 c. ft. It takes a night load (8 p.m. to 8 a.m.) and over 8 months it consumed about 153,000 units (19,125 per month) at a cost of .4d. per unit, which is equivalent to about .033d. per c. ft. per month.

* * *

THE ELECTRIFIED CURATE

There let me sit to see the brewing storm
Collect its dusky horrors, and advance
To bellow sternly in the ear of night;
To see th' Almighty electrician come,
Making the clouds his chariot. Who can stand
When he appears? The conscious creature flies,
And skulks away, afraid to see his God
Charge and recharge his dreadful battery.

From The Village Curate, *by the* Rev. James Hurdis. *2nd edition.* 8*vo.* 1790.

* * *

THE LIFTING STORM CLOUD

The smoke cloud which electricity is lifting off England reveals blemishes that have hitherto escaped notice. The blight, rising off Manchester, reveals electric lamp standards of a hideousness only equalled by those in Trafalgar Square and Shaftesbury Avenue in London. Nor are the posts for overhead-wire trams in any city in England, worthy of praise.

REVEALS FRIGHTFULNESS

The clean air will give a new impetus to architecture. Architects will have to be careful of their detail; we are going back again to the eighteenth century. And bad architecture in our towns will not only become more visible by day, but continue illuminated until late at night. It is, therefore, of vital importance that ugly buildings should, at night, be shrouded in respectful darkness or else adorned with electrical decorations which will improve their proportions. Such façadism, as a temporary measure, is, like stucco, surely permissable?

AND ANOTHER CLOUD BEHIND?

There is, however, always the possibility that the storm cloud, after lifting, will reveal an equally obnoxious cloud behind it, hitherto unanalysed. The electrification of the Southern Railway has brought with it a host of jazz-modern upholstery which, though comfortable to the limbs is irritating to the eye. The new Pullman cars on the Brighton line are jazz indeed.

MARGINALIA
(CONTINUED)

THE FINNISH EXHIBITION IN LONDON

A slung bent plywood armchair with rigid-framed upholstered seat and back, designed by Alvar Aalto.

Under the recent commercial treaty it is well worth Britain's while to buy her wood from Finland and thereby to establish a mutual exchange of products. With this object in view Finland has organized an Exhibition of her wooden products, which will be shown at Messrs. Fortnum and Mason's shop in Piccadilly, London, in late November.

The Exhibition will consist of chairs, tables, toys, glass, textiles, rugs, acoustic papers, and photographs of furnished rooms, and the buildings which contain them to act as a background to the finished products. The Exhibition will display the *best* that Finland can produce, not the mere pseudo-Swedish or fake antique by which much foreign work has been stigmatised. The value of the Exhibition is therefore twofold. It will show the discriminating section of the British public articles of beauty and utility at once, which can be produced at low rates and in mass production. To the manufacturer, the Exhibition should be a stimulus. For the wood, once shipped from Finland, can be assembled and processed in British factories.

The Finnish Exhibition will therefore be well worth a visit. It will finally prove that Finland has as much to teach us as had Sweden, and that, unlike most other countries, with its teaching it can also provide us with definite material advantage.

The Editor regrets that a special number of THE ARCHITECTURAL REVIEW this month prevented him from giving the Exhibition the many pages of illustrations and comment it would otherwise have obtained.

Four large Finnish firms are arranging the Exhibition.

Much of the work is designed by Alvar Aalto whose sanatorium and whose furniture have already appeared in recent issues of THE ARCHITECTURAL REVIEW. His name, and that of his wife, should be enough to show readers that such an enthusiastic notice as this is justified by the importance of the occasion.

Alvar Aalto's first (1930) composite resting model: plywood seat backs mounted on continuous tubular steel under frames.

This bronze statue by Mestrović was recently erected at Split, Yugoslavia, to the memory of Gregor Niksić, a great patriot bishop.

The column is one of forty which have stood for nearly 1700 years. They formed part of the Emperor Diocletian's palace. The column shaft is in Porphyry marble—the base is granite.

FINNISH CHAIRS

The three illustrations on this page go further to explain the type of work which will be seen at the Finnish Exhibition at Fortnum and Mason's. The top left-hand illustration shows the processing of bending wood. The bottom left-hand illustration shows a bentwood rocking chair in lacquered black beechwood, upholstered in viridian green cotton. It was designed by Hulmann Sevaldsen and is reproduced by courtesy of *The Studio*. The chair illustrated above was designed by Alvar Aalto and is made of bentwood.

The advantage of bentwood chairs is that, owing to the abundance of material and thanks to the lengthy experiments with wood-processing, they can now be produced amazingly cheaply by mass production. A more "finished" chair can also be produced to suit the rich.

AN ELECTRIC ENGLISH OPERA HOUSE

Compared with many countries on the continent, England is very behindhand as regards the opera. In Germany nearly every town has its opera house and municipal theatre, and Covent Garden compares poorly with many of them. In this country the opera is confined to a season at Covent Garden and some productions by touring companies.

It is therefore encouraging to hear that a new opera house has just been built at Glynde, in Sussex, and will be opened next year in the spring or summer. Glyndebourne is a Tudor house, enlarged during the reign of William and Mary, and again since the war. The new opera house, to seat 310 persons, and a music-room large enough to act as a foyer, have now been added to it.

The stage-mechanism consists of over seventy overhead sets, of two stage lifts, of stage wagons, of galleries and of a steam apparatus for stage effects using electrical power. The lighting for the stage is worked by an apparatus in a cabinet which is placed in full view of the stage from the front of the house where the lighting man can control the whole of the dimming, and, at the same time, have a clear view of the results he is getting. About seventy spot lamps are available, and a large Schwabe cloud apparatus is also installed. (See page 194.)

* * *

ARCHITECTURAL LIGHTING

Whilst remodelling their showrooms in Kingsway, Messrs. G.E.C. have added a modern architectural lighting demonstration department to the series of rooms containing period and modernistic visible lighting fittings, and in it every form of wall and ceiling illumination from concealed sources: lay

lighting, cornices, decorative wall panels and so on, is demonstrated in such a way that the architect who has an illumination problem to solve, can see immediately the effect that results from hire of lamps of varying degrees of intensity with stippled, coloured, or etched diffusing glass and variations of reflector arrangement and colouring.

In order to enable the reader to form a mind-picture of the apartment containing these modern lighting devices I cannot do better than quote from a recent publication of the G.E.C.:—

"These structural lighting settings consist of overflowing fountains, recessed windows with rainbow hued curtains of light, the rays of morning sunrise or crimson sundown, and mirror lighting settings of refinement.

"Again there are marigolds, sunflowers, and even cobwebs fashioned in light to catch the eye and hold one spellbound when making a tour of this wonderful home of electric lighting and electrical progress."

TO ELECTRICAL ENTHUSIASTS

Among the many concerns, institutes, companies and associations for the furthering of public interest in, and use of, electricity in this country, only two are purely unprejudiced and disassociated with trade. They are the British Electrical Development Association, Inc., and the Electrical Association for Women. Particulars of both Associations are given in the next columns.

THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.

The British Electrical Development Association, familiarly known as E.D.A., is the central publicity organization for the electricity supply interests in this country. The major activities of the Association consist of various forms of educational propaganda and publicity designed to remove hindrances to development and instruct people in all walks of life in the many uses of electricity.

ENLIGHTENING ARCHITECTS

Of more immediate interest, however, to the readers of this journal are the efforts which the Association has made from time to time to bridge the gulf which for long appeared to divide the architect and the electrical engineer. A start in this direction was made nearly fifteen years ago when the Association produced what proved to be a very valuable report on "The Use of Electricity in Working Class Dwellings." The report dealt with the plans and specification of a subsidy house and showed clearly that by omitting all except one of the fireplaces the houses could be readily adapted for electricity for lighting, cooking, and heating without increasing the cost of construction, indeed the savings effected proved more than sufficient to cover the cost of the entire electrical installation and equipment. Many thousands of these reports were circulated to architects, builders and to members of housing committees, and there is not the slightest doubt that it was to a large extent responsible for the inauguration of a number of electric housing estates which followed close upon the circulation of the report.

THE SPECIFICATION

More recently, the Association has issued a national specification known as the E.D.A. Electric Home Wiring Specification. The specification offers a standard value established by a recognized authority; it gives confidence to the client on the question of *adequate* wiring; it shows how the value of a house can be increased. Copies of the specification can be obtained on application to the Association's headquarters at 2, Savoy Hill, W.C.2.

The Association was responsible also for organizing the electrical section of the Building Centre in Bond Street: those who are familiar with the Centre will appreciate that the Association's contribution is no mean one; indeed it symbolises the electrical industry's desire, through the E.D.A., to secure the closest co-operation between the architect and the engineer, no less desirable for the client than for the members of the two professions. The facilities provided by the Association at the Building Centre are described in a brochure entitled "The Architecture of Electricity."

The British Electrical Development Association, which has been in existence for the last fifteen years, cordially invites architects to make the fullest use of its organization as a source of information on any problems related to the use of electricity in domestic, commercial and industrial premises.

* * *

THE ELECTRICAL ASSOCIATION FOR WOMEN

The Electrical Association for Women was formed nearly nine years ago by the Women's Engineering Society, following a member's suggestion that in the Electrical Age of the future, all housewives would need to be equipped with some electrical knowledge in order to run their homes by efficient modern methods.

Taking as its object the promotion of the use of electricity in the service of women, and the provision of a platform for the women's point of view on matters electrical, the Association found the scope of its work rapidly increasing, and from occupying part of the office of the Women's Engineering Society, it is now at 20, Regent Street, where in addition to the office accommodation, there is a large clubroom for members, and an Electrical Housecraft School, designed for demonstration purposes by a woman architect. The Association has thirty-three branches in England, Wales and Scotland, and a membership of nearly six thousand.

ITS LECTURES

Throughout the year fortnightly lectures and visits of educational electrical interest are arranged for members, weekly evening classes in electrical housecraft for domestic science teachers, a series of special lectures and demonstrations for housekeepers and housewives, and weekly meetings of an educational and social nature for women demonstrators in the electrical industry.

AND DIPLOMAS

Realizing the need for adequate training for these demonstrators, and of giving their work a more professional status, the Association called together a committee of electrical and educational experts, which institutes the E.A.W. Electrical Housecraft Diploma for Women Demonstrators; during the first year 172 diplomas were awarded at the discretion of the Committee to women with more than four years experience in the industry. The first examination for the diploma was held on September 7, and the E.A.W. Certificate was awarded to nineteen candidates, to be endorsed by the award of the diploma when sufficient experience has been obtained.

Other work of the Association has included, in three consecutive years, the organization, on behalf of the Board of Education, of summer schools on "Electricity Applied to the Home," for teachers of domestic science.

Having no trade interest, the Association seeks only to benefit women by spreading among them a wider knowledge of electrical methods which may affect their private and public interests.

* * *

CORRESPONDENCE

A CORRECTION FROM SIR REGINALD BLOMFIELD

The Editor,
THE ARCHITECTURAL REVIEW.

Sir,—In the THE ARCHITECTURAL REVIEW *for October 1933, on page 137, views are given of buildings in the new street known as the Head Row, Leeds, and the names of Mr. G. W. Atkinson, Messrs. Kitman, Parrish, Ledgard, and Pyman are associated with my name as architects of the buildings illustrated. The designs for the elevations of all the buildings illustrated, with the exception of the Leeds Corporation electric power station, were made solely by me, and these gentlemen took no part whatever in the designs of the elevations.*

I should be obliged if you would be good enough to insert this correction in your next issue.

Your obedient servant,
Reginald Blomfield.

1, New Court, Temple, E.C.4.

TRADE NOTES

The General Contractors for the new showrooms of the Westminster Electric Supply Corporation at 112, Victoria Street, S.W.1, were Messrs. Bovis, Ltd. Among the artists, craftsmen and sub-contractors were the following: James Couper and Co., Ltd. (steelwork), Pollard and Co., Ltd. (patent non-reflecting window), Boro' Electric Signs (signs and neon lighting), Comyn Ching and Co., Ltd. (ironmongery), Dunlop Rubber Co., Ltd. (rubber flooring), Mr. Lee-Elliott (designer decorative map), Textophote, Ltd. (painting decorative map), Eric Mundy, Ltd. (applied metal letters), Troughton and Young, Ltd. (electrical fittings), Waring and Gillow, Ltd. (carpet), Lee and Kitley, Croydon (chairs and settees), The Chiswick Guild (table), The Lord Roberts Memorial Workshops (mat).

A 2 kW portable electric heater mounted on a chromium-plated tubular steel frame. Designed by A. B. Read for Troughton and Young.

ELECTRICAL DEVELOPMENT

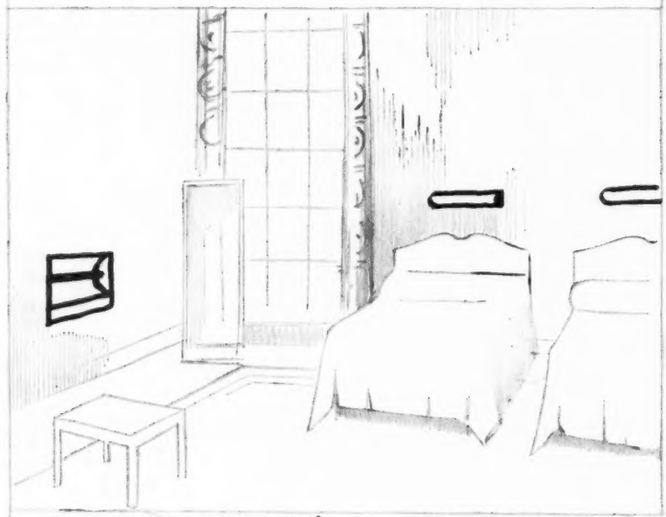
● This supplement to the Architectural Review is presented by the British Electrical Development Association, Incorporated, which is the central educational and propaganda organisation for British Electricity Supply Undertakings.

By means of national advertising, editorial articles in the press, lectures and exhibitions, the Association is constantly endeavouring to bring to the attention of all classes of consumer the advantages of electrification.

It is a distinct advantage both to the public and professions that the Association is able to give advice without any regard for proprietary articles and systems. Some of the work which the Association has done in recent years of particular interest to architects and allied professions is dealt with briefly in this supplement.

The Association cordially invites architects to make the fullest use of its organisation as a source of information on any problems relating to the use of Electricity in domestic, commercial and industrial premises.

The British Electrical Development Association, Incorporated,
2, Savoy Hill, London, W.C.2.
Telegrams : Electreda, Rand, London.
Telephone : Temple Bar 4569 (3 lines).



TOWARDS ALL-ELECTRIC SERVICE

Twenty years ago electricity presented itself to the architect as a source of light—and little more. Today it calls for consideration as a means of heating, water heating, cooking, refrigeration and labour-saving in addition to lighting. Already the all-electric house has proved itself in many thousands of cases to be a very practical proposition, and the prevailing tendency, in houses, large and small, is definitely towards comprehensive electrical equipment.

CHEAPER ELECTRICITY

Progress in this direction is being accelerated by the lower costs at which electricity is generally available, by the rapid spread and increased capacity of electric mains, and by the education of the public. Broadly speaking, the majority of people today are electrically minded ; they are ready to welcome the fullest contribution that electricity can make to beauty, comfort and convenience in their homes, and they realise more and more every day that these benefits can be freely enjoyed and can, in fact, at the same time ease the burden of the household budget.

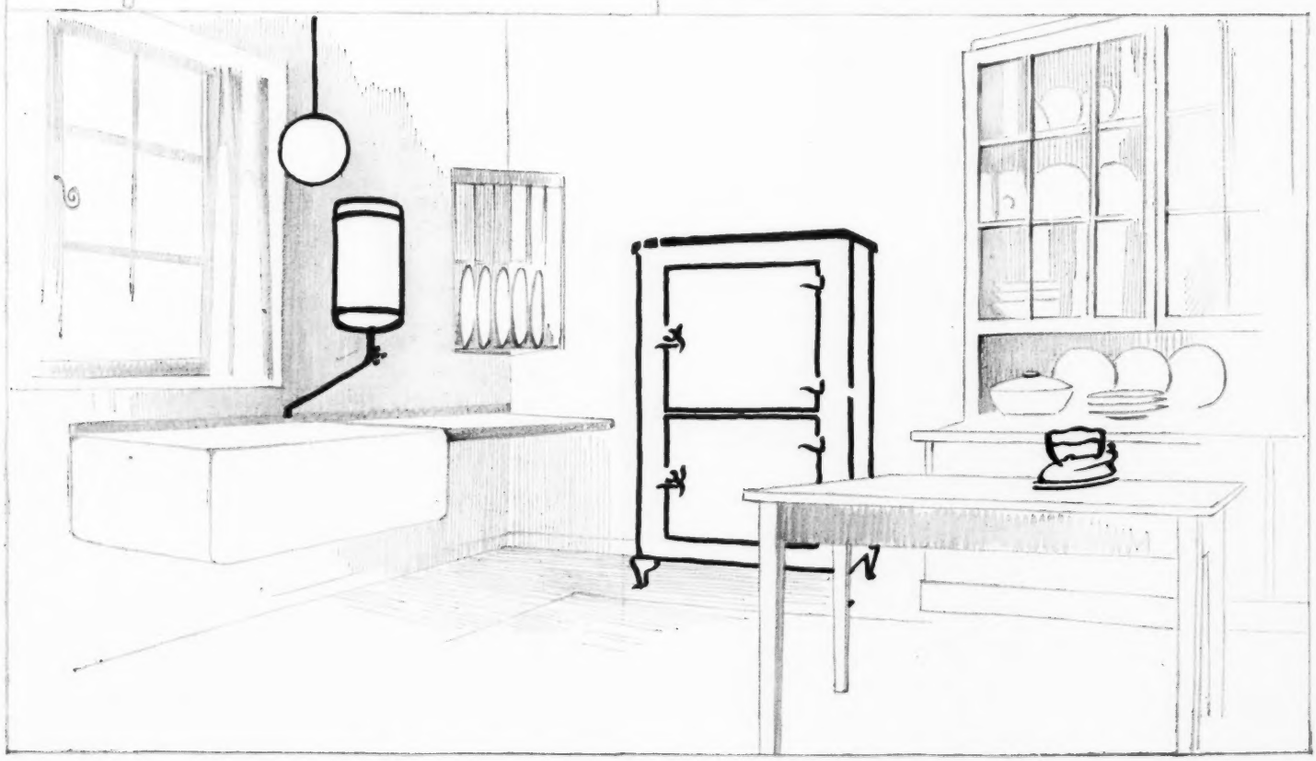
The time has long gone past, therefore, when, in building a house, electrical requirements can be left until the final stages. Provision must be made in the original plans for all that is implied in the modern conception of *electrical service*.

Even in the matter of light alone we have gone far beyond the point at which needs could be satisfied by ceiling points and switches fixed according to rule-of-thumb methods. People have learned to appreciate higher standards of illumination, both in regard to quantity and quality.

There is, further, an increasing recognition of the decorative value of electric light. The ease with which lamps may be placed anywhere enables light to be employed to enhance architectural design.

The technique of "architectural lighting," in which the fittings instead of being adjuncts in the form of pendants or brackets, provide for the light to be incorporated in the actual structure, the illumination being obtained from panels on the walls or ceiling, or reflected from cornice, ceiling or other parts of a room.

Another development which will be appreciated by architects is in the decorative values of colour lighting, for which purpose lamps are sprayed either internally or externally with a lacquer which is for all practical purposes to be regarded as permanent within the normal life of the lamp, and is an infinite improvement on the early efforts to obtain coloured bulbs. The use of these lamps enables a room or any portion of a room to be efficiently supplied with diffused light of any desired colour. For added convenience and utility provision should be made for cupboard lighting, while plug points are essential for portable lighting fittings, such as floor and table standards, and luminous ornaments now available in an extensive variety.



DOMESTIC ELECTRIFICATION AND DESIGN

The advance in domestic electrification has introduced new problems of design. Electricity is unique in providing light, heat and power without combustion, and therefore without fumes. Other sources of heat demand the provision of a flue at every point of use and involve the deterioration of decorations and contamination of atmosphere with hot products of combustion ; electricity is free from these disabilities which hamper design and decoration.

The influence of electricity upon domestic architecture began long ago when it was used almost exclusively for lighting. With electric light the hygienic necessity for lofty ceilings disappeared. At the same time the cleanliness of electric lighting at once made it practicable for the householder to enjoy lighter and more cheerful schemes of decoration. The contrast between the sombre decorations typical of the Victorian age and the brighter modern styles is largely due to the distinguishing virtues of electricity.

The development of electric heating has had even more far-reaching effects. Owing to the provision of pure heat at any point to which wires are run, it enables chimney breasts and flues to be dispensed with, thus simplifying design and either affording more space for the same cost of construction or reducing first cost for the same accommodation.

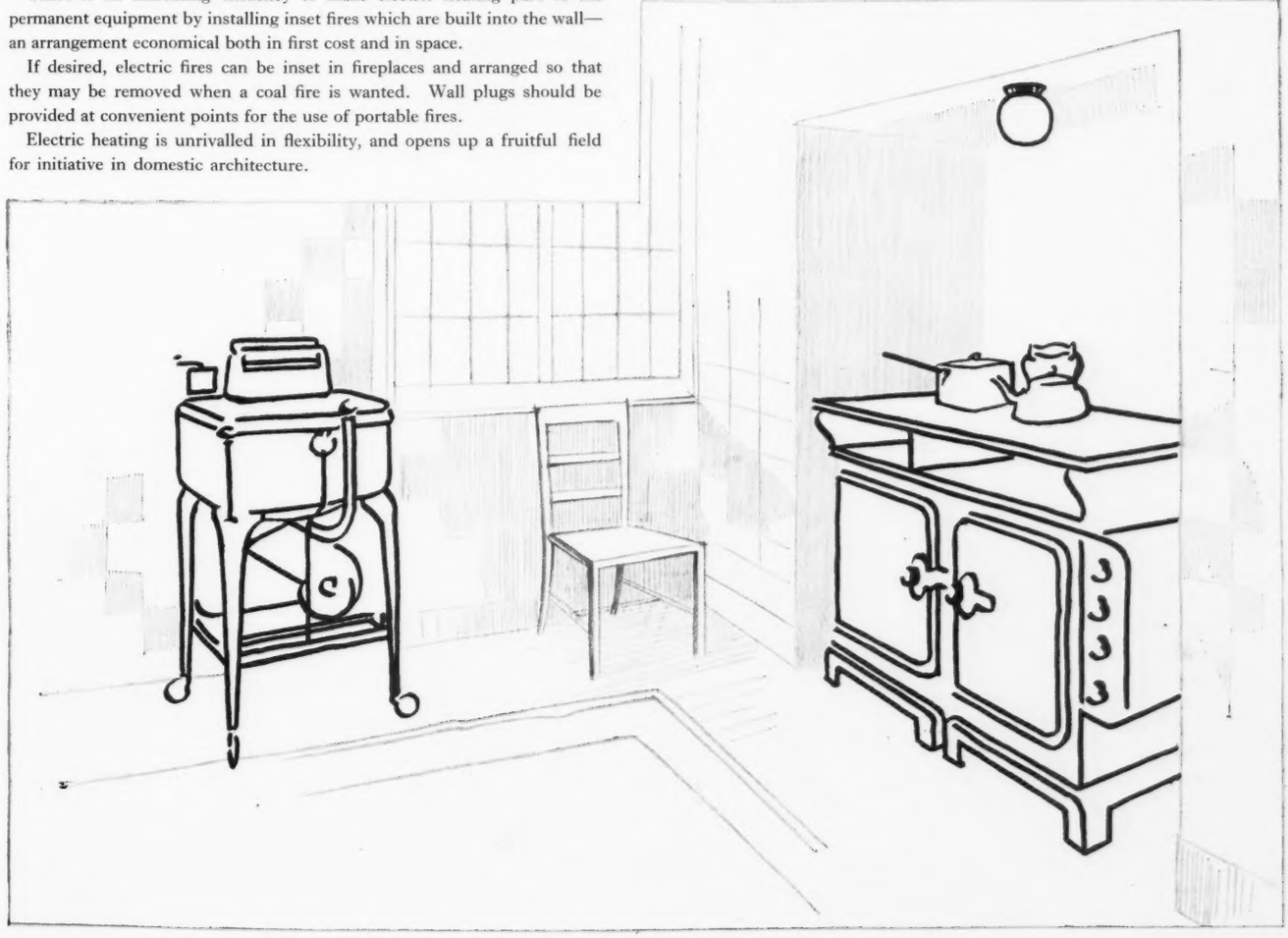
The electric fire is ideal for occasional heating which so frequently becomes necessary with our variable climate. It gives full measure of radiant warmth within a minute or two of switching on ; the degree of warmth can be instantly controlled ; the heat is pure heat, without dust or fumes, and as none of it is wasted the efficiency of the electric fire is unequalled.

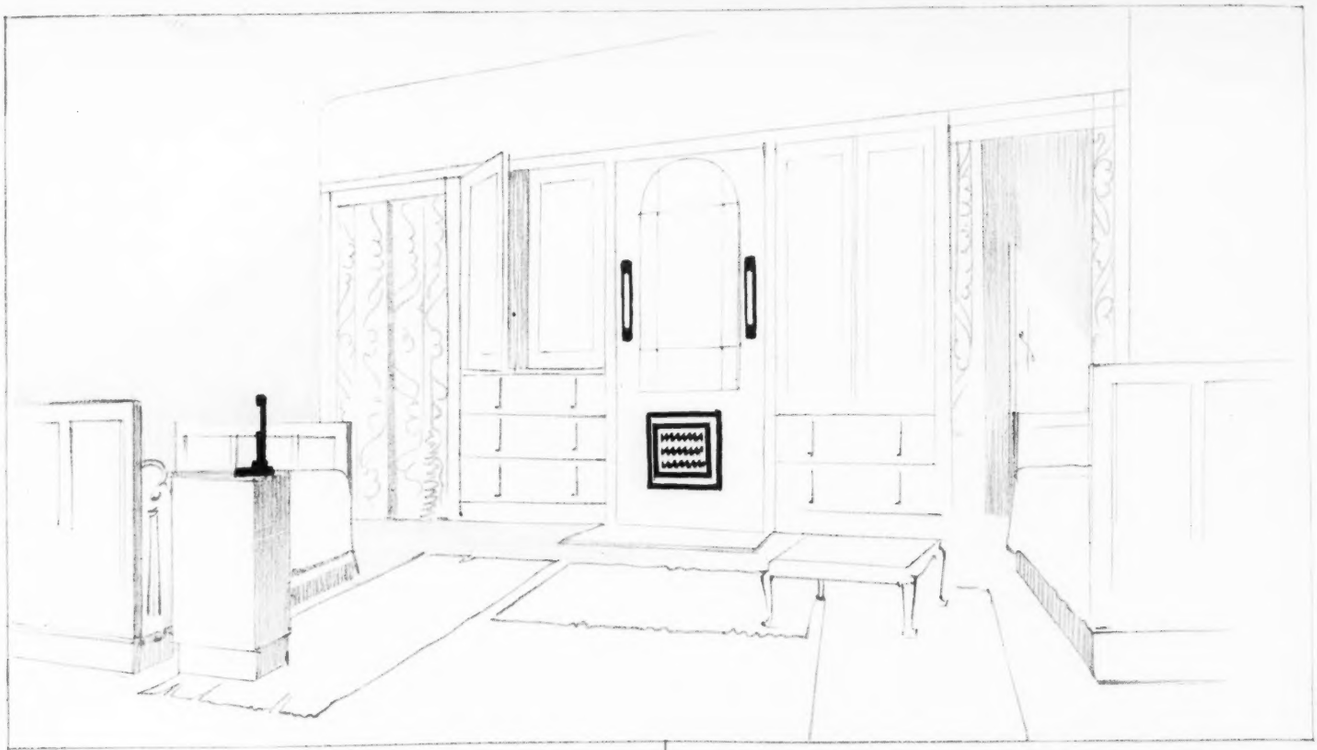
Electric fires are now available in an interesting variety of period, modern and ultra-modern designs. British manufacturers are to be congratulated on the determined manner in which they have set out to place on the market electric fires of improved design free from the objections often criticised in some of the early models.

There is an increasing tendency to make electric heating part of the permanent equipment by installing inset fires which are built into the wall—an arrangement economical both in first cost and in space.

If desired, electric fires can be inset in fireplaces and arranged so that they may be removed when a coal fire is wanted. Wall plugs should be provided at convenient points for the use of portable fires.

Electric heating is unrivalled in flexibility, and opens up a fruitful field for initiative in domestic architecture.





COOKING, HEATING AND WATER HEATING

Nowhere is the value of electricity more appreciated than in connection with cooking and other services involving the major portion of domestic labour. This growing appreciation must have an important bearing upon the design of the modern " workshop of the home." The electrical equipment which is necessary in an up-to-date kitchen consists of an electric cooker, an electric refrigerator, electric water heater, washing machine, wash boiler, electric ironer and other appliances designed to save labour.

The reasons for the popularity of the electric cooker are its cleanliness, reliability, efficiency, ease of control, excellence of results, and the remarkably small degree of waste heat. It produces no fumes and needs no flue ; therefore the designer of the kitchen is able to place the cooker in a position which will fit conveniently into his plan and with full consideration for the most convenient and efficient use of the cooker.

The electric refrigerator forms the ideal larder, in which perishable foodstuffs can be kept fresh for several days. Its hygienic value, in combination with its low running cost and automatic control, has made it an essential item in kitchen equipment. Like the cooker, it can be put in any position, or may be built into a recess designed to accommodate it.

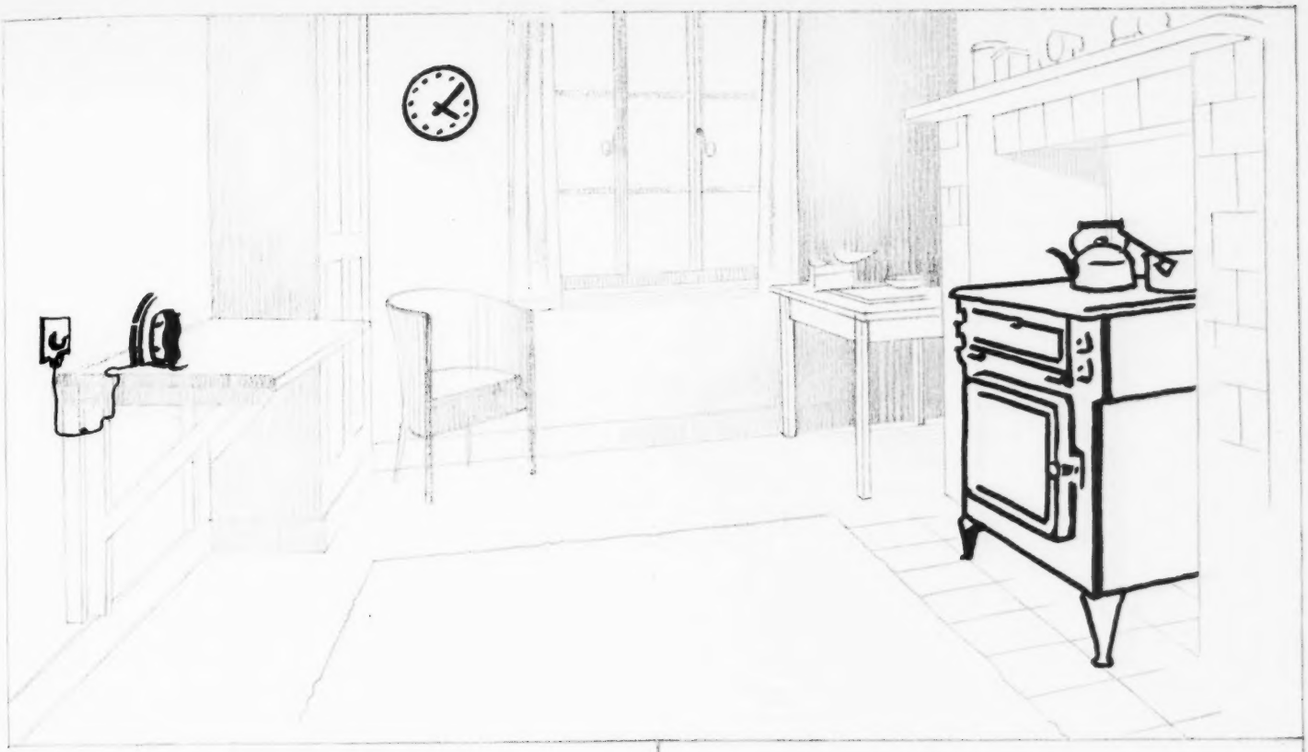
WATER HEATING

The most popular method of water heating is by means of the central electric water heater, either as a self-contained unit or obtained by means of immersion heaters in an existing hot water cylinder. In either case the system is automatic, being thermostatically controlled. As with all other electric appliances, the electric water heater needs no flue, consequently there is practically no heat loss and its efficiency is extremely high. By providing a constant supply of really hot water at any point where required, electricity affords a hot water service superior in every way to old-fashioned methods.

It may be noted that the same advantages apply to the provision of hot water at local points of use by means of small local storage water heaters for lavatory basins, sinks, etc., by means of which long pipe runs are avoided. By the process of recessing storage heaters, space is saved and can be utilised for other purposes.

THE HOME LAUNDRY

The electric washing machine and wash boiler provides the means for clothes washing to be carried out cheaply with a minimum of labour and inconvenience. Combined with the electric iron or ironing machine, they complete the equipment of a home laundry. They take up little room, and it is a simple matter to plan cupboard space to accommodate a washing machine and ironer when not in use.



LABOUR-SAVING

In addition to the services already described—lighting, cooking, heating, washing, refrigeration and water heating—there are numerous electrical appliances which, on account of their convenience and labour-saving qualities, are now regarded as essential to the equipment of the modern home.

Prominent in this group are vacuum cleaners, floor polishers, irons, kettles, fans, milk boilers, coffee percolators, bed-warmers, hair driers and sewing-machine motors.

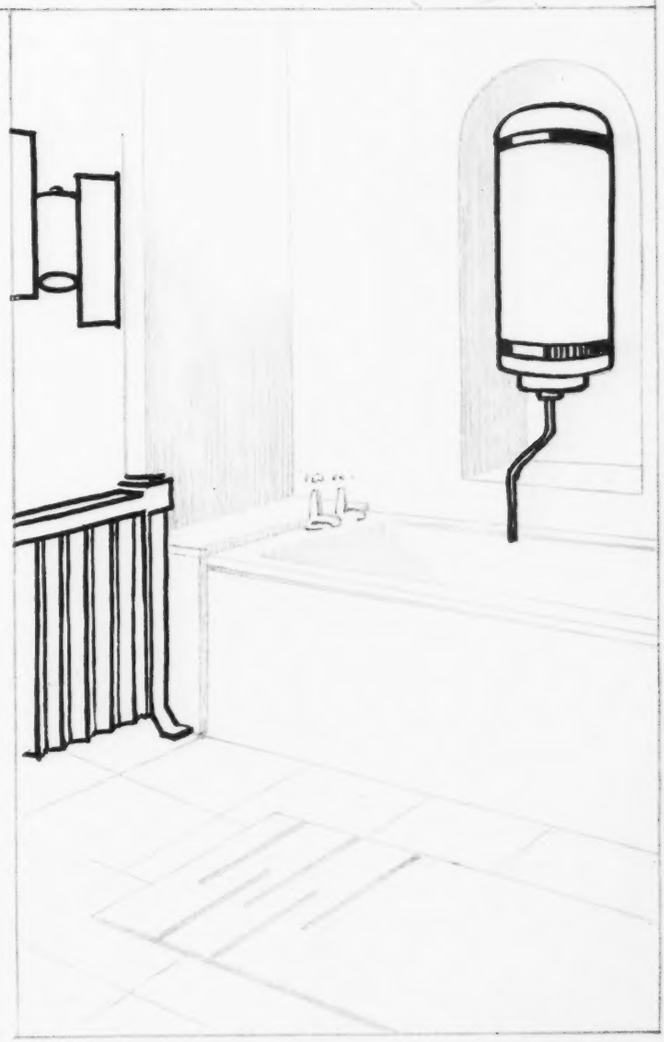
These applications differ from the others in their portability. They are designed for use from any lampholder or wall-plug; consequently the demand they make upon the architect is for an adequate supply of such outlets in convenient positions.

Hitherto the tendency has been to restrict the number of outlets far below the standard required for the convenient use of electrical appliances. For the guidance of architects, builders and others in this important matter, the British Electrical Development Association has prepared a model Home Wiring Specification which sets out in detail the lines upon which houses should be wired and equipped for adequate electrical service.

The specification should be regarded as setting out the minimum provision. Any increase in the initial cost of wiring is amply repaid by the great advantage and convenience of having wall plugs available at several points in each room, in passages and on staircases. By specifying British Standard plug-sockets throughout—the 15 ampere size for fires, and the 5 ampere size for lamps and small appliances—interchangeability is secured in addition to safety.

No structural modifications are involved in these aspects of electrical service, but it is useful for the architect to bear in mind the provision of convenient cupboard space for portable electrical appliances.

All-mains radio sets and all-mains clocks feature amongst recent additions to the ever growing list of electrical helps. Special outlets should be provided for the radio, and connecting wires run to various rooms for additional loud-speakers. Supplementary wiring should be installed for electric clocks, the terminals being brought to the centre of mantelpieces or other appropriate positions. As the electric clock mechanism can be inset in the panels of walls or furniture, it lends itself in an unusual degree to decorative treatment.



ELECTRICAL SERVICE IN TENEMENTS

The British Electrical Development Association is conscious of its great responsibility in this matter and urges the co-operation of every Architect who will be concerned in the development of these schemes to ensure that in so far as it is possible every facility shall be provided to increase the amenities and improve the hygienic conditions of these new dwellings with a view to rendering it impossible for some of the evils in the old to reappear in the new.

The programme for slum clearance provides for the clearance of about 210,000 houses, rehousing over one million people in five years—at a cost of about £95,000,000.

But even this ambitious programme does not embrace by any means all the efforts that are being made for providing better accommodation for the working classes. Apart from slum clearance many local authorities, building improvement societies and private owners are actively engaged on the construction of tenements and small houses.

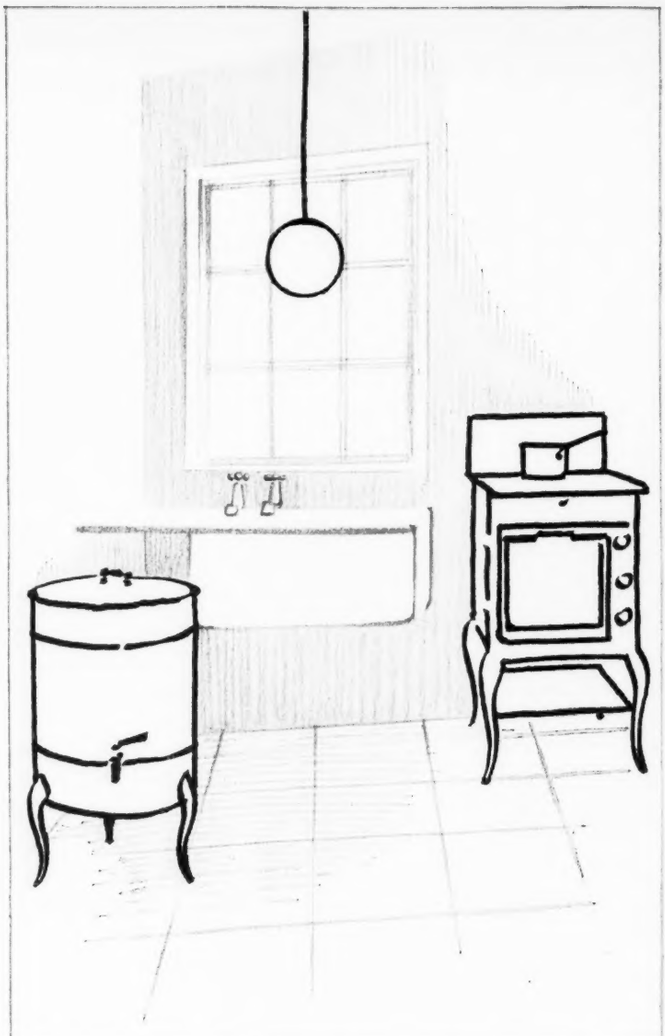
The problem is to provide, on an economic basis, not only the accommodation demanded by modern hygienic standards, but also the fullest measure of the comforts, amenities and conveniences that the means of the tenants will permit.

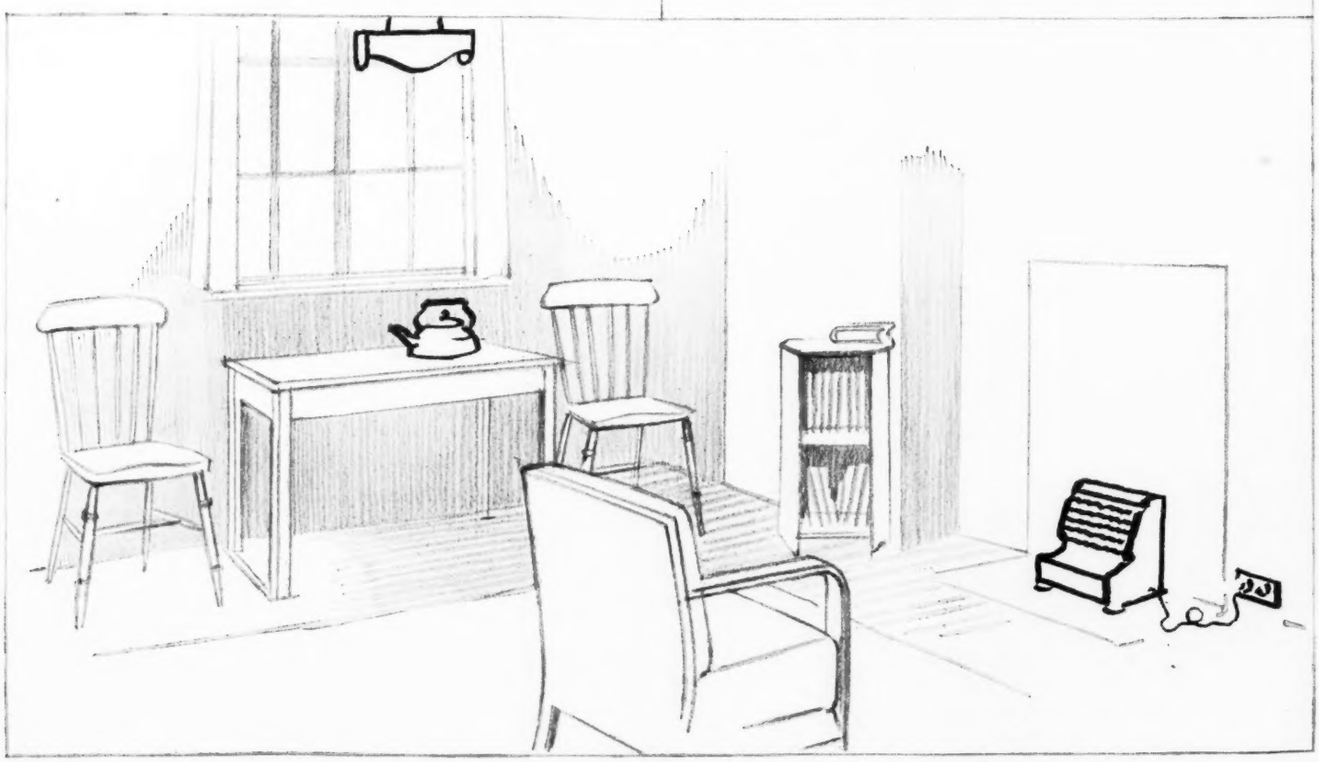
The part that electricity can play in solving this urgent and complex problem is not so fully recognized as it deserves to be. As electricity was first adopted by the well-to-do and permeated slowly downwards through the middle and lower middle classes, the notion that it is a luxury beyond the reach of the poor has become a rather stubborn tradition.

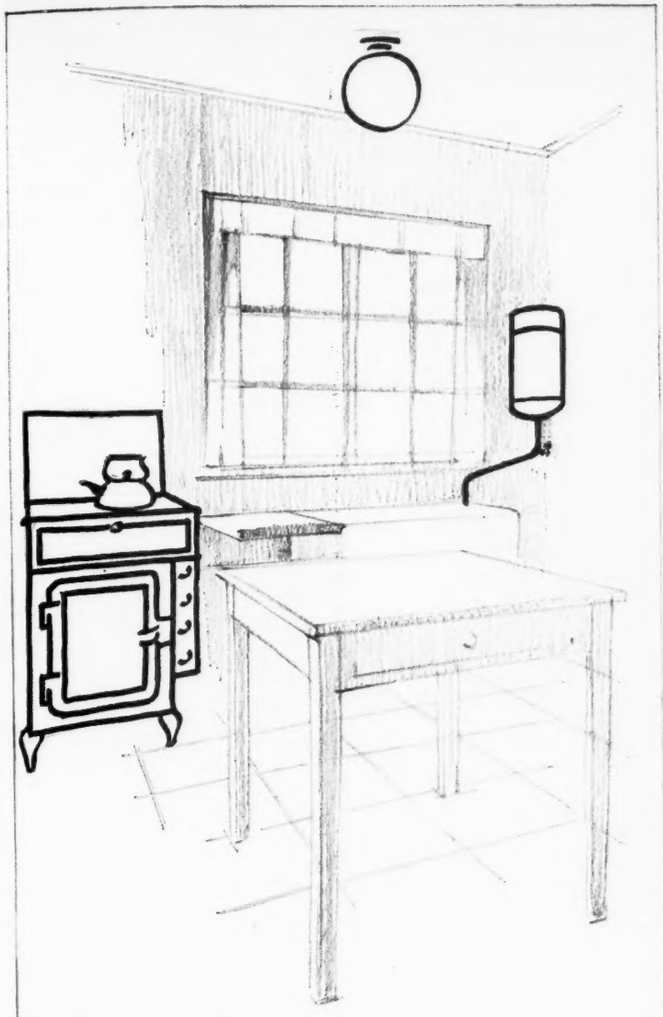
To-day, nevertheless, we find electricity used not only for lighting but also for heating, cooking and water-heating in the humblest homes, both in the country and in the towns.

This change has been wrought by the gradual cheapening of electricity resulting from improvements in production—culminating in the construction of the Grid—and from the increasing use of current for all purposes. Electricity is now available in numerous districts at a running cost of ½d. per unit, and in almost every centre of population at a penny or less than a penny per unit, which unquestionably places it on an economic level with alternative services.

Both in London and in the provinces working class tenements are provided with electrical service on a basis eminently satisfactory to the tenant, to the owner and to the electricity supply authority.







ELECTRICAL SERVICE IN TENEMENTS

The secret of success in supplying electricity to working class dwellings lies in making provision for the regular use of current for purposes other than lighting. Where the supply is given for lighting alone, the tenant is deprived of the vastly more important advantages of cheap electricity while the architect is unable to make the best of the convenience and economy of design which electricity renders possible.

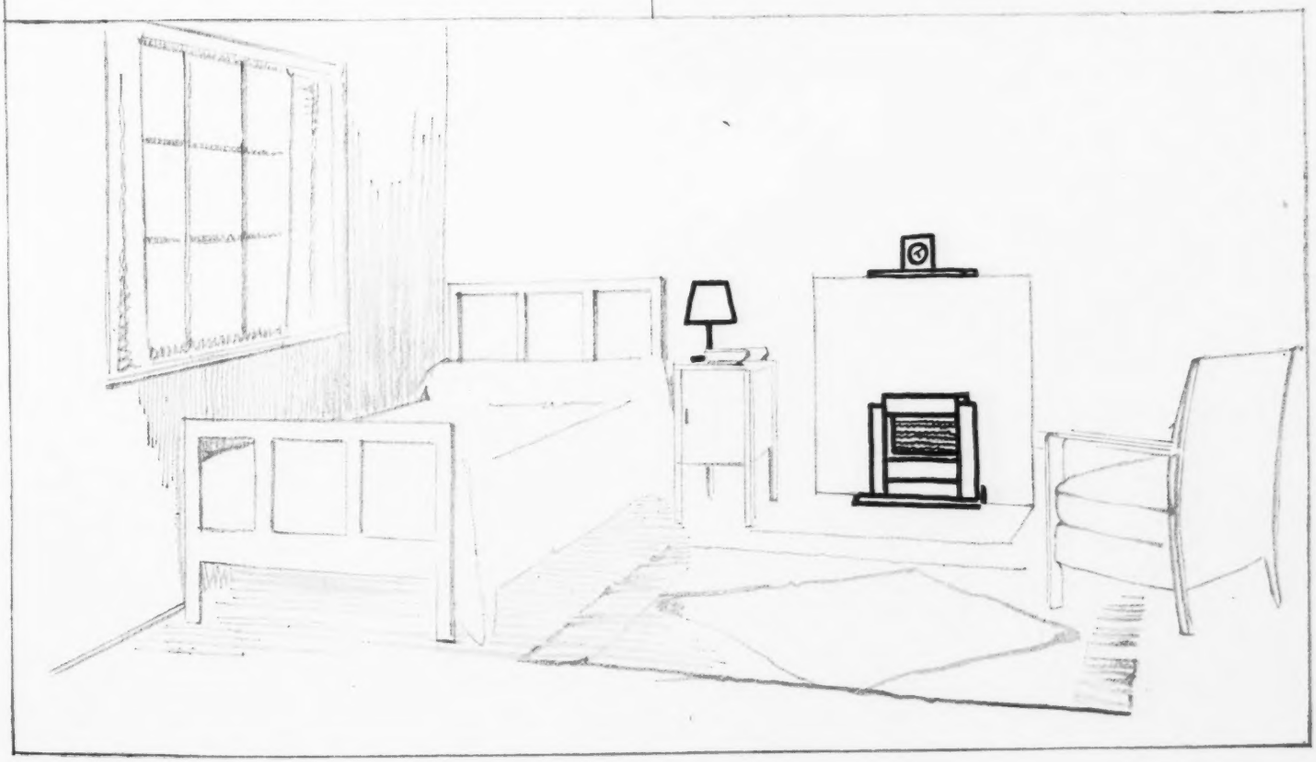
Typical electrical equipment in a modern London tenement includes, in addition to electric lighting, an electric cooker (with oven, grill and two hot plates), a 2-kilowatt electric fire, a 10-gallon wash boiler and an electric iron. The wash boiler is used not only for washing but also for filling the bath. The cooker, wash boiler and bath are all placed in the kitchen-scullery.

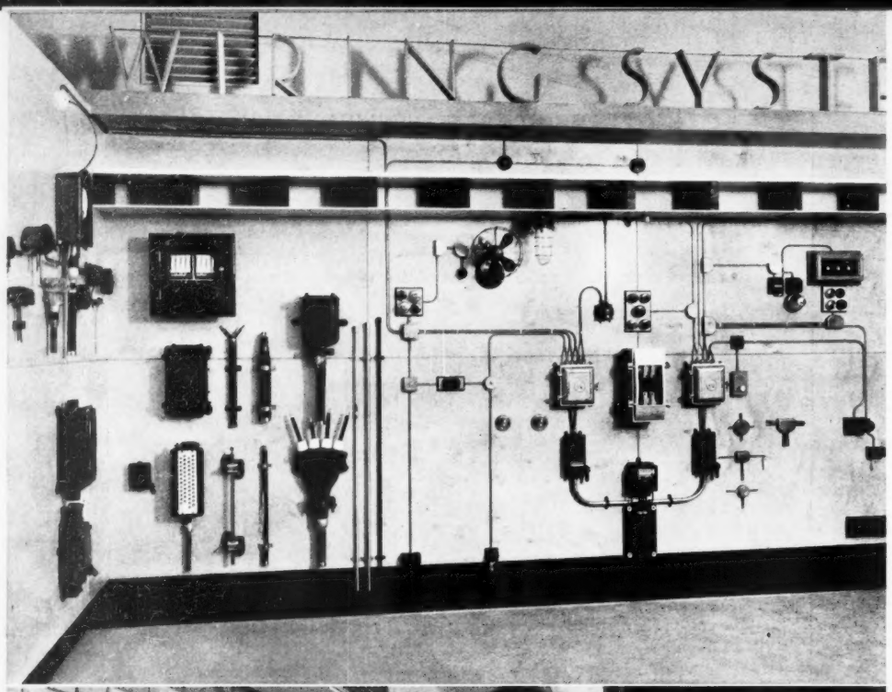
A combination range is generally fitted in the kitchen, so that only one flue per flat is necessary. To the resulting economy in space and in cost of construction there is added the saving in cleaning and redecoration, owing to the cleanliness of electricity.

The cost to the tenant is about eighteen pence per week for the use of this electrical equipment which includes the standing charge on the electrical service, meter rent and hire of apparatus. This sum is, for the convenience of the tenant, included in the rent, the owners remitting the amounts collected in respect of the charges to the electricity authority at the end of each quarter.

Current is charged at ½d. per unit through shilling-in-the-slot meters, the money being collected in the usual way by the electricity authority. Current consumption averages from about 1s. 3d. per week in a two-room flat to about half-a-crown in a four-room flat. It will be readily appreciated that these costs are definitely lower than would be the case if the tenants were obliged to use a variety of forms of light and heat.

Such arrangements which have been adopted in a considerable number of areas over the country have already amply proved that they give the utmost satisfaction to the tenants, the owner and the supply authority. The success of the above typical example under conditions prevailing in the metropolis proves that electrical service in tenements is a sound proposition.





ELECTRICITY IN THE BUILDING CENTRE

At the Building Centre at 158 New Bond Street, London, W.1, there is a large variety of electrical exhibits, a few of which are illustrated on these pages.

Left above:

Installed electrical cables, conduits and accessories.

Left centre:

Electrical cookers, pastry ovens and refrigerators for restaurants, canteens and hotel kitchens.

Left below:

Fittings, designs, and electric lift sections.

ON THE OPPOSITE PAGE

Top left:

Surface type of rectangular storage water heater.

Bottom Left:

A pedestal electric water heater, an example of bathroom lighting over a mirror, and an electric towel rail.

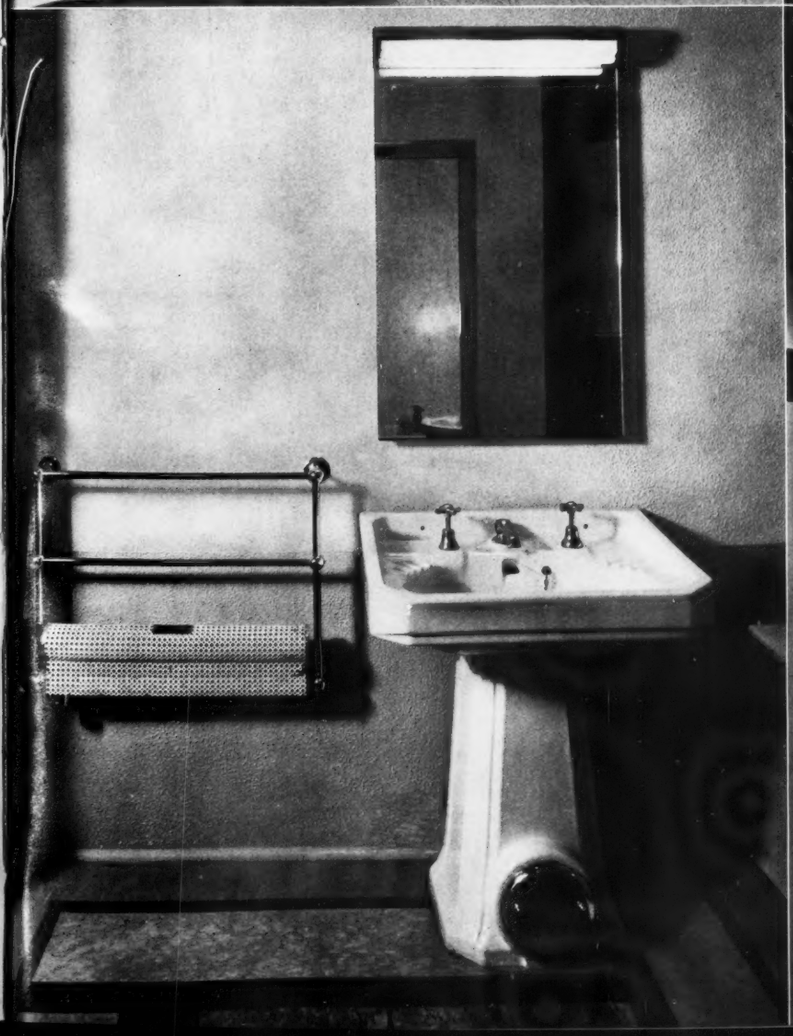
Top right:

Sunshine tube for interior lighting.

Bottom right:

Trough lighting in the ceiling of the ground floor.

• An illustrated book is published by the British Electrical Development Association entitled **The Architecture of Electricity** which gives an exhaustive review of the electrical exhibits at the Building Centre.



ELECTRICAL SERVICE

Lower Ground Floor

● The electrical section at the Building Centre, 158, New Bond Street, London, W.1, begins on the lower ground floor at the point where the service cables enter the building. Here will be found the model sub-station of the Westminster Electric Supply Corporation, also commercial cooking and refrigerating apparatus, electrically equipped bathrooms and a telephone exhibit staged by the Post Office.

The sub-station affords a typical example of the space needed for the accommodation of the plant.

On the right-hand side of this corridor leading from the model sub-station is an exhibit of electric cooking equipment for canteens and other commercial uses. It includes large cooking ranges (see illustrations on page lviii) for restaurants and hotel kitchens, also pastry ovens of the type which are coming into general use among bakers. The commercial electric refrigerator appears among these exhibits.

On the north side of this corridor there are two electrically equipped bathrooms with electric water heaters built into alcoves. The wash-basin in one of the rooms has a self-contained water heater inside the pedestal under the basin (see illustrations on previous page).

No flexible wires are exposed anywhere and all the fittings exhibited are of non-corrosive material, the fires being fixed in safe positions.

Next to the bathroom exhibits is the display arranged by the Post Office telephone department.

Ground Floor

● The display windows of the Building Centre are illuminated by concealed electric lamps with special reflectors. In the main entrance there is an example of luminous tube lighting which produces a sunlight effect. The tube is fixed to the ceiling pelmet and follows its outline. On the south side of the entrance hall there is a glazed and illuminated panel which shows the rising electric mains and cable ducts. This particular exhibit is designed to enable architects to see the provision which is necessary for the admission of an adequate electrical service to modern buildings.

Glazed and lighted floor traps and wall panels are installed throughout the Centre to facilitate inspection of the wiring arrangements. Various systems of show-case wiring are demonstrated in the entrance hall and elsewhere throughout the Centre. In the main corridor of the ground floor on the north side there is a series of bathrooms in which various forms of lighting systems and illuminated mirrors are shown, one room illustrating the effect of an illuminated ceiling panel above the bath.

In the main corridor itself, concealed lighting is provided by a trough. (See illustration on previous page). A number of built-in and portable electric

FOR ARCHITECTS
AT THE BUILDING CENTRE

fires and lighting fittings are shown on the ground floor and at the far end of the corridor on the north side three electric kitchens have been equipped.

The equipment includes vertical and table type electric cookers, grills and boiling plates, refrigerators, water heaters, vacuum cleaners, floor polishers, an ice cream freezer and various other domestic appliances. All the apparatus shown is on circuit and can be demonstrated in actual use by an expert who is in permanent attendance.

First Floor

● The electrical apparatus shown here includes installed wiring systems, fittings of various types, fires and heating systems, hospital equipment and health treatment appliances. An exhibit on the east wall consists of cables, conduits and electrical accessories. Round the upper part of the wall a section of flooring with joists and floor boards has been provided to illustrate the actual methods of wiring. On the wall itself systems of wiring (conduit, lead-covered cables, etc.) are installed complete with junction boxes, switches, fuses and other accessories connected to fittings and appliances.

Adjoining this display is a collection of fittings and accessories exhibited by individual makers. Luminous signal indicator equipment is also shown.

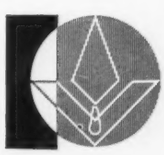
The section described as the Solarium includes various health apparatus, ultra-violet ray lamps, etc. All these exhibits are arranged on a glazed counter provided with push-button switches so that any appliance can be easily operated.

Adjoining the Solarium there is a section devoted to electrical heating systems which includes radiant fires of luminous and non-luminous types, convectors, tubular heaters and other low temperature heating systems which can be automatically controlled by thermostats.

The Electric Lamp Manufacturers' Association of Great Britain, Ltd., has provided a big display of electric lamps of all types and sizes. This section also includes a showcase of portable lamp fittings, and various small appliances and a coloured lay light with push button and sliding panels and motor operated dimmer.

This brief outline of some of the exhibits suggests the wholly practical character of the electrical sections in the Building Centre. It is designed to facilitate the work of architects, and the Association maintains a permanent staff there which is available for technical consultation.

Copies of a special book published by the E.D.A. on the exhibits of the Building Centre entitled "The Architecture of Electricity" will be sent free on application to the Association at 2 Savoy Hill, London, W.C.2.



WARMING BUILDINGS BY ELECTRICITY

What are the chief features of an ideal system of providing artificial warmth indoors ?

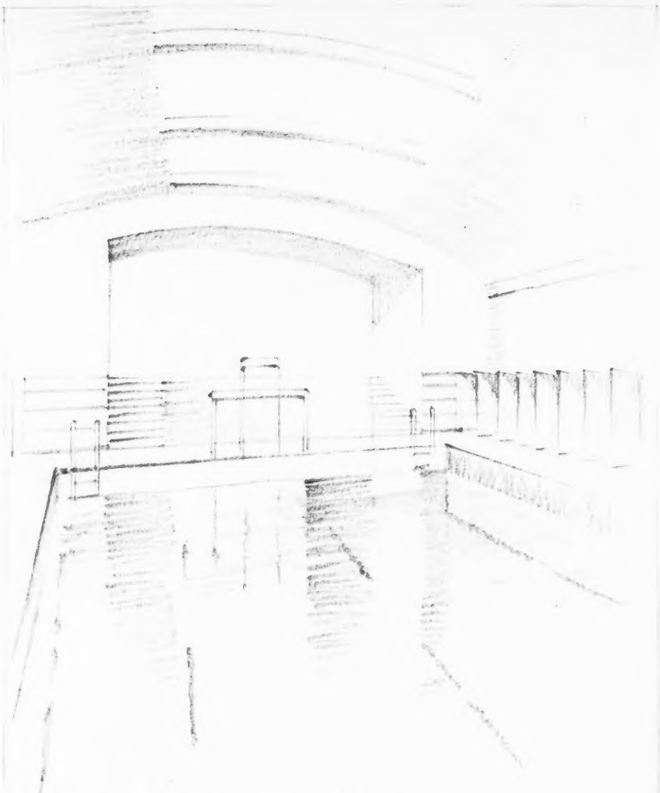
This is a question which the architect is well qualified to answer, because he is naturally concerned with the fitness of things. The ideal system of warming should be so adaptable that it can be moulded into the design of a building, so free from complication that the necessity for including flues and chimneys does not arise, and so flexible that the most convenient use is assured. These advantages, and many others, are inherent in electric heating.

The superiority of electricity as a heating agent is, in fact, generally accepted, and the chief reasons why it has not been more generally employed have been dependent upon practical matters of construction and cost. Let it be said immediately that the progressive reductions in the cost of electricity in recent years have materially altered the financial aspect of the question, and that the equipment developed by British makers is unequalled in any other country.

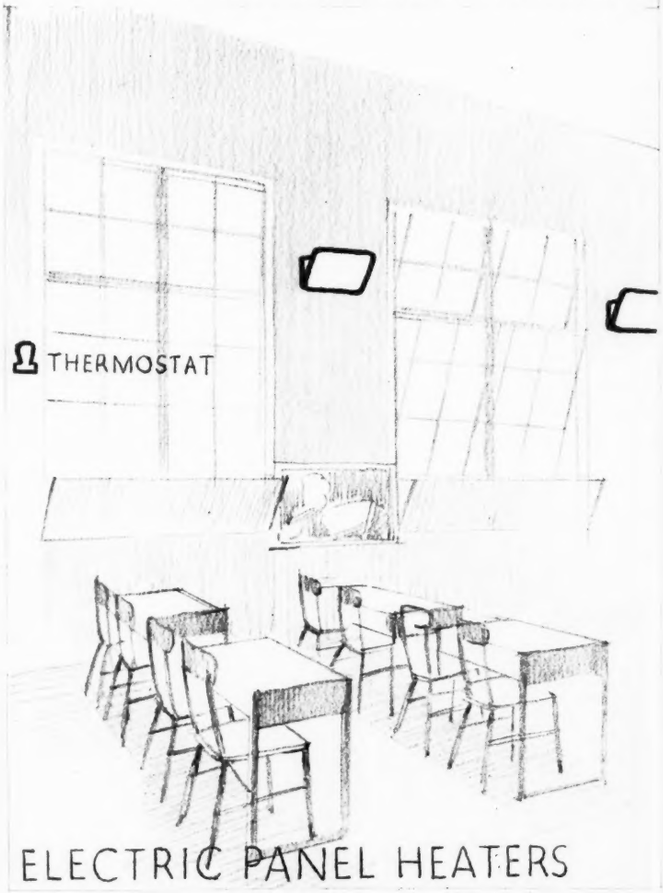
From every point of view electric warming should receive careful attention in the design of buildings of the future. Its practical application no longer depends upon the persuasion of enthusiasts. Exact experience is readily available so that designs leave nothing to chance and estimated costs of maintenance can be relied upon.

The warming of large buildings by electricity began by the employment of electric boilers in conjunction with ordinary central heating systems. This method is still used to a considerable extent and will no doubt be extended in future ; it ensures that heat is obtained at the lowest possible cost because Electricity Supply Authorities can afford to sell current at extremely low rates, say 0·3d. per unit during the night when there is very little other demand. The heat so generated in the electric boiler is accumulated in a thermal storage vessel for use during the day under automatic control.

The thermal storage system of warming has very definite advantages when compared with other methods in general use. First, there is a real simplification of the design and layout of the building, because no flues or chimneys are required. This leads to an appreciable reduction in building cost and the release of a certain proportion of floor space. Secondly, the heating plant takes up less space and can be easily fitted into the most convenient position irrespective of roadways or other circumstances of the site. All the heat passes into the



BATH AND BUILDING
ELECTRICALLY HEATED



ELECTRIC PANEL HEATERS

building through a cable ; nothing but heat is generated and there is no combustion, noise or smell.

Regulation of heat supplied to the building is carried out by an automatic mixing valve which only allows sufficient hot water to be released from the storage cylinder to maintain the desired temperature, according to the operation of a thermostat fixed in a typical room. This means that overheating and stuffiness do not occur.

The other drawback of ordinary systems, namely, insufficient warmth first thing in the morning, is also positively overcome by the electric method by reason of the fact that there is a large store of heat always available at the beginning of the day. Such improved operating characteristics place electric thermal storage heating in a strong position, especially when the saving of all labour charges is taken into consideration.

The applications of electric thermal storage are many and the arrangements differ considerably. The design of plant is governed by the total heat requirements, the space available for the installation and the nature of the electrical supply.

TYPES OF THERMAL STORAGE PLANT

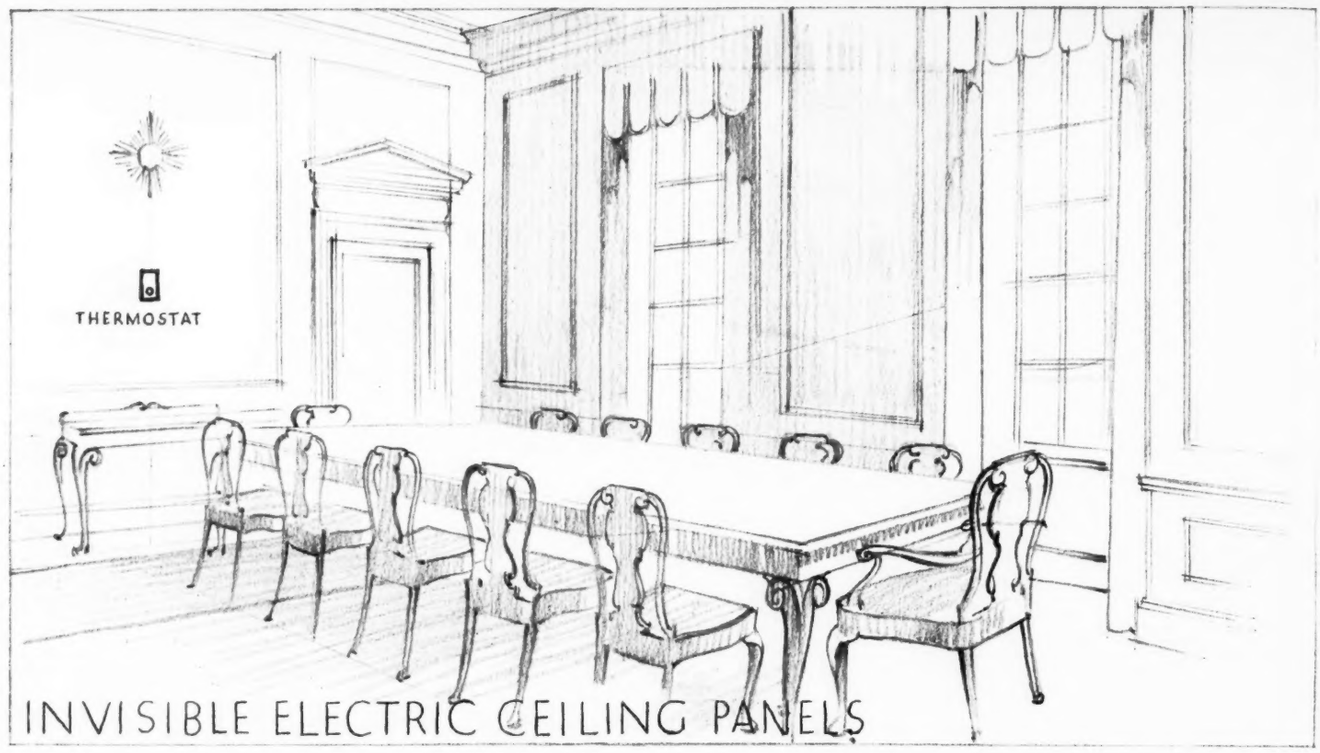
In buildings with a large heat demand, say 500,000 cu. ft., or larger, the electric boiler is usually constructed to utilise an extra high tension supply voltage so that the cost of a transformer is saved. For small buildings it is sometimes found desirable to dispense with a separate boiler, electric immersion heaters being mounted direct in the storage cylinder.

The total annual cost of heating by this method will compare favourably with fuel-fired plants. The efficiency of the electric heating equipment is very high, being in the neighbourhood of 98 per cent., and the greatest economy in use is assured by the accuracy of the automatic control. The electric thermal storage system has been largely used for offices, theatres, garages and factories. The latest application of the system is in connection with the heating of swimming baths. Electric heating is used not only for warming the building and hot water for slipper baths, but also for heating the water in the swimming pool.

EFFICIENCY IN PRACTICE

The fact that the efficiency of the electric method closely approaches 100 per cent. is easily appreciated, but the comparative efficiency of other methods is not always accurately examined. In one investigation of the overall thermal efficiency of fuel-fired installations for public baths it was found that the average figure was no more than 12 per cent. This is much less than the thermal efficiency of modern electricity generating stations; consequently there is true economy as well as financial saving to be made in utilising electricity for large-scale heating.

ELECTRIC TUBULAR HEATING



TUBES, CONVECTORS AND PANELS

The greatest advantages of using electricity as a source of heat for ensuring conditions of comfort for the occupants of buildings are obtained when warmth is produced directly by electricity in individual rooms. A variety of equipment is available for this purpose, ranging from water-filled radiators similar to those used in ordinary central heating systems but heated by an electric element fitted in the lowest waterway, to specially designed panels which are built into ceilings or walls, so that they become an inconspicuous part of the structure.

By these direct or local methods of heating there are further substantial savings in building costs as, not only is the construction of flues and chimneys avoided but also the boiler house and much work in connection with accommodation for the hot water pipes, all of which frequently amount to as much as the cost of the heating plant.

The essence of this general system of electric warming lies in the use of accurate thermostatic control in every room. Reliable and inexpensive thermostats have been developed for this purpose, and can be depended upon to control the temperature in the most effective manner. Their use not only permits the warming to be regulated according to the requirements of the individual rooms, but also permits the various occupants to have the temperature set in accordance with their personal predilections, an arrangement which completely safeguards the owners of the building from complaints about the heating installation.

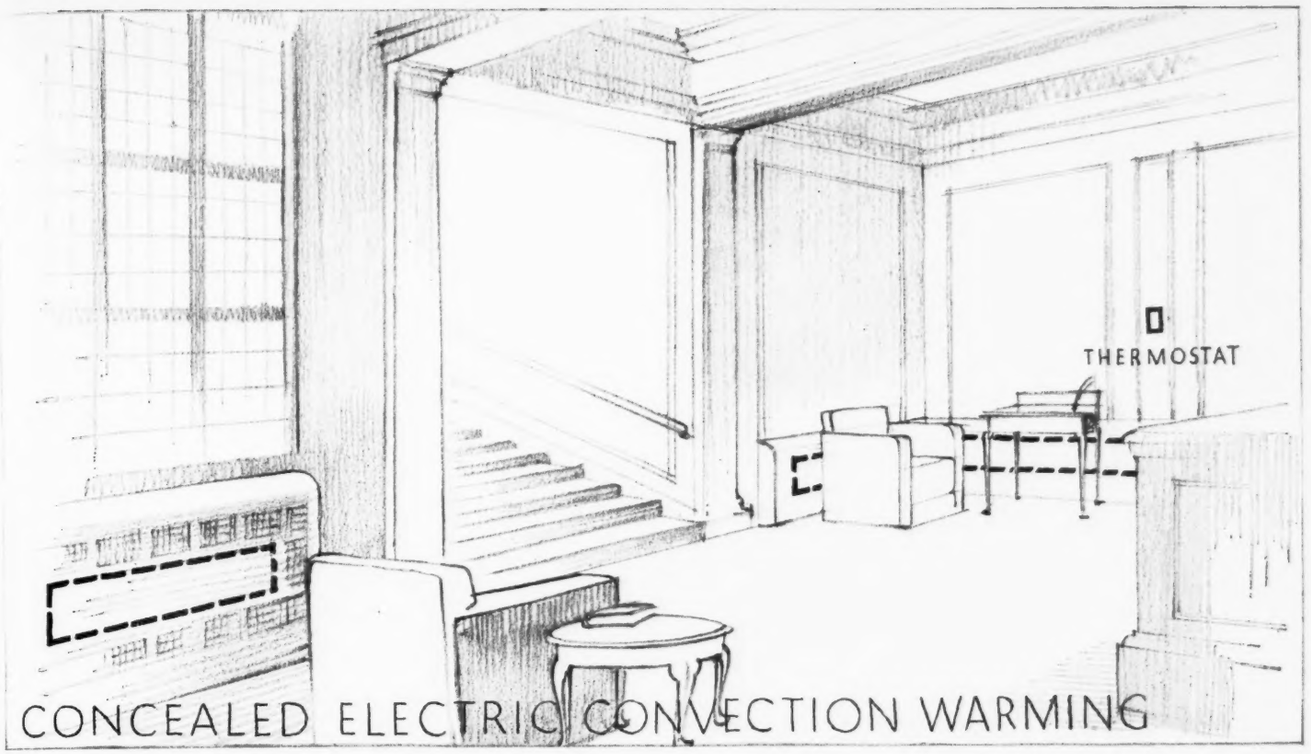
In point of fact, electric warming systems of this type are quite free from the objections commonly raised against central heating. Stuffiness cannot occur, and as a large proportion of the warmth is provided in the form of radiant heat the pleasant impression received on entering an electrically warmed building is always confirmed by the favourable comments of the occupants. Electric warming has become recognised as one of the most desirable amenities in modern offices as well as modern houses.

Thermostatic control ensures the maximum economy in use, and sub-division of the warming equipment between the various rooms renders possible the saving of heating costs in rooms which are temporarily unoccupied, as is often the case in public buildings, offices and hotels. Moreover, the warming equipment can be readily extended at low capital cost and without inconvenience or disturbance to the existing installation.

LOW WORKING COST

The question of running cost need cause no concern in the large majority of places now that the cost of electricity has been reduced to such low figures as one penny per unit or less. So much experience has been gained with electric warming that estimates of current consumption may be accepted with confidence. The actual amount of electricity used will naturally depend upon the hours of occupation and the heat losses of the structure. In the case of a church or public hall used only one or two days during the week, the annual consumption may be as little as one-tenth of a unit per cubic foot of content. A school building may require about half a unit and an office, about one unit per cubic foot per annum. Such figures, which are based on thousands of installations, show that the cost of electric warming will compare favourably with other methods of warming when the saving of labour, the great reduction in maintenance and other advantages are assessed in terms of money.

In addition to thermostatic control, electric warming is also controllable in point of time by an automatic time switch. This controls the electricity supply to all the rooms and ensures that current is always switched on at an early hour so that the building is warmed in good time for the day's work. A recent refinement of such time switches is the incorporation of a temperature-sensitive



CONCEALED ELECTRIC CONVECTION WARMING

device so that current is switched on earlier on a cold morning.

The fact that most electric warming apparatus consists of comparatively light material ensures that there is very little time lag on the adjustment of temperature and conditions of comfort are uniformly maintained.

The earliest and best known type of electric low temperature warming equipment is the tubular heater, which consists of a plain steel tube about two inches in diameter, containing the heating element. Tubes are applied either singly or in banks, according to the heat requirements, and are usually fixed on walls just above skirtings ; they are also used at high level positions for correcting down draughts in lofty buildings such as churches and factories. The total length of tube required is calculated for each room according to well-established methods which take into account the heat losses through the walls, floor and ceiling and the loss of heat by air change. As the thermostat will prevent excessive temperature rise, it is well to make sure that the loading is sufficient to deal with the worst weather conditions, a minimum temperature of 30° F. being usually assumed.

The temperature setting of the thermostats will depend upon the use of the building : for living rooms and offices 65° F. is usually satisfactory, 60° F. being sufficient for corridors, halls and churches.

One or more thermostats are used according to the size of the room, and it is important that these should not be fixed immediately over the heaters.

ADAPTABILITY IN DESIGN

It must be emphasised that the use of tubular heaters need not be unsightly in buildings where appearance is of importance. Tubular heaters can be recessed into walls or a suitable ornamental casing may be fitted over them so that they are quite unobtrusive.

Another type of low-temperature warming equipment consists of a casing made of metal, wood or other material suitable for the surrounding style of decoration, and so designed to allow for the free passage of air. The heating elements, consisting of resistance wire coils, are mounted inside on suitable formers spaced and held in a frame.

RADIANT PANELS

It is now generally recognised that if a considerable portion of artificial warmth is provided by means of radiation rather than the direct heating of the atmosphere, a lower air temperature will suffice and more pleasant conditions of comfort will be provided. The example of the popular electric fire shows that electricity is particularly suited to provide radiant warmth, and several different types of electrically heated panels have been developed for this purpose. They are being increasingly adopted owing to the facility with which they may be incorporated in the structure of a building.

The simplest form of electric panel consists of a ceramic plate fixed on the wall or incorporated in a lighting fitting. This type of panel works at a comparatively high temperature, approximately 600° F., and emits a very high proportion of its heat by radiation. It is particularly suitable for use in large halls and in open-air schools.

Panels suitable for building into ceilings and walls consist of flat iron or steel casings containing heating elements and working at a surface temperature of between 120° and 250°. Alternatively, special low temperature heating fabric, working at a temperature of only 100° F., may be applied directly to plaster board, or may be built into the ceiling itself and plastered over.

The utilization of panel heating in this way is probably one of the best examples of the perfect adaptability of electric heating.

As in all other systems of electric warming, the efficiency of the installation is maintained year after year at the constant full value of heat output for the electricity used.

USING THE E.D.A.

● It is the job of the E.D.A. to know everything about the latest appliances, the latest method of electrical service, the simplest and most economical ways of solving problems connected with the installation of electrical equipment of every kind.

The huge capacity of electricity for domestic, industrial, commercial and public service, inevitably reacts upon the plan of buildings and upon the character of their interior equipment and decoration.

● The E.D.A. is organised to give technical assistance to Architects in the problems which are continually arising in electrical equipment. This constant reference to electrical problems suggests complexity: actually electricity is the great simplifier. It enables planning to be lucid and convenient, because electricity can do anything anywhere without making clumsy demands upon space, without uprooting and destroying services, making only the most modest claims upon accommodation. For proof of this statement see any piece of modern electrical apparatus or any well-planned installation.

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