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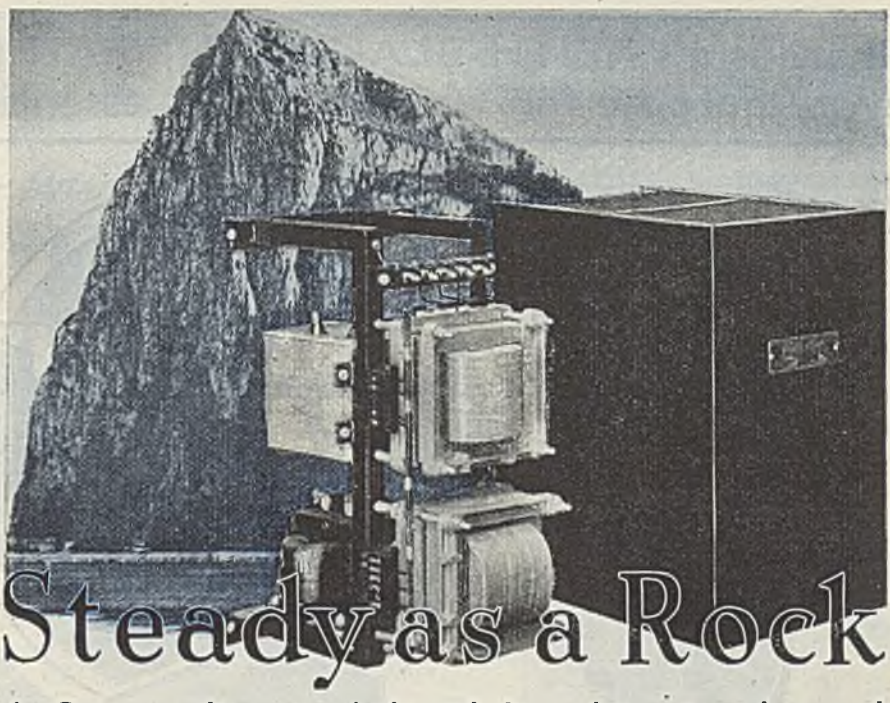

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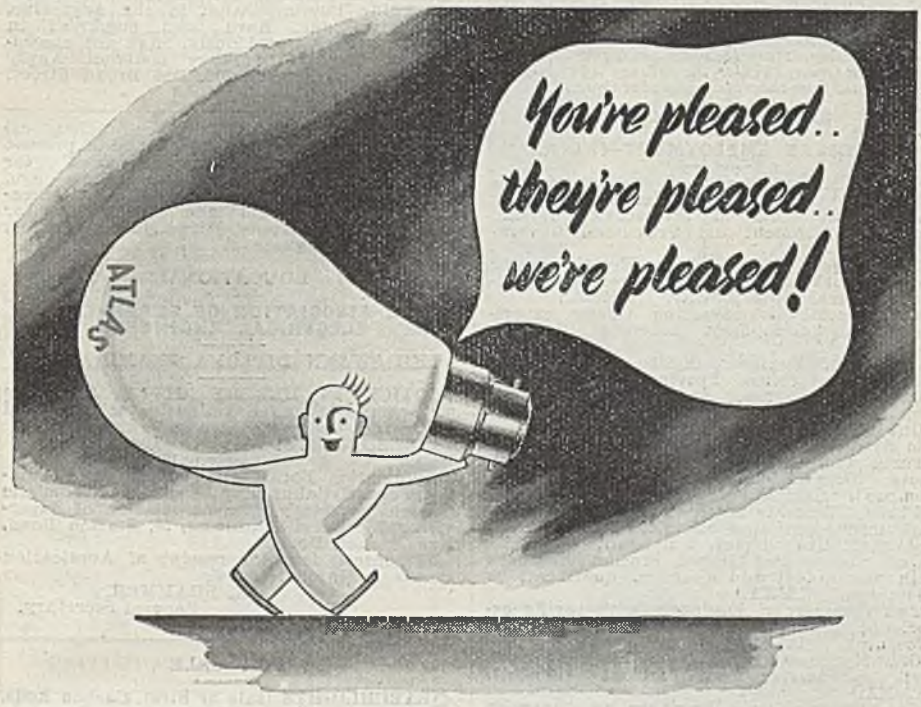

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A. BRAMMER,
General Secretary.

22nd November, 1945.

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The Fuel Famine

THE appeals which the Ministry of Fuel and Power has been making in the national Press for economy in electricity consumption—though explaining that without any additional plant and despite the impossibility of proper maintenance during the last six years our power stations are still being called upon to produce 50 per cent. more current than pre-war—offer no admission of the fact that the shortage of plant is due to Government policy. Warning of the conditions now existing in the generating capacity field were put forward by the Central Board first in 1940 and repeated in subsequent years, but it was not until last year that approval of some of the extensions beyond the direct war effort requirements was obtained. Since then the execution of that programme has, it appears, fallen behind schedule—again as a result of Government policy.

The reason for withholding permission to extend our stations to capacities greater than those needed to meet the munition-making loads during the war years was said to be that the materials and labour needed to manufacture generating plant, could be put to better use in the manufacture of armaments, but, we ask, what justification can there be for permitting the approved building programme to remain behind schedule when—with our enemies defeated—by releasing for building generating plant labour now tied up in a network of controls which no longer apply to the altered circumstances, realisation of the whole programme could be speeded up?

The whole problem of fuel famine seems to be permeated with official pessimism, for instead of showing a lead in constructive reconversion following the stupendous effort made by the supply industry during six years of war, the Ministry whose responsibility it is to administer to its needs and at the same time see that the public requirements are satisfied, can apparently, do no more than issue warnings of possible load-shedding during the next few months, while its Labour equivalent, of the same negative frame of mind, continues to keep man-power in a condition of mobilisation against dangers which none but the Ministry regard with awe.

The fuel position is admittedly desperate but if left to itself, it is not unreasonable to assume that industry would by now have done something positive about it; done something to expedite our passage through the gloom which the end of the war has left behind; done something to inspire individual enterprise and personal risk in an attempt to replenish our dwindling coal stocks, inadequate generating capacity and falling volume of other fuels.

During the last six years we seem to have become disciplined to what is

called "ordered planning," when in fact past industrial history shows that our world leadership in commerce and technology was built up, not according to the dictates of this or that Government department, but on a willingness to take risks following what in military parlance would be called appreciation of the position. No one can reasonably question the seriousness of the fuel situation, but we have yet to hear arguments in favour of the Government's present handling of it which inspire confidence enough to hope for early relief.

Electricity Generation Statistics

THE resumed publication by the Electricity Commissioners of their official returns with respect to generation, indicates a certain falling away of the units generated during the first ten months of this year compared with the corresponding period of 1944. This may be due to various causes but the chief we judge to be the reduction in load provided by the war factories which, operating to full capacity during the months January to October of last year, were not operating at such high tempo during the current year. Another cause may reasonably be the increasing age of generating plant without replacement, while the demand, in response to the Ministry of Fuel appeals, has no doubt been reduced. In spite of the falling away the figures are, however, still impressive, generation during October alone amounting to 3 179 million units. At the present stage in the post-war period, the industrial demand on our generating capacity is not by any means as heavy as it will be when peacetime requirements for the home and export markets are being met, and the tendency we imagine, may well be for the monthly returns before very long to record substantial increases, without, we hope, embarrassing results.

Electrical Service in Temporary Houses

OF the temporary houses now being erected throughout the country, fully 55 per cent. are all-electric, and many of the tenants will be using electricity for cooking and water heating for the first time. To help the householder to make the best use of the benefits which such service has to offer, the E.D.A. has produced a twelve-page illustrated brochure which describes in simple language the electric equipment in such houses, a copy of which is to be given away to every tenant. This little book takes its reader on a word tour of the house, indicates the position of the meter, main switch and fuses, and gives details of the number of plug points in the different rooms with suggestions as to their correct use. It will be obvious to all in the industry who see this booklet that the housewife who has never used an electric cooker will, after reading the simple instructions which have been specially prepared, have no difficulty right from the first time she uses the cooker, in getting the consistently good results which electric cooking provides. In the same way the correct use of the electric water heaters and refrigerators which are installed in the houses is also explained. Publication of such a booklet is timely, for the tenants of temporary houses will eventually reach such numbers that unless they are sufficiently educated in the handling of electrical equipment to give satisfaction in its operation, there may be built up a prejudice favouring the use of the less modern fuel to which many of the tenants became familiar in their former homes. To approach the problem of operating an electric house, however small, armed only with the experience of other fuels, is both unfair to electricity and user. The E.D.A. is to be congratulated on its vision.

Nationalisation

THE statement by Mr. MORRISON on Monday on nationalisation, added little to the programme put before the electorate in July. The Labour intention to nationalise the fuel industries was long since declared, and electricity supply was clearly selected to follow coal through the legislative mill. The policy of the Government is so far without details, but the issue calls for the largest practical wisdom from the Government and the closest vigilance by Parliament, in that there is a danger of party zeal outstripping the proclaimed purpose of the change, namely to increase the national output and income by every available means. We say this because Mr. MORRISON introduced into his statement a warning note which was not in any way called for; this was to the effect that all necessary development in the industry must proceed and that the Government propose to see that progressive undertakings will not be prejudiced if they

continue to develop in the interim period, inferring thereby that the tempo of the industry is slowing down. Mr. MORRISON made no reference to compensation except to mention pointedly the penalties that might attach to failure to keep undertakings in a state of full efficiency, and the industry has still to learn the form and powers of the organisations to be set up. These are matters about which the earliest possible information should be given, and its absence in Mr. MORRISON'S statement, makes one wonder why the subject was discussed at all.

Electricity in Rural Areas

THE appointment of Mr. H. W. GRIMMETT as chairman of the E.D.A. Rural Electrification Advisory Committee, is the first indication of this useful body commencing its work, and if the proceedings of the first meeting are anything to go by, no time will be lost in making known its activities in both rural and electrical circles. Among the many things pointed out by Mr. GRIMMETT at the first meeting was the fact that although development was held up during the war, some 2 000 to 3 000 farms were connected annually during the war years. The total of 290 000 farms in England and Wales includes many agricultural holdings without housing but even so, no less than 25 per cent. of these properties are connected to the mains, while of farms of over 1 000 acres, 64 per cent. are connected. The importance attaching to the extension of electrical service in rural areas is accepted by all sections of the industry, and various company-owned authorities have already prepared plans for meeting the needs of the country-side. The attitude of the Government with respect to nationalisation and the absence of any clear statement as to what is to be the future constitution of the supply industry is, however, responsible for some delay in putting these plans into effect.

Achievements in Photo-telegraphy

READERS of South African newspapers saw photographs of the Silver York leaving Britain to inaugurate the new Springbok air service twenty-four hours before the aircraft arrived at Capetown. The photographs taken on the Saturday, were handed to Cable and Wireless Ltd. in London on the Sunday, and were ready in South Africa by mid-morning on the same day. The value of photo-telegraphy was also illustrated recently when the Cable and Wireless manager in Singapore needed hurriedly to re-open the local bank account. He wrote a letter to the bank, giving specimen signatures, then wired facsimiles of the letter to London so that the company could telegraph back confirmation of the signatures to satisfy the bank. The whole transaction was completed in a single day.

The Voice of Protest

MANUFACTURERS and traders who have noted the many pronouncements of SIR STAFFORD CRIPPS in the past two months, can be in no doubt regarding the determination of the President of the Board of Trade to endeavour to apply his extreme Socialistic theories to our major industries. Not long ago when Sir STAFFORD addressed, in London, an audience of representatives of many varied industries, one who was present caustically attributed the very large attendance to the fact that all had come to hear whether the Minister was going to apply his working party plan to their particular trade, or whether out-and-out nationalisation of their industry was imminent. Industrialists are getting a little tired of platitudes that mean nothing, and when the President of the Board of Trade addressed the Society of Motor Manufacturers and Traders the other day, he was met with loud cries of dissent on suggesting that people in this country should go without cars so that export could be built up. This austerity declaration accorded ill with the Minister's later statement that "this was the morning of victory and hope." It is all to the good that industrialists are raising their voices in protest against those who prolong and perpetuate controls, regulations and hampering restrictions on production and trade generally, and at the same time assume the title to teach the manufacturer how to conduct his business. The motor manufacturers certainly showed what they thought of Sir STAFFORD'S fantastic notion that exports can flourish while home trade languishes.

New L.M.S. Control System

Modernised Telephone Equipment at Stoke-on-Trent

A NEW control system, costing £1 000 000, has been adopted by the London, Midland and Scottish Railway Co., to facilitate passenger and goods traffic over its 20 000 miles of track, and to ensure that the trains run to time.

Nineteen operating districts are being formed by merging the existing 42 control districts in England and Wales, and in each of these new areas a district operating manager will be appointed with responsibility for all train running and organisation of passenger and freight services in his district. The offices of the district operating managers are being equipped with the latest telephone apparatus, so that they and their staff can make instantaneous contact with every station-master, engine shed, carriage shed, goods marshalling yard, and signal box in their areas. Four of the new offices are already in operation—Birmingham (Western), Leeds, Derby and Stoke.

General view of the Stoke-on-Trent control room

In the new lay-out at the Stoke-on-Trent control office, accommodation is provided for nine operators, four positions being equipped with area diagram boards on which traffic movements are plotted, these boards being positioned so as to be easily viewed from all other positions in the office. Each operator is provided with a separate desk and keyboard unit. An independent switchboard is provided for circuit switching. In order to allow for a flexible staffing arrangement, all circuits are connected to each keyboard which, in addition, provides the following facilities: (a) Inter-communication between all operators and administrative offices; (b) independent connection to the main station exchange.

In modernising the terminal equipment at the control office, no alterations have been made to the external circuit operation, by which the control office is selectively called by a reverse loop battery or differential ring and out-stations are called by code. Provision has been made for operation of inter-control office circuits on a full selection basis by digit dialling.

All "Call" and "Busy" lamps are normally operated direct from the a.c. mains, via step-down transformers at 24 V. The P.A.X. unit, operator's telephone and relay sets are operated from duplicate 26 V secondary batteries. Ringing-out on the control circuit is also derived from a secondary battery.

Fault alarm signals are provided to cover the following services: (1) Failure of any circuit or position fuse; (2) failure of mains supply; (3) operation of ringing trip relay sets. The ringing trip relay sets are provided to guard the ringing battery when ringing out on a faulty circuit. In addition to the normal display of alarm signals on the apparatus racks, these signals are also extended to a panel fitted on the control office, complete with reset switches.

During certain periods of the day selected control circuits are utilised for the setting up of an inter-control office conference network, and for this purpose it is necessary that the circuits concerned should only be available to the persons concerned. This facility is provided by the relay switching of lines via conference keys located on the fault alarm panel in the control office.

All cabling is carried out in lead-covered switchboard cable. Each keyboard and switchboard is cabled back to the local side of an intermediate cable frame located in the apparatus room. Cabling from the relay set rack and fuse panel rack is terminated on the multiple side of the same frame and connected to the local side via jumpers, thus providing a completely flexible arrangement for testing and faulting. All external circuits are connected to the equipment via a main cable frame which provides full protection against lightning, etc.

Low Voltage Cable Distribution

Some Experiences in the United States With Overhead Conductors

IN the current issue of the American General Electric Review, is described some experiences in the United States in the use of insulated cables as overhead distributors, and below is an abstract giving the salient features.

It is first pointed out that before the war there was a trend toward the increased use of insulated cable in various phases of power distribution, but the limitations on the use of copper necessitated by the war-time requirements restricted installations to new war plants and to maintenance and repair operations. It is anticipated that the use of insulated cables for overhead distribution will return, however, and the problem will, therefore, need to be reviewed in relation to the new developments which have taken place in insulation materials in the interim.

Two types of self-contained aerial cables which were, before the war, beginning to receive extensive use will soon again be available, and the demands for improved appearance of power distribution lines will

Example of ærial cable installation (seen above telephone lines) running through trees

probably increase, particularly in high-class residential and suburban areas.

The experience of one American supply authority with the pre-assembled type of aerial cable has led them to the conclusion that if all the advantages are capitalised, the cost of an aerial cable installation is not much greater than that of bare wire construction.

It is claimed that the cost of standard messenger-and-cable construction is approximately 130 per cent. of bare wire construction at 5 000 V. Since, it is stated, the special pre-assembled cable is approximately the same in material cost as the standard messenger construction and re-

Fig. 1.—Pre-assembled ærial cable composed of three conductors and a copper-clad messenger

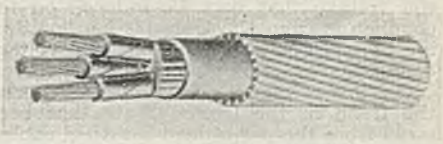


Fig. 2.—Self-supporting ærial cable insulated with varnished cambric, and a rubber jacket with a steel and copper sheath

quires only about 50 per cent. as much installation time, the cost differential between this type of aerial cable and open wiring is substantially less than 30 per cent. Greater production of the cable and more experience with its use may permit still lower costs.

For one typical installation, cable was furnished in 850-ft. lengths, and the maximum time required for installing a length was 2 hr. and the minimum time 41 min.; these times did not include splicing the individual conductors, in that this could be done later without the presence of a full crew. The average installation rate for standard messenger construction is said to be three days per mile.

One type of cable which has been used quite extensively is the pre-assembled arrangement in Fig. 1, consisting of three rubber-insulated shielded conductors which are cabled together and bound to a copper-clad steel messenger by means of a 0.030-in. thick copper tape applied with a long pitch. At each pole, the copper tape is unwrapped for a short distance, the messenger placed over a standard messenger clamp, and the cable pulled up to the correct sag. Pole spans of 150 ft. and above are common.

Another type of self-contained aerial cable which has been used in exclusive residential sections, is the self-supporting type illustrated in Fig. 2. This cable has

a wire armour over the assembled conductors which consists of alternate strands of steel and copper. The steel wires in this form the messenger and at the same time the copper strands can be used as the earthed side of a single-phase system or the neutral of a 3-phase system. The high-strength steel used in the armour will permit long spans to be used and will also protect the cable from damage. The necessary fittings for this type of cable have been developed.

A self-supporting control cable like that shown in Fig. 2 but with twisted-pair conductors has been installed for pilot-wire relaying purposes on several high-voltage lines. The armour permits long spans and the cable can usually be installed on the transmission-line towers, rather than requiring supplementary construction, or the renting of lines for relaying. The armour can be earthed frequently and thus forms a high-conductivity shield which minimises the voltage that may be induced on the conductors from the transmission line during normal operation, or abnormal voltage conditions due to faults or lightning surges.

On low-voltage underground networks, the trend in the United States has been away from the use of lead-sheathed cables, primarily because of the cost of the leaded cables, handling difficulties due to weight, electrolysis problems, and corrosion from other agents. Because of these factors, many supply authorities changed to braid-covered cables; although this change solved the problem of weight and in general reduced cost, the braid did not offer sufficient protection from the oils, greases, and other agents harmful to rubber which are often present in manholes and ducts. In addition, the braid often became charged and men working in the manholes received severe shocks.

One practice which started before the war and which seems to offer satisfactory answers to most of the problems, is the use of a sheath of polyvinyl chloride or of chloroprene over the rubber insulation.

For circuits buried directly in the earth, rubber-insulated cables with polyvinyl chloride or chloroprene jackets have been used satisfactorily, and their use, with some of the new insulating materials should prove even more successful since the synthetic sheaths are not affected by those agents which are harmful to rubber jackets.

Although shielding should be provided for rubber-insulated cables at 2 300 and 5 000 V, there are instances where circumstances dictate the use of non-shielded cables at those voltages; in such cases, the use of cables jacketed with either of these synthetic materials will minimise the corona damage which usually causes the braided or rubber-jacketed cables to fail in a very short time.

In September, 1943, the American cable industry was required to eliminate the use of natural rubber in the manufacture of all cables except those covered by Armed Forces specifications. Although substantial quantities of the synthetic rubbers were manufactured in that country prior to that date, almost all of it was devoted to conversion of the tyre industry. As a consequence, the cable industry received only small quantities for development purposes. Despite this, however, the change to synthetic materials was made with little loss in production and comparatively little change in the resulting product.

Only a few of the various types of synthetic compounds have been used by the American cable industry and some of these compounds and their characteristics are listed in Table I.

TABLE I.

CHARACTERISTICS OF SOME SYNTHETIC COMPOUNDS USED IN THE UNITED STATES CABLE INDUSTRY.

Compound.	Make-up.	Type.	Use.	Dielec. Prop.	Phys. Prop.	Resistance to: Ozone and Sun.	Oil.	Burn.
Buna S.	Butadiene and Styrene.	Thermosetting.	Insulation or Jackets.	G	G	F	P	P
Butyl.	Iso-olefindiolefin Copolymer.	Thermosetting.	Insulation.	E	G	G	P	P
Polyvinyl Chloride.	Vinyl Chloride Polymer.	Thermo-plastic.	Insulation or Jacket.	F	G	E	E	E
Polyethylene.	Ethylene Polymer.	Thermo-plastic.	Insulation.	E	G	E	F	P
Chloroprene.	Chloroprene Polymer.	Thermosetting.	Jacket.	P	G	E	G	E
Buna N.	Butadiene and Acrylonitrile.	Thermosetting.	Jacket.	P	G	F	G	P
Natural Rubber		Thermosetting.	Insulation or Jackets.	G	E	F	P	P

E—Excellent. G—Good. F—Fair. P—Poor.

Housing and Wiring Problems

By "SUPERVISOR"

IN an article entitled "How to Speed Housing," in the "Observer" for Sunday, October 14, Brigadier Grand, R.E., said—"Probably the best line that can be pursued for the moment is for the Government to aid and push in every way possible the production of components—especially components that save man-hours in erection and installation, such as plaster boards and house-frames, joints that eliminate skilled plumbing, and electrical lay-outs that eliminate the electrician."

Harness Type Installations

The author of the article undoubtedly had in mind the use of harness-type wiring systems that have proved so useful in the electrical equipment of aircraft and armoured fighting vehicles, and which eliminate the skill, if not the labour, of the electrician on site. For various reasons, however, the electrical industry has never taken very kindly to harness-type equipments of this kind for housing, whatever modification of views may take place in the immediate future, and there seem to be good reasons for this attitude. It is said, for one thing, that there are never enough small houses of one type to allow for mass-production on a really large scale, and when man-hours at the factory are added to the man-hours on site it is doubtful if any real overall saving is shown.

A pre-fabricated wiring system for a small house is a rather unwieldy object compared with a similar equipment for a car or aircraft, and may still call for considerable skill in handling on site. Conditions associated with wiring in houses are vastly different from those prevailing in factories, where most harness-type equipments are installed, and light assemblies suitable for the latter purpose are obviously inadequate for the small house. As we know, considerable hesitation is exhibited regarding the installation of conductors in steel conduits before plastering and other operations are carried out, but they must be installed with harness-type sets or the old need for the electrician's skill is preserved.

Another point is that pre-fabricated equipments do not eliminate sufficient man-hours on site, as a considerable amount of cutting away must still be faced. This again is a condition that does not prevail in situations where harness-types are normally used, and irrespective of whether the work is carried out by the general contractor or the electrical contractor, cutting away must always represent a considerable labour item. There is no guarantee that with a harness-type system there will be any less slotting of joists or chasing of walls to be done by somebody—in fact, experience suggests the reverse—and if wiring is to be cheapened this is the item that should receive attention.

It is not the actual cutting away alone that represents so much unproductive labour, but the associated delays and difficulties that accompany it. In view of the fact that proposals for an increased number of points for the small house await an economical solution of the wiring problem—according to the Ministry of Health the cost of houses must be drastically cut—it seems fair to assume that unless unproductive man-hours can be eliminated then electrical services will suffer in company with all others.

A brief survey of present wiring methods may bring this point more to the fore. The building contractor finishes the carcass of his small house, and may roughly put down the floor boards inside; he cannot lay them permanently, as the electrical contractor has to come along and place his conduits in slots in the joists, or channels in the walls, all of which have been prepared by somebody. No matter how bad the weather, the builder is prevented from laying floors until this section of the wiring work has been done, and even then must leave loose boards and traps for the later convenience of the electrician.

Construction Problems

Nor can the builder complete internal partitions, as a rule, until the floor boards are laid. The electrician must then make another journey back to the site to complete conduit work on or in these internal partitions, and internal plastering work is, usually, held up until such work is complete, or more cutting away and making good must take place. The electrician can then leave the job for a bit, returning later to draw in his wires and cables; he is very lucky if in the meantime someone has not driven a nail or two through his conduits.

Under these conditions it would appear almost impossible for the building contractor to organise his work to the best advantage, and have an ample amount of inside work available if and when the weather is too bad for men to work outside. This is all primarily due to the fact that rigid steel conduit systems demand such a large amount of cutting away on even small buildings, and it would not

seem that harness-type equipments could to any great extent eliminate this costly aspect of electric wiring. The mere fact that the electrician must visit the house at least three time to instal, say, eight or nine lighting points and a few socket-outlets, accounts for more wasted time, and possibly pre-fabricated systems would do no more than reduce this to two visits, one for wiring and one for fittings.

The cart seems to be well in front of the horse when effective building organisation has to await the installation of part of the electric wiring system, but this is the case to-day. No doubt electric wiring systems will be devised—in fact they must be—which will allow the builder to proceed normally without any hold-up of any kind. That is to say, the new systems will be installed in positions not generally utilised to-day—for instance, the underside of the joist might be employed instead of the upper side, and this would not delay the laying of floors, at least, and possibly the erection of internal partitions.

The running of conduits from point to point should eliminate the central run with its loose boards and traps, as with this method the lighting, switch and socket-outlet points become the draw-in points. With plastic insulated wires and cables much smaller conduits than $\frac{1}{2}$ in. can be used, and in most cases these would eliminate a great deal of wall chasing in addition. With point to point methods, only two conductors appear at most points, looping being unnecessary, and $\frac{1}{2}$ in., or even $\frac{1}{4}$ in. conduit would suffice for two conductors.

Although the use of such small conduits would in most cases permit their installation on the underside of joists, contractors with whom the matter has been discussed fear that difficulties may arise in effecting reasonable continuity. There must also be a risk of rusting through the plaster of walls and ceilings unless the conduits were deeply buried, although the growing use of plaster board might obviate this to some extent. The ideal development would, of course, be non-metallic conduits, eliminating the need for continuity and the risk of rusting or other chemical actions, and we are likely to see these shortly.

There would appear to be no good reason why conductors should not be installed with the conduits, especially if these be of the p.v.c. insulated variety. Unfortunately, there still seems to be an inordinate amount of prejudice against the use of p.v.c. wires and cables, which satisfactory experience seems to do little to dispel. With the increased number of utility socket-outlets proposed for the new houses the need for extension or alteration of wiring is hardly likely to arise, and if conductors cannot be withdrawn from the conduits after erection it should occasion no hardship; although with reasonable care in installation the withdrawal of conductors should always be possible, even if they are installed with the conduits.

The over-riding importance of this proposal is, of course, that building progress can be better organised, and the existence of floors when the electrician arrives should make his job easier. With the placing of conduits as suggested, little risk of damage by nails, etc., would arise.

Welding Development

WELDING, which was greatly extended in its industrial applications during the war, is making rapid headway as a science, and technicians associated with many industries are at present investigating problems which may result in a still wider application of this process of joining metals.

On November 29 and 30, a symposium on the metallurgy of steel welding will be held in London, organised by the British Welding Research Association, when leading authorities will discuss recent researches on the constitution and properties of weld metal; fundamental investigations on cracking in the hardened zone in welded joints in alloy structural steels; and initial researches on the viscosity of welding slags.

Plans are well advanced for tackling in a thoroughly scientific manner all the questions connected with the application of welding to industry. Property has been acquired near Cambridge by the British Welding Research Association, and special laboratories will be built there for full-scale experiments on welded structures, and other laboratories are being laid out in the London area for metallurgical research.

Experiments on welded steel structures are being carried out under the direction of Prof. J. F. Baker, of the Chair of Mechanical Sciences, Cambridge.

Much of the work now being put in hand is a continuation of experiments initiated during the war, when perhaps bigger practical advances were made than all that was achieved in the two decades preceding the war.

The Director of Research of the British Welding Research Association is Mr. A. Ramsay Moon, who as director-in-charge of the Advisory Service on Welding, Ministry of Supply, took a large part in the extension of welding in shipbuilding, structural engineering, in the production of tanks, aircraft and armaments.

Electricity Statistics

Decline in Generation Output—Loan Sanctions To Public Authorities

THE official returns rendered to the Electricity Commissioners show that 3 179 million units were generated by authorised undertakers in Great Britain during the month of October, 1945, as compared with the revised figure of 3 332 million units in the corresponding month of 1944, representing a decrease of 153 million units, or 4.6 per cent. During the ten months of 1945, up to the end of October the total amount of electricity generated was 30 138 million units as compared with the revised figure of 31 014 million units for the corresponding period of 1944, representing a decrease of 876 million units, or 2.8 per cent.

The Commissioners have also made known details of the amount of loans sanctioned from April 1, 1938, to September 30, 1945, as tabulated below:—

(A) Public Authorities (excluding Central Electricity Board).*

Item.	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	6 months ended Sept. 30, 1945.
	£	£	£	£	£	£	£	£
Purchase of property...	154 509	120 202	48 972	14 213	23 314	14 265	13 907	52 180
Buildings (generation)	1 976 911	1 384 251	2 473 992	988 666	1 259 554	771 761	6 711 285	3 320 616
Buildings (distribution)	794 901	466 866	224 573	124 260	135 820	70 358	42 734	100 783
Plant (generation) ...	6 125 393	7 815 141	9 808 924	3 409 256	6 137 725	774 747	20 323 383	11 278 552
Plant (distribution) ...	3 686 437	2 473 289	1 883 150	1 078 768	830 936	682 977	593 327	1 203 519
Mains and services ...	8 107 154	3 740 677	2 131 188	850 182	641 276	608 248	491 422	1 498 672
Meters and instruments	1 199 600	723 660	205 971	106 059	34 927	47 192	31 249	113 395
Wiring installations ...	645 823	237 232	137 742	9 089	944	306	1 107	3 000
Apparatus	2 016 932	1 088 721	450 396	71 102	25 974	1 400	24 034	46 500
Other purposes ...	581 143	850 776 (1)	395 592 (2)	346 696	94 122	142 699 (3)	105 370 (4)	3 218 569 (5)
Total	25 288 803	18 900 815	17 760 500	6 998 291	9 184 592	3 113 953	28 337 818	20 835 786

(B) Central Electricity Board.**

	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.
	£	£	£	£	£	£
Purchase of property ...	—	—	—	340 000(2)	20 000	—
Buildings (distribution)...	—	—	—	—	—	200 000
Plant (distribution) ...	—	—	—	4 370 000(2)	1 825 000	230 000
Mains	—	—	—	3 425 000(2)	400 000	400 000
Civil defence	1 000 000	1 000 000	—	500 000	—	100 000
Generating stations ...	—	—	4 000 000(1)	900 000(3)	—	1 075 000(4)
Other purposes	—	—	—	165 000(2)	5 000	20 000
Total	1 000 000	1 000 000	4 000 000	9 700 000	2 250 000	2 025 000

(C) Total Amounts Sanctioned during each Quarter.

	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	6 months ended Sept. 30, 1945.
	£	£	£	£	£	£	£	£
April 1-June 30 ...	4 882 232	5 456 132	2 872 006	1 550 176	1 755 345	639 788	1 067 578	16 800 783
July 1-Sept. 30 ...	5 182 348	6 608 888	5 595 889	775 510	1 044 507	657 279	5 801 894	4 035 003
Oct. 1-Dec. 31 ...	7 423 093	4 267 918	4 966 369	5 976 706	13 434 705	3 070 059	8 070 946	—
Jan. 1-March 31 ...	7 801 130	3 567 877	5 326 236	2 695 899	2 650 035	996 827	15 422 400	—
Grand Total ...	25 288 803	19 900 815	18 760 500	10 998 291	18 884 592	5 363 953	30 362 818	—

* (1) Includes £659 204 to four authorities in respect of the purchase of four undertakings. (2) Includes (i) £136 543 to three authorities in respect of the purchase of three undertakings; (ii) £160 000 to Fulham Corporation for purchase of two ocean-going colliers. (3) Includes (i) £100 000 to North of Scotland Hydro-Electric Board for preliminary and administrative expenses; (ii) £17 500 to one authority in respect of the purchase of an undertaking. (4) Includes (i) £10 213 to London and Home Counties J.E.A. for expenditure incidental to purchase of undertakings in the years 1930, 1931 and 1932 (Stamp Duties, etc.); (ii) £80 000 to North of Scotland Hydro-Electric Board for preliminary and administrative expenses. (5) Includes (i) £200 000 to Fulham Corporation for purchase of two ocean-going colliers; (ii) £3 000 000 to North of Scotland Hydro-Electric Board for purposes of Section 12(2) of the Hydro-Electric Development (Scotland) Act, 1943.

** (1) Loan advanced by Treasury in respect of War Emergency Extensions. In respect of these extensions sanctions have been issued to local authorities amounting to £2 154 789, which sum will be advanced by the Central Board. The £2 154 789 is included under the headings plant (generation) and buildings and civil engineering work (generation) in Table A. (2) For expenditure on grid system incurred substantially before the war. (3) This amount covers the extension of the Earley s ation; the original instalment was included in the sanction to the borrowing of £4 000 000 for war emergency stations, but the extension is not covered by the Treasury advance. (4) This amount covers the further extension of the Earley station.

Electrical Personalities

We are always glad to receive from readers news of their social and business activities for publication in this page. Paragraphs should be as brief as possible

Alderman J. Minto has been re-elected chairman of the Leicester Electricity Committee. **Councillor C. B. S. Morley** is vice-chairman.

Alderman T. J. Gooding has been appointed chairman of the Leicester Transport Committee and **Councillor S. Russell** vice-chairman.

Alderman R. A. Jones, chairman of the Electricity Committee, is the new Mayor of Caernarvon.

Sir James French, chairman of Barr and Stroud, Ltd., has accepted the position of chairman of governors of the Royal Technical College, Glasgow.

Mr. C. G. Morley New, an Electricity Commissioner, has accepted an invitation to serve as a member of an economic goodwill mission to Egypt, which is expected to set out this week-end.

Sir Thomas Higham, who has presided over the Accrington electricity undertaking for over quarter of a century, has been re-elected chairman of the Electricity Committee.

Alderman E. Johnson has been elected chairman of Sunderland Electricity Committee, and **Councillor J. A. Smith** has been appointed chairman of the Transport Committee.

Mr. T. A. Robinson, station engineer, Dalmarnock power station, has retired after 40 years' service, and the Electricity Committee has promoted **Mr. A. C. Lindsay,** assistant station engineer, to succeed him.

Mr. C. Pinkham, manager of the publicity department of the General Electric Co., Ltd., has made a welcome return to his duties at Magnet House, Kingsway, on his recovery from the effects of an accident which occurred on VE-Day last May.

As from January 1 next, **Mr. B. Hallows Garside** relinquishes his position of general manager of the Chelmsford works of Crompton Parkinson, Ltd. From the same date, **Mr. T. H. Windibank** (works director), who held the position in 1942-3, will assume direct control.

The Minister of Education has appointed **Dr. Herman Shaw,** Keeper, Science Museum, to be director and secretary of the Science Museum in succession to **Colonel Ernest Elliott Buckland Mackintosh,** who will retire on November 30. Since 1935 Dr. Shaw has been Keeper of the Department of Physics and Geophysics.

Mr. C. A. Wilkinson, who has gained a seat on Blackburn Town Council, is sports secretary of Philips (Blackburn) Works, Ltd. He served as a captain in the war and was invalided from the Army in 1943, following wounds. Another new councillor is **Mr. G. L. Pidgeon,** an electrical engineer at Philips' works.

Having completed 50 years of service in the electrical industry, **Mr. Victor Watlington** has expressed a wish to retire next year from the position of Director of the British Electrical and Allied Manufacturers' Association which he has held since 1932, and the B.E.A.M.A. Council have agreed to release him as soon as a suitable successor can be found. Mr. Watlington will be available for a reasonable time to give the new director any assistance that may be needed. He was educated at Bedford Grammar School and and at the Central Technical College of the City and Guilds of London, where he obtained the A.C.G.I. Diploma. He was awarded the I.E.E. Students' Premium in 1896 for a paper on "Underground Conductors." The same year the business side of his career began when he joined the firm of Blackwell and Co., specialists in the design and construction of electric tramways. After 10 years' practical experience with them, Mr. Watlington launched his own company, Watlington and Co., in 1906, concentrating on the supply of tramway materials. This carried on successfully until, in 1911, it was taken over by Dick Kerr and Co., who had asked him to join them as sales manager. When, in 1919, the merging of several engineering and electrical firms, Dick Kerr and Co. being one, brought into existence the English Electric Co., Ltd., Mr. Watlington continued to act as sales manager for the larger organisation at first, but in 1925 was appointed managing director. In September, 1925, he was elected a member of the B.E.A.M.A. Council, and in 1929 became chairman. In that capacity he was appointed a member of the Advisory Panel of the Overseas Trade Development Council of the Department of Overseas Trade. In 1932, Mr. Watlington became joint director of the B.E.A.M.A., with the late D. N. Dunlop as his colleague, and in July, 1935, sole director, after the death of Mr. Dunlop.

Mr. V. Watlington

The influence and status of the B.E.A.M.A. grew steadily higher under his wise guidance. Mr. Watlington has been a member of the I.E.E. since 1917. For two periods of three years he was a member of the Council, and has served also on the I.E.E. Finance Committee. He was one of the British delegates to the World Power Conference at Berlin in 1930. In the 1914-1918 war his services in connection with the production of flying-boats were recognised by the honour of the M.B.E.

The Nobel Prize for Physics has been awarded to **Professor Wolfgang Pauli,** a Viennese scientist, specialising in atomic research, who has been at Princeton University since 1940.

Mr. G. A. Marriott, manager of the valve department of the General Electric Co., Ltd., has been appointed to the board of the Marconi-Osram Valve Co., Ltd.

The board of directors of Edgar Allen and Co., Ltd., announce the establishment of a scholarship, to be known as the Charles Kingston Everitt Memorial Scholarship, tenable at a university or other appropriate educational institution, to commemorate the late chairman of the company. It will have the annual value of approximately £200 and will be confined to employees of Edgar Allen and Co., Ltd., or subsidiary companies. The first scholarship will be awarded in the autumn of 1946.

The scientific development of radar during the war was the subject of a talk by **Mr. H. de A. Donisthorpe,** of the General Electric Co., Ltd., to the Northampton and District Electrical Association on November 14. With the aid of instruments and slides, Mr. Donisthorpe told of the development of the radio valve which led to this advanced form of radiolocation, and he concluded with a demonstration with a toy aeroplane and analogous radiolocation apparatus.

The Electrical Trades Commercial Travellers' Association at its annual meeting in London on November 9, elected **Mr. F. Winstanley** (the General Electric Co., Ltd.) as president for the coming year, **Mr. B. E. Crow** (G.E.C.), chairman, and **Mr. H. Potton** (the British Thomson-Houston Co., Ltd.), vice-chairman. Victory and the 21st year of the association will be celebrated at a luncheon in the Connaught Rooms, London, on February 15 next.

The C.E.B. announce that **Mr. V. A. Pask** will relinquish the post of district manager for the Mid-East England and North-East England grid scheme areas at the end of the year, to take up a new appointment at the head office as personal assistant to the general manager. The Board have appointed **Mr. W. M. Lapper,** their operation engineer for North-West England and North Wales, to succeed Mr. Pask as district manager for Mid-East England and North-East England. Mr. Pask received his early education and engineering training in Preston and afterwards held appointments in Paisley, Hull and Bootle before becoming deputy-general manager and engineer of the Newcastle and district electricity undertaking. He was for eight years city electrical engineer at Norwich prior to joining the C.E.B. in January, 1940, as district manager for Mid-East England. Four years later he also took over the managership of North-East England when the two areas were combined for administrative purposes.

Mr. V. A. Pask

Mr. Lapper, who was born at Stoke in 1893, was educated at the Stoke High School and Technical College. After early engineering experience with the Potteries Electric Traction Co., he held generating station appointments at Perth, Falkirk, Doncaster and Wolverhampton, having been for five years station superintendent at Wolverhampton and in charge of the West Midland J.E.A.'s main control centre prior to joining the C.E.B.'s staff in 1934. Mr. Lapper's service with the Board began as an assistant operation engineer for the Central England grid scheme area.

Mr. W. M. Lapper

He was transferred to the Board's Manchester office, where, at the beginning of 1940, he was appointed operation engineer for North-West England and North Wales. In response to a request by the Government, Mr. Lapper's services were lent to the Allied Control Commission for Italy and, after the landings in 1943, he took charge of the Public Utilities Division and was responsible for the restoration and organisation of electricity supplies throughout Italy in the wake of the advancing armies. He organised a system of advisory committees on electric power of which he was the chairman, and, on the completion of his mission, the Italian Ministry and the electrical engineers with whom he had been

associated paid him the compliment of electing him honorary chairman of the National Advisory Committee. During the first world war he was commissioned with the Royal Engineers and saw service in Gallipoli and France with the field company formed by the I.E.E., which was attached to the Royal Naval Division, and for his more recent services in Italy he retains the honorary rank of Lieut.-Colonel.

Mr. H. W. Grimmett, of the Electricity Commission, has been appointed chairman of the Rural Electrification Advisory Committee, recently set up by the British Electrical Development Association to advise the E.D.A. Council on matters affecting the use of electricity in rural areas, and **Professor H. G. Robinson**, principal of the Midland Agricultural College, Sutton Bonnington, has been elected vice-chairman. Mr. Grimmett has also been elected chairman, and **Mr. S. E. Britton** (Chester electricity department) vice-chairman of the Policy Sub-Committee. **Mr. V. A. H. Clements**, North Eastern Electric Supply Co., has been appointed chairman, and **Mr. F. T. Elliott**, Wolverhampton electricity department, vice-chairman of the Publicity and Exhibitions Sub-Committee. The Technical Sub-Committee elected **Mr. C. A. Cameron Brown**, Edmundson's Electricity Corporation, as chairman, and **Mr. F. E. Rowland**, General Electric Co., Ltd., as vice-chairman.

At a recent meeting of the English Electric (Stafford Works) Engineering Society, attended by over 300 members, a lecture was given by **Mr. F. W. Lawton**, chief engineer and manager of the Birmingham electric supply department, on "The Development and Administration of a Large Electric Supply Undertaking." The chair was occupied by Mr. E. B. Banks, deputy commercial manager. Mr. Lawton gave a resumé of the upward trend of Birmingham's electric supply covering a period of over fifty years, and which had culminated in the erection of Ham's Hall "B" power station, designed for an ultimate capacity of 300 000 kW generating at 33 000 V and transmitting to the city at this pressure. Further details, amplified by lantern slides, were then given respecting generation, distribution, economics of power production, administration, management and the training of personnel. After the lecture a discussion was opened by Mr. A. R. Blandford, chief engineer and manager of the company's switchgear department, and in which a number of members took part.

Obituary

Mr. John Wilson, formerly assistant general manager of the Leicester transport department, aged 67 years. He retired in May, 1943, after 42 years' service with the department.

Mr. A. E. Logsdon, managing director and secretary of Farnham Gas and Electricity Co.

Lady Priscilla Walker, wife of Alderman Sir William Walker, president of the I.M.E.A., and member of the C.E.B., at her home at Penrith, last week.

Mr. William Merrilees, manager of the Newcastle branch of W. T. Henley's Telegraph Works Co., Ltd., on November 12, aged 54 years. The interment took place on November 15, at Benton Parish Church, Northumberland. Mr. Merrilees joined Henley's in January, 1914, as a clerk in the Newcastle office. He was appointed traveller for the Newcastle area in September, 1932, and in April, 1936, became branch manager.

Mr. W. Merrilees

Mr. Bryan Priestman, Professor of Physics at the University of New Brunswick since 1927, on November 11, aged 48 years. He was drowned in an attempt to rescue a child at Fredericton, Canada. Prof. Priestman served in the R.C.A.F. throughout the war.

Mr. H. B. Reynolds, at Glasgow, for some 30 years plant manager with Babcock and Wilcox, Ltd., Renfrew. He was a native of Manchester, where he trained in power plant production, later going north to join the Glasgow concern. He had been living in retirement for some years.

Mr. Norman Lampard, acting manager for the Eastern Telegraph Co., Ltd. (Cable and Wireless, Ltd.) at Alexandria, on November 9, at University College Hospital, London, after an operation, aged 49 years. He was on leave at the time of his death.

Francis Charles Raphael, consulting electrical engineer, on November 17, aged 74 years. He was consulting engineer to St. Bartholomew's Hospital and the Bank of England, and at one time manager of the cable and wire department of the Edison Swan Electric Co., Ltd. Mr. Raphael was educated at Charterhouse and the Central Technical College. For three and a half-years he was editor of THE ELECTRICIAN and for ten years editor of "Electrical Engineering." During the 1914-18 war he served as a Lieutenant with the London Electrical Engineers (R.E.(T.)). He was a member of the I.E.E.

Engineers' Joint Meeting

Victory Luncheon and Lecture of the A.S.E.E. and I.E.I.C.

OVER 300 members of the Association of Supervising Electrical Engineers and the Institution of Engineers-in-Charge attended the twentieth combined annual meeting and victory luncheon at the Connaught Rooms, London, on November 17. They were the guests of the General Electric Co., Ltd., and Mr. F. Winstanley was in the chair.

Proposing the toast of " The Association and the Institution," the Chairman extended a cordial welcome to the guests and said that the occasion was the twentieth on which the association and the institution had met annually in conjunction with members of the G.E.C. He believed those gatherings had been the means of establishing almost a brotherhood, at least a close relationship, between the members of the two associations, and they had afforded them opportunities of discussing those subjects which were part and parcel of their everyday lives. He was told that the I.E.I.C. were this year celebrating their fiftieth birthday. They were founded in 1895 by a handful of men—about seven—but they did not get their charter until about 1923. The A.S.E.E. was founded in 1914. His late colleague, Mr. H. W. Roberts, had initiated the joint meetings with the G.E.C. round about 1926.

Electrification of Industry

Mr. E. R. Wilkinson, president, A.S.E.E., in reply, said one could not help thinking that we were at the beginning of an era, which, given any sort of stability, would be outstanding for the electrical industry and industry in general. As he looked around he saw other industries which did not offer similar promise. In his presidential address to the A.S.E.E., he expressed the view that unless those industries were modernised and electrified we could not hope to regain our position in the world markets. On the other side of the Atlantic the electrification of industry computed in horse power per worker, was as near as might be twice that of Great Britain, and we could not compete unless we had a similar degree of electrification.

Sir John Kennedy also replied to the toast, and said that the help that the General Electric Co., with its enormous research and manufacturing facilities, had given both associations had been of great assistance. The company had given of its best and it had been very illuminating in all senses of the word. They had seen recently in connection with the atomic bomb how the work of the scientist and the engineer should be co-ordinated for the benefit of mankind generally. The work that the company and its staff had done for the two associations had not only been of value to them, but it had helped to spread knowledge throughout that part of the industry with which they were particularly concerned.

A lecture on " Putting things in a Good Light " was given by Mr. R. O. Ackerley, manager of the G.E.C. illuminating engineering department.

Lighting Problems

In the course of his lecture, which was illustrated with lantern slides, Mr. Ackerley emphasised the importance of considering surroundings in regard to lighting and the value of getting cheerful, pleasing and not monotonous background colours. In designing a lighting installation one had to give general consideration to the room, the people working in it, and in particular, what light was wanted for the special objects of regard. Whether it was work on a machine, or in the office, reading at home, or whether it was some special object of regard, the factors which affected the method of lighting were: (1) physical factors—actual facts relating to the thing; and (2) visual factors—things which concerned how one considered the object, its texture and finish; whether it was glossy, smooth or rough, or coloured. The elevation angle, the aspect from which the object was to be viewed and the purpose or process concerned with it, had to be considered. The effects of light and shade and colour were illustrated and discussed and the lecturer showed how advantage could be taken of high lights and specular reflection.

In conclusion, Mr. Ackerley said the most important part of illuminating engineering was determining what the lighting problem was, so that one could decide what was the good light in which to put the articles one wanted to see.

A number of questions were asked and dealt with.

Dealing with questions regarding fluorescent lighting, Mr. Ackerley said all the statistical evidence they had got, and it was very difficult to get statistical evidence, fully substantiated the claims made for fluorescent lighting and in no case did it go against it. In its present form fluorescent lighting had certain limitations, the principal being that with the very low brightness source one could not get a con-

centrated narrow beam of light. There were certain things for which a high directional narrow beam of light was necessary, but they might be only two per cent. of the things met with in daily life, or factory work, so his own belief was that for most general purposes in industry and commerce, fluorescent lighting would gradually supersede the present tungsten lamps. When more types of lamps became available and when the cost came down, he had no doubt that fluorescent lighting would superede a very great deal of, but not all, tungsten lighting, and it would take time for it to happen.

Replying to a question with reference to cycle flicker and the effect on the eyesight of a worker engaged on moving bright parts, Mr. Ackerley said he would like to clear away the idea that cycle flicker was condemned by the medical profession. The general question of stroboscopic effect was one that had to be faced. It was true that with machinery moving at certain speeds they got that stroboscopic effect, but not once in a hundred times had stroboscopic flicker caused trouble. If it did it was easily remedied if they had three phases in the room and could get the lamps sufficiently close so that the light overlapped over the three phases. If they used a split-phase circuit they would have no more trouble with stroboscopic flicker. Most people preferred to use a single-phase source for every other fitting, so that they got a split-phase effect.

Other questions dealt with related to directional illumination for street lighting, ceiling and wall lights, coloured light sources, and the use of fluorescent materials for interior decoration.

New I.E.S. Code

Chief Features and Recommendations Reviewed

AT a meeting of the Illuminating Engineering Society, on November 13, Mr. H. C. Weston, President, spoke of the new I.E.S. Code issued under the title of "I.E.S. Code of Practice for Good Lighting of Building Interiors." The Code was, he said, divided into two parts dealing, respectively, with natural and artificial lighting. It also included notes on assessing the amount of illumination required together with a schedule of pre-determined values for a large number of specific "visual tasks."

The Code was primarily intended for the guidance of those professionally engaged in planning and installing lighting, and their experience and skill would usually be required in applying its recommendations. It would also guide the consumer in formulating his lighting requirements, or he might require compliance with it as a condition of any contract given for lighting.

Some informative diagrams were included in the Code. These referred to the duration of adequate daylight throughout the year, to the chief characteristics of different systems of lighting, to the permissible brightness of lighting units within specified angles of view, and to the determination of recommended values of illumination according to the nature of the "visual task." For the latter, two diagrams—termed I.E.S. Illumination Charts—were provided. One referred to natural lighting and gave values of daylight factors while that referring to artificial lighting gave values of illumination, in lumens per sq. ft. These values formed a geometric series, such that, by six steps, the illumination was multiplied ten-fold. The charts were so designed that they gave, at a glance, a maximum of information. Another important feature of the new Code was a section dealing with the quality of lighting and, in particular, with the avoidance of glare.

The provisions of the Code were based on the results of numerous scientific investigations and, for this reason, the Code was an authoritative document, and should prove most useful.

Book Review

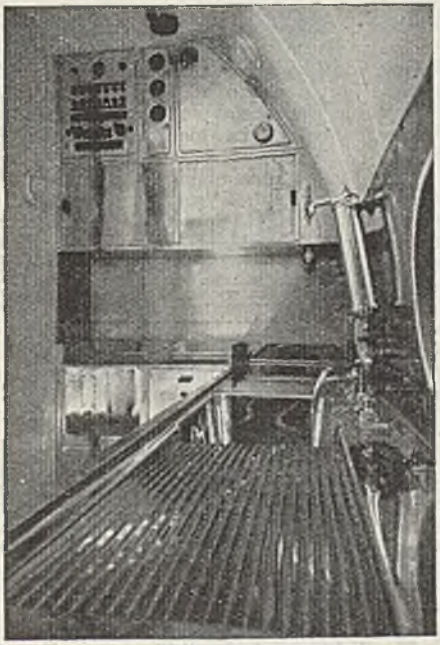
Radio Receiver Design. By K. R. STURLEY. (London: Chapman and Hall). Pp. xv + 480. 28s. net.

This volume by Dr. Sturley is Part II of his radio technique studies and includes the theoretical treatment and practical realisation of topics not included in Part I. The principal divisions are Audio Frequency Amplifiers, Television and Frequency Modulated Receiver Design. While the detailed treatment may not offer anything strictly new, the thoroughness of the discussion is exceptional in wartime books, and the author and publishers can alike be congratulated on the clarity of expression in what is, under present paper restrictions, highly condensed. The two volumes taken together form a valuable source-book through its careful treatment of its references to those divisions of radio communication particularly applicable to broadcast reception up to the commencement of the war, the main features of which will probably hold sway for some years to come. L.E.C.H.

Mr. Churchill's Luxury 'Plane

All-British Electrical Equipment in the "Skymaster"

BEHIND the announcement last week that Mr. Winston Churchill has returned to the United States the "Skymaster" aircraft, which was presented to



View of the galley showing control panel for electrical equipment. The sliding doors conceal the plate rack, below which is the boiler

him last year by President Roosevelt, lies the story of British endeavour which produced the most luxuriously appointed airplane in the world.

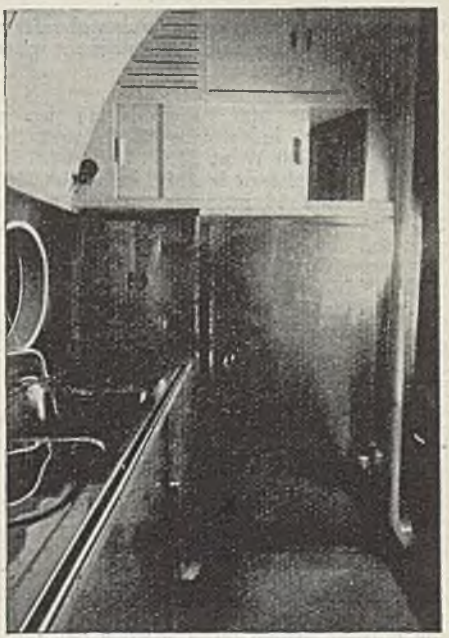
The aircraft was delivered to this country as a shell and was modified by Sir W. G. Armstrong Whitworth Aircraft, Ltd., of Coventry, the furnishing was undertaken by L. A. Rumbold and Co., Ltd., of London, W., and the electrical equipment, which was far in advance of any such gear previously installed in aircraft, was manufactured by the General Electric Co., Ltd.

The "Skymaster" carried a crew of 6 and had accommodation for 10 passengers. The aircraft was completely soundproof and its appointments included a conference room panelled in walnut, with seating for eight people.

The electrical equipment, supplied by the aeronautical department of the G.E.C., comprised an aircraft refrigerator, cooker and hot cupboard, an electrically-heated lavatory seat, a luminous stewards' call system, cabin and berth lighting fittings, illuminated shaving mirror, a hot and cold water system and electric fans; equipment designed and made as a result of tests carried out on a "York" aircraft, used previously by Mr. Churchill, and which flew the King to Italy.

The cooking equipment was capable of providing, from raw food taken aboard the aircraft, a four-course hot meal for 20 people, the meals being cooked on the aircraft grill-boiler and kept warm in a two-compartment hot-cupboard. This British cooking equipment was exclusive to the aircraft used by Mr. Churchill, for even the Skymaster C54B, used by the late President Roosevelt was devoid of all cooking facilities.

The aircraft grill-boiler is fitted with a heating element, common to the hotplate and the grill. When the hotplate is required for boiling, a deflector plate is put



Another view of the galley showing the Coldair refrigerator

into position, while for grilling the deflector plate is removed; after switching on, the grill is ready for use in two or three

One of the toilets with an illuminated mirror on the right. The cupboard houses the water storage heater

minutes. The unit measures 11¾ in. x 16¾ in. x 10¼ in., weighs 21 lb. and the loading is 1 800 W at 24 V.

The hot-cupboard is 2 ft. in height, 10¾ in. deep and 16 in. wide, and it weighs 23½ lb. Like the grill-boiler, it is constructed of aluminium, the cavity between the inner and outer casings being lagged with "Idagrass." The upper compartment is heated by two, and the lower compartment by three, elements, each of the sheathed-wire type, separately controlled; when all elements are switched on a temperature of 350°F. can be reached.

The water boiler has a draw-off capacity of 2 gall. It is installed in the aircraft pantry primarily for boiling water for tea, etc. The loading is 1 kW, each element being of 250 W for 24 V supply.

A luminous call system incorporates a relay switch, which, when electrically-operated by means of a call push, closes certain contacts and completes the circuits of various indicating lamps. The energising current, which flows when a call push circuit is closed, is used to release the lock mechanism which normally keeps the lamp contacts apart. When the call push circuit is opened these indicating lamp circuits remain closed, since the contacts of the relay switch can be separated only by pressure of a re-set button which is an integral part of the switch. In addition to the visual indication, an audible signal device is incorporated and arranged to function only when the call push circuit is closed.

The main water tank is situated in the roof of the fuselage and water is gravity fed from this tank to water storage heaters installed under wash-basins in the toilets. These water heaters are designed to provide ½ gall. of water at 150°F., with a time lag of approximately 10 min. An adjustable thermostat controls the current to each heater, the loading of which is 500 W at 24 V.

Raw foods taken aboard the aircraft for cooking were stored until required in a Coldair 5.75 cu. ft. lightweight aircraft refrigerator, the cabinet of which is constructed of aluminium alloy and is specially designed to give the necessary strength using metal of minimum thickness. The equipment incorporates special features to enable it to function satisfactorily despite sudden changes of ambient conditions encountered in long-distance flying.

Special light-weight 24 V d.c. aircraft fans were installed in many parts of the "Skymaster," including the cabins, cockpit and galley. The motor is designed for 24 V operation and consumes .8 A. Further, 24 V fans, with 15 in. dia. blades, kept the air circulating in the aircraft when on the ground, a feature of importance in tropical climates.

Lighting Arrangements

The lighting of the "Skymaster" was provided by specially designed lightweight lighting fittings, providing individual lighting for each passenger seat, together with general lighting in the corridor and also in the passengers' compartment. The conference room lighting was provided by three bowl fittings incorporating three lamps in each fitting, the switching arrangement enabling one, two or three lamps to be switched on as required. The toilets of the "Skymaster" were equipped with electrically-heated lavatory seats. This device consists of a sheathed wire element let into a recess on the seat of a standard Mark II "Elsan" aircraft closet, and has a loading of 50 W at 24 V. When the lid is down the heater is switched on, and when the seat is up the switch (which is attached to the base of the lid) is switched off.

Rawtenstall Electricity Committee recommends the appointment of **Mr. Thomas Stockwell** as electrical engineer.

Engineers in War and Peace

Annual Dinner of Mersey and North Wales I.E.E. Centre

THE Mersey and North Wales Centre of I.E.E. was congratulated on Monday night on being the first centre to resume its annual dinner after the war hiatus. Held at Reece's Restaraunt, Liverpool, the gathering was thoroughly representative of academic, professional, municipal and industrial electrical engineering interests. Mr. J. O. Knowles presided.

Ald. A. Critchley, who that day was elected chairman of the Liverpool Electricity Committee, in proposing the toast of the institution, paid tribute to British engineers and physicists for their work during the war years. It had been rightly said it was an engineers' war, but, too, it was going to be an engineers' peace, for upon engineers would devolve increasingly the responsibility of producing the benefits of a new era of progress.

Engineers' Achievements

Dr. P. Dunsheath (president I.E.E.) said we were facing a momentous period, not only in the history of this country, but in the history of electrical engineering and of the institution. Never before had we been at the end of a period which had produced so much in the engineering field, nor faced a future so fraught with unknown factors and, at the same time, of such great promise. Looking back over the last six years, electrical engineers could be really proud of the accomplishments in a great many fields of activity, but not even they, nor the institution, knew the whole story. In the years 1939, 1940 and 1941 the output of electrical energy in this country increased by something like 47 per cent. with a reduction of about 27 per cent. in personnel —a very considerable achievement. Not only were they faced with difficulties in carrying out these extensions, but they had no end of trouble due to breakdowns and also bombing. He understood " outages " of the grid during the war numbered about 2 000, of which 73 per cent. were due to home faults. Instancing the progress which had been made in communications, he said that in the Empire network there were about 100 000 miles total circuit. This Empire network had been the subject of some discussion lately, but whatever the future of this great organisation, all could be proud of its contribution to the successful conduct of the war. On the technical side, one outcome was that the B.B.C. today had the largest long-wave transmitter in the world, which had a delivery to the aerial of something like 800 kW and, in addition, the world's largest short-wave transmitter, with an equally magnificent technical performance. Within the next few years they would hear even more of that most outstanding achievement, radar.

Paying tribute to the manufacturing side of the industry, including all grades of personnel for the loyalty and devotion to duty, Dr. Dunsheath said that without the radio valve and the cathode tube we should not have got very far in locating objects hidden by cloud and fog. The use of the valve developed to such an extent that in the last year of the war 38 000 000 thermionic valves were made for the Services. Before the war the cathode-ray tube was not much more than a scientific toy. Annual manufacturing output rose to something more than 300 000. Clearly, the results of these advances would be applied in many ways, notably as aids to navigation in air travel.

Replying to the toast of the Guests, which was gracefully proposed by Mr. J. Eccles (city electrical engineer, Liverpool), the Lord Mayor of Liverpool (Ald. Luke Hogan) said there was much speculation about the future of the electrical and kindred industries in relation to national economy. One thing generally admitted was that electrical engineering, whether under private or State control, had always been able to attract first-class brains, and they could be sure that that would continue.

Atomic Energy to Speed Government

Some people said they were against Government control because they disliked bureaucracy, because of the miles and miles of red tape—there was still a great deal of it—and lack of quick decisions resulting in inefficiency. These might be good reasons, but he was inclined to believe they were not the real reasons. Their views might be influenced by a little false vanity, perhaps indifference, if not selfishness and fear of progress. No one knew what the Government was going to do in regard to the major industries. All he knew was that if they did not make greater strides in dealing with some of the fundamental problems that demanded attention, a little atomic energy ought to be directed into the seats of the mighty.

Mr. W. K. Brasher (secretary, I.E.E.) congratulated the Mersay and North Wales Centre on being the first to re-start its annual dinner. He hoped within the next twelve months other centres would do the same and get back to their normal routine. Joint central meetings also ought to be resumed. He proposed the toast of the Chairman, which was acknowledged by Mr. J. O. Knowles.

News in Brief

Tummel-Garry Scheme.—The prayer for the annulment of the Order to set the Tummel-Garry hydro-electric scheme into operation, which was moved in the House of Commons by Mr. M'Nair Snadden, was defeated by 263 votes to 45.

Surplus Scientific Equipment. — Arrangements have been made to give a general priority to educational establishments in the acquisition of scientific equipment and apparatus from surplus Government stocks, and special attention is to be given to those establishments whose needs are particularly urgent.

Telephone Kiosk Lighting.—The Assistant Postmaster-General stated recently that since the black-out regulations were withdrawn, lighting has been restored in approximately 26 400 telephone kiosks, and will be restored in a further 1 800 as soon as the necessary equipment can be made available or supply cables connected. Some 8 000 kiosks, mostly in rural areas, have no lighting, in most cases because there is no power supply in their neighbourhood.

School Heating.—The Glasgow Education Committee has arranged for the electricity department to instal electric heating at Penilee temporary school at a cost of £655.

Carlisle E.A.W.—The newly-formed Carlisle branch of the Electrical Association for Women has held its first meeting. The first chairman is Mrs. M. Fraser, hon. secretary Mrs. Sewell, and treasurer Mrs. Watson. Speakers at the meeting included Miss N. Balls of the National Executive and Mr. A. C. Thirtle (Carlisle city electrical engineer).

Incompetent Wiring.—At a meeting of the Chester Electricity Committee the Electrical Engineer reported that a number of cases of incompetent wiring had been brought to his notice, and he suggested that a warning be issued to the public of the need to employ competent persons in order to comply with the safety regulations. The Town Clerk was authorised to issue a warning accordingly.

TWENTY - FIVE YEARS AGO

FROM THE ELECTRICIAN *of November 19, 1920: Some people, including certain Members of Parliament, are becoming impatient at the delay in the formation of Joint Electricity Authorities and would like to bring pressure to bear upon the Commissioners to expedite matters. For instance, Mr. Seddon asked the Minister of Transport in the House of Commons whether the work of carrying out the various electricity schemes could be put in hand at once in order to give work to the unemployed, and to provide much-needed electric power for new industries. Mr. Neal's reply to this was somewhat indefinite, and added but little to our knowledge of the subject.*

Caroline Haslett Trust.—A meeting to announce the inauguration of the Caroline Haslett Trust for establishing scholarships and travelling exhibitions in electrical housecraft will be held at the headquarters of the Electrical Association for Women on November 28, under the chairmanship of Mrs. M. B. Jackson, when the speakers will be the Right Hon. Ellen Wilkinson, M.P., Minister of Education and Mr. H. Hobson, chairman, Central Electricity Board.

Fuel Economy Appeal.—The Ministry of Fuel and Power has issued a warning that unless there is strict economy in the use of electricity this winter it may be necessary for the supply to be cut off over large areas in the mornings as was done last winter, and also between 4 and 6 o'clock in the afternoons.

WORLD POWER CONFERENCE

The International Executive Council of the World Power Conference met in London on Tuesday and Wednesday to discuss the post-war revival of the constituent national committees and their field of future action.

Delegates included those from Great Britain, all the British Dominions, India, Belgium, Denmark, France, Greece, Luxembourg, Netherlands and Netherlands East Indies, Poland, Sweden, Switzerland, and the United States.

The World Power Conference, whose executive chairman is Sir Harold Hartley, has its central office at 36, Kingsway, London, W.C.2. It was founded in Great Britain in 1924, being opened in the conference hall of the British Empire Exhibition, Wembley, where over 1 000 delegates and members attended from 43 countries. The second conference was held in Berlin in 1930 and the third at Washington in 1936. Sectional meetings have been held in different capitals.

On Tuesday the British Committee of the conference entertained the International Executive at dinner at the Dorchester Hotel.

High Voltage Research

The Parsons Memorial Lecture—Work at the N.P.L.

At the meeting of the Institution of Electrical Engineers, on November 15, Mr. R. Davis, of the National Physical Laboratory, gave the Parsons Memorial Lecture. Mr. Percy Good was in the chair in the absence of Dr. P. Dunsheath, the president, whom it was explained had been detained in Paris on account of fog. The Chairman said this was the first post-war lecture for which provision was made by the Committee responsible for arranging the form which the memorial to Parsons should take. There was, he said, a memorial in Westminster Abbey, and a Parsons Memorial Library in London House in connection with the Dominion Students' Hall there. These provided a measure of satisfaction to the individual, but the Parsons Memorial Lecture provided an opportunity of a collective reminder of the contribution Parsons made to the benefit of all. He recalled that the arrangements were that there was to be a lecture every fourth year on the North East Coast to interrelate with three successive lectures in London. The scheme provided for the London Lecture at the invitation of the Royal Society to be delivered in the first instance before the I.E.E. and in turn before the Institution of Mechanical Engineers, the Institution of Civil Engineers, the Institution of Naval Architects, the Institute of Marine Engineers, the Physical Society and the Institute of Physics. The North East Coast lectures were to be delivered in turn before the North East Coast Institution of Engineers and Shipbuilders, and the Institution of Engineers and Shipbuilders in Scotland. Each lecturer would receive a bronze medal.

High Voltage Problems

Mr. Davis, who spoke on high voltage research at the N.P.L., said that the formation of the Central Board by the 1926 Act stimulated interest in high voltage problems because of the decision to transmit at a three-phase voltage of 132 kV between phases. In this country at the time there were, with one or two exceptions, no high voltage laboratories for the study of such problems, and so the h.t. laboratory at the N.P.L. was completed and a number of manufacturing concerns and universities provided similar facilities for themselves.

The chief problem in the utilisation of high voltages was the efficient use of the available dielectrics, whether gaseous, liquid or solid. It was because Sir Charles Parsons was interested in this problem that the subject chosen could be considered suitable for a lecture in his memory. In 1929, he and Mr. Rosen read a paper before the I.E.E. on the direct generation of a.c. at high voltages, in which they discussed the design and operation of an alternator for generating at 33 kV.

With the extension and interconnection of overhead transmission lines, the possibilities of disturbances and interruptions due to switching operations and overvoltages caused by direct lightning discharges to parts of the system, as well as indirect discharges, were greatly increased. This had necessitated the study of the transient response of electrical networks and the behaviour of dielectrics with transient or surge voltages, leading to a considerable increase in knowledge of surge phenomena. Thanks to the work of Schonland in South Africa and McEachran and others in America, knowledge of the nature of the lightning discharge had also greatly increased. A contribution to this work had been made by the E.R.A. in co-operation with the N.P.L.

Measuring Methods

Mr. Davis said he would be chiefly concerned with those aspects of high voltage pertaining to testing technique, measuring methods and some of the general results of such measurements. There was a growing tendency for high voltage equipment to be accepted on the basis of performance under surge conditions as well as, or in some cases, in place of, working frequency, the reason being that such equipment in service was not likely to be subject to overvoltages at the working frequency, while surge over-voltages were extremely probable.

High power frequency voltages were readily obtained by the interconnection of two or more transformers. The equipment at the N.P.L. was unusual in that no oil was used. This made it easily possible to derive intermediate voltages from points on the winding. The transformers were supplied by a sine wave alternator, and at full excitation gave 1 000 000 V.

One of the first research projects undertaken was the measurement of high power frequency voltages. This was usually effected with the aid of a voltage divider, a fraction of the total voltage being read on a suitable voltmeter. Dividers incorporating resistances were not generally used above 50 kV. To avoid excessive power consumption, the value of the resistance must be high and the bulk considerable to aid heat dissipation. Con-

sequently the resistor had large capacitance to earth through which current flowed from the resister giving rise to errors in measurement. Capacitance dividers were therefore adopted, and diagrams of two methods of measurement were shown. One was the capacitor voltage divider arranged for the measurement of peak and r.m.s. voltages. The agreement between the two methods was said to be very close. The high voltage capacitor must be completely shielded if the capacitance was to be independent of voltage. An attempt to make such a condenser, utilising vacuum as the dielectric, failed because of the difficulty of outgassing the electrodes. Completely shielded condensers using compressed gas for the dielectric had been made for voltages up to 500 kV, the limit being imposed by the size of the tube available for insulating the high voltage electrode. By the provision of an intermediate electrode, however, the need for very large insulating tubes was avoided.

The high voltage shielded capacitor performed an important function as a standard of zero phase angle in high voltage bridge circuits for the measurement of power factor. In voltage divider methods of measuring high voltage, the ultimate reference was to the standard cell, and the multiplying factor was large. Several workers in recent years had made absolute measurements of r.m.s., voltage up to values of one or two hundred kV, and the N.P.L. proposed to make a study of absolute methods of measuring high voltages.

Natural Phenomena Reproduced

High d.c. voltages had up to the present been used mainly for physical research, and the two main methods of producing them were by means of electrostatic generators of the Van der Graaf type—an elaboration of earlier electrostatic machines—and voltage multiplying circuits incorporating rectifiers and condensers. Resisters and a sensitive current measuring device provided a convenient method of measuring high voltages. The N.P.L. had constructed a resister of 100 megohms which had proved satisfactory for voltages up to 100 kV. The resister consisted of a number of carbon film resisters in series and immersed in transformer oil.

For the production of high surge voltages, capacitors were charged in parallel and discharged in series via spark gaps. To ensure that an output voltage of given amplitude was obtained, it was usual to charge the capacitors of the generator to an appropriate voltage and then to initiate breakdown of the gaps by a surge applied to the middle of a three-electrode gap. Provision had been made for a 20-stage equipment. Each stage had a capacitance of 20μF, and a maximum voltage of 100 kV, so that the nominal output was 2 000 kV from a capacitance of 0.01 μF.

The impulse generator would be arranged to deliver voltages or currents lasting from less than a millionth of a second to several hundred millionths, to imitate the time scale of the transient electrical phenomena occurring in nature. For measurements of such phenomena, where the unit of time was the microsecond, the high speed cathode-ray oscillograph was of supreme importance.

For the measurement of high transient voltages, a voltage divider was required, and this could be constructed from capacitors or resisters, or combinations of them. A simple method devised by Mr. G. W. Bowdler at the N.P.L. was described.

Analysis of Transient Response

The mathematical analysis of the transient response of electrical networks was simplified by the use of the operational methods developed by Oliver Heaviside. in some complex networks, for example transformer windings, the analysis became involved and, more serious, the different parameters were not known with certainty. Mr. Davis concluded this section of his lecture with a demonstration of a piece of apparatus designed for direct observation of response to transients, which he said had found much favour in high voltage laboratories. It consisted of a surge generator in combination with a cathode-ray oscillograph. The generator produced a surge which was applied to the network and the resulting voltage across a portion of the network, which might be proportional to the current in the network, was applied to the oscillograph. The whole process was made to occur recurrently—in the case of this equipment 50 times per second—and a steady picture appeared on the screen which could be examined at leisure and photographed. An indication was given of the response of the network to (1) a rectangular voltage; (2) a chopped wave, such as might be produced by the flashover of an insulator on a transmission line; and (3) an exponential wave such as is used in testing.

The high voltage characteristics of dielectrics was next discussed. In dielectrics of appreciable thickness, dielectric loss on a.c., or ohmic loss on d.c., may lead to a rise in temperature or even to thermal instability. To measure electrical strength under known conditions of temperature, etc., these phenomena must be avoided. Measurements of electric strength at high voltages were therefore best made by impulse voltages of short duration (between a microsecond and a millisecond). The results of N.P.L. impulse tests on a number of materials at voltages up to several hundred thousand.

suggested that the conception of electric strength as a characteristic of a material, corresponded to a reality. It seemed probable that in general breakdown, gradients of solid dielectrics in a uniform field were independent of thickness over a wide range provided that the time of application was longer than a microsecond but too short for the generation of appreciable heat.

Protection of Equipment

Summarising a lengthy section of the lecture on high voltage characteristics of electrical equipment, and the insulation of a transmission system, Mr. Davis gave a brief outline of the steps that might be taken to proportion correctly the insulation in a transmission system. He said that failure at power frequencies should be avoided by suitable proof tests and, in the case of outdoor insulators, by controlling the voltage distribution across the string. The weak link in the system to which insulation failure, inevitable with surge voltage, should be confined might be the smallest air gap in the system, an expulsion tube, or a surge diverter. In the case of the first two, the level of insulation should be such as to avoid too frequent operation. Protective equipment for terminal stations should be close to the station to avoid voltage increase due to reflection at the station. The flashover characteristics of line insulators, including arcing fittings, should be appreciably higher than those of the weak link, and the flashover voltages of the fittings should be below those of the insulators with which they were associated so that any flashover was removed from the surface of the insulation. On parts of the system exposed to lightning and where the chances of back flashover were considerable, such as at high towers or areas where the earth resistance was high, expulsion gaps with flashover characteristics appreciably lower than those of adjacent insulators and gaps might be fitted. Such devices would ensure that flashover was not followed by a sustained arc with consequent local damage and possible interruption of supply.

It was added that an actual use was concerned with the characteristics of manufactured equipment and that a considerable amount of work had been done at the N.P.L. on the behaviour of apparatus of all types. It would be economically impracticable to insulate a transmission system sufficiently to avoid any possibility of breakdown, and an important problem was to proportion the insulation of the system to restrict failures in the most convenient locality and the least expensive equipment, and to limit as far as possible the shock to the expensive equipment.

Finally, the lecturer discussed the protection of barrage balloons and personnel against lightning, which also illustrated some aspects of the problems of protection against lightning. In 1937, the Air Ministry set up a Committee under the chairmanship of Sir George Simpson to examine problems associated with the flying of balloons in thundery weather. This Committee made recommendations directed to ensuring the safety of the crews and to reducing the vulnerability of balloons to electric current, associated with brush discharge. Against destruction by a lightning stroke to a balloon it was felt that useful measures were probably impracticable.

Later, doubts grew concerning the rôle played by brush discharge in causing balloon casualties, and as a result of tests it was concluded that when balloons were destroyed through the agency of atmospheric electricity, the cause was a direct stroke involving hundreds of amperes, and not brush discharge involving currents of milliamperes.

Audible Lightning Predictor

The question was then posed, could balloons be protected against direct strokes? As it was not practicable to provide perfect protection for balloons the need was felt for some thunderstorm warning device, and an instrument was devised which depended for its operation on the steady and transient currents in the balloon cable. Eventually the audible lightning predictor was developed, and this device acquired sufficient favour to be utilised in barrage control.

Attention was also given to the protection of balloon crews and safety regulations were formulated. Throughout the long period the balloon barrage was in operation, no casualties due to lightning occurred when the safety regulations were observed.

In conclusion, Mr. Davis said that high voltage research in the future must cover a very wide field. Measuring methods and techniques were capable of improvement, and more knowledge was required as a basis for the formulation of sound test specifications to ensure good performance of equipment in service. New materials were being produced and required study, and new projects such as transmission at 250 kV, or using d.c. would present new problems. Co-operation with the physicist was needed in studying the fundamental properties of insulators and semi-conductors, and in investigating breakdown problems. The field was so wide that there was need for a great amount of co-operation and for men of the wide range of interest and capability of Parsons. The N.P.L. was eager to do its part.

High Voltage Overhead Lines

Review of Progress in Design on the Grid System

A PAPER by Mr. W. J. Nicholls, of the Central Electricity Board, on "Recent Progress in the Design of the High-Voltage Overhead Lines of the British Grid System," an abstract of which was given in our last issue, was read and discussed at a meeting of the I.E.E. Transmission Section on November 14.

The paper reviewed the progress that has taken place in the last 15 years in the design of the steel-tower high-voltage transmission lines of the Central Electricity Board. Lines operating at 132 kV were dealt with separately from those operating at 66 kV and 33 kV. Changes in conductors, joints, insulators and towers have been made in the light of experience, and a record of these was given as well as of other improvements of a minor character. The behaviour of s.c.a. conductor and the methods employed for jointing it were described in detail, and alternative copper conductors were also mentioned. The development of new types of insulators to suit operating conditions in the country was described. The steps taken to reduce the effect of lightning, e.g., more effective earthing, gap control, and the limited use of double earth-wires, were covered, and alterations in towers which have proved advisable were detailed.

Mr. E. Ambrose (Messrs. Highfield and Roger Smith) said he had been hoping something would have been said why in some areas the towers were constructed of copper-bearing steel, whereas the majority of the other towers were plain mild steel galvanised. It would be interesting to know what had happened, if anything at all, and what was the comparison between the two types in regard to maintenance. The construction of the grid had afforded opportunities for carrying out original work in many directions, in addition to the towers, and a similar review in another 15 years would, no doubt, indicate further interesting progress. As to conductor lengths, the original conductors were supplied in drum lengths, which meant that frequently it was necessary to have mid-span joints, and the design of these had led to many headaches. More latterly, however, the conductors had been supplied in lengths which enabled a number of complete spans to be worked out without finishing up with a mid-span joint.

Mr. R. W. Mountain (Messrs. Kennedy and Donkin), a member of the institution and also representing the Structural Building Engineering Division of the Institution of Civil Engineers (members of which were given a welcome to this meeting) said the general statement, in connection with the vibration of conductors, that the stress in the aluminium strands should not be greater than about 20 per cent. of the breaking stress of the aluminium to avoid danger from vibration, rather indicated that the steel core could not be fully used, and that was probably one of the limitations of the s.c.a. cable. Reference was made to corrosion, and it would be interesting to know if other conductor materials had been considered, in addition to s.c.a. and certain alternatives used during the war. Had consideration been given to aluminium alloys such as the light alloy which was used in Switzerland some 15 years ago ? With regard to mid-span joints and the need for avoiding them, it might be that they would have to be inserted due to breakdown, or damage, after the line had been erected. Could the author say whether experience of the double-earth wire since 1938 showed this type to be justified by the improved protection against lightning ? Finally, he asked whether it would be possible to use a standard design of overhead lines in future, which might reduce, to some extent, the weight and the cost, bearing in mind that there were, doubtless, improved methods of manufacture and erection.

Mr. H. W. Grimmitt (Electricity Commission), said that when the first grid specification was issued it was a serious shock to see that it included mid-span joints, and he asked the author whether the C.E.B. had now ceased to use them. The additional cost of having conductors of the right length to avoid midspan joints would have been more than counterbalanced by the money involved in the use of mid-span joints. Referring to the stringing of conductors, he said that in 1930 there was considerable agitation suggesting that the Commissioners' loading regulations were excessive and that they resulted in the cost of overhead lines being excessive. His own view was that there must be some tension at which vibration did not arise and that was what everybody would like to know. For lower voltage lines, viz., 33 and 66 kV, he suggeested that wood poles were far superior to the lavish towers that had been used in the past. Wood lasted for 60 years, and the tendency in America was to go back to wooden poles for such lines.

Mr. D. F. Sayers (Birmingham electricity dept.), said that from inquiries he had made some time ago it seemed that the concensus of opinion was very much against s.c.a. conductors. The only advantage at the moment was in price, but if the copper market became free again and the price went down, then copper might come into more general use. As to the author's mention that cadmium-copper conductors were subject to vibration, were these cables erected at the full tension or a reduced tension? Had doubled earth wires afforded better protection than single earth wires? From the appearance point of view they were a very undesirable addition to the tower design. Glass was coming into very much more popular favour than might be inferred and there was a great deal to be said for glass insulators. He was under the impression that the C.E.B. were carrying out replacements with glass insulators, but the paper rather gave the contrary impression. It would also be interesting to know what had been the experience with galvanised steel towers which had been up for 15 years. Had there been trouble through moisture getting in between the concrete and steelwork at ground level?

Mr. E. C. Neate (Messrs. Riley and Neate, Ltd.), suggested that the statement in the paper that in the early days of the grid troubles had been experienced with cone type joints due to bad workmanship should be withdrawn in justice to the engineers and men concerned. The position was not a very simple one, but a case for bad workmanship had not been made out, and the people concerned certainly thought they were doing a good job of work. He was not personally interested, except at a remote range. Putting forward an argument in favour of the use of hard-drawn copper conductors, he said his firm recently received enquiries from various undertakings for lines generally in accordance with the C.E.B. requirements, and they had been impressed by the great disparity in the prices for various conductors. For example, at the present moment a single conductor of .175 sq. in. steel core aluminium cost £162 per mile, a corresponding cadmium copper conductor cost £216, and a hard-drawn copper conductor only £143 per mile, or two-thirds the cost of cadmium-copper. Providing difficulties of sag and spacing could be overcome, the cost of an ordinary line having a copper conductor would be much cheaper than the two alternatives adopted by the Board for 33 and 66 kV grid construction. The final outcome was a design almost identical with the conventional grid tower, but somewhat lighter due to decreased windage and line tension. The normal span was 700 ft., and for .15 sq. in., conductors the sag was some 50 per cent. greater than that for cadmium copper. The whole of the saving on the conductor was gained at the expense of a somewhat deeper sag, and there was still a margin in hand in tower weight to enable increased spacings to be adopted if desired. He commended this type of construction to the attention of the Board's engineers as a possible and cheaper alternative to their present design. Vibration troubles were almost entirely eliminated, line joints were simple and reliable, and corrosion troubles, which appeared to loom large when any composite conductor was used, were obviated.

Mr. P. J. Ryle (Messrs. Merz and McLellan) maintained that conductors vibrated for 95 per cent. of their life, but whether that mattered or not was purely a matter of what was called every-day tension. As the paper mentioned, the original construction for 132 kV lines allowed a maximum working tension of 8 000 lbs. at 22° F., with ice and wind equivalent to a tension of 3 450 lbs. in still air at 40°F., but that was not the whole story. That figure of 3 450 lbs. only applied to the normal 900-ft. span, and it rose very much indeed with shorter spans. For instance, for 500-ft. spans the figure was 5 000 lbs. When vibration was first experienced it was a serious trouble and there was no reliable information as to how to avoid it. Therefore, the only thing to do was to have the tension constant in all spans, which was decided upon, and reduce slightly the temperatures. Experience had shown that the temperatures were extremely efficient, and he asked the author whether it would be justifiable on future lines to retain the temperatures and reduce the every-day tension somewhat, still keeping it constant on all spans. Referring to schemes that had been put forward for circulating current to melt the ice, he said a point always forgotten was how to warm the earth wire. Personally he could not see how an earth conductor could be warmed, and if the ice could not be kept off the earth conductor it would sag with a different sag from that of the main conductors and swing about non-sychronously and give trouble.

Mr. G. R. McCullagh (J. L. Eve Construction Co., Ltd.) said the C.E.B. adopted the Stockbridge damper contrary to the advice of the E.R.A., for Mr. Morgan and Mr. Whitehead, in a paper in 1930 said, there were serious objections to it. He would, therefore, like to know whether the results of their use had justified them. Various types of damper had been used by the Board, and he asked how the various makes compared. Regarding foundations, the author said there had been no failures, and it might seem that this called for some relaxation of the regulations for the less important grid lines.

Mr. N. E. P. Harris (Bullers, Ltd.) said the information in the paper would be of

value not only to engineers engaged in the design, construction and operation of high-voltage overhead transmission lines, but also to those who, like himself, were engaged on the manufacture of small components.

Mr. C. H. E. Ridpath (British Aluminium Co., Ltd.) suggested that consideration be given to the use of two dampers per span. The author had given as one reason for increased resistance in aluminium joints, the fact that aluminium had a tendency to flow slowly under pressure, but he was not satisfied that under normal temperature conditions, up to 100°C., there was this flow. A second reason given by the author was the high resistance of the oxide film on the conductor, but the natural thickness of the oxide film was of the order of one-millionth of a c.m., and whilst he agreed that under high temperature conditions the film would grow into a thickness which would create an insulating film, he would like to get rid of the idea that aluminium exposed to the atmosphere at normal temperatures would have a film that grew thicker and thicker. Under those conditions of temperature the tendency of the oxide film after about 14 days was to inhibit further growth. Finally, with regard to s.c.a. conductors, he had had occasion to send out a questionnaire relating to 11 kV lines, and 15 out of 17 undertakings were completely satisfied.

The author, in the course of his reply to the discussion, said it was necessary to face the fact that mid-span joints might be necessary under breakage conditions, and therefore such a joint should be available and probably would always be in use on some part of the line. The Board were investigating the possibilities of aluminium alloys for conductors, but the prospects were not very hopeful at the moment. There was as yet no positive experience that the double earth wire was no good, but the point was being watched. As to the saving of weight on new designs of towers, there was a saving of some 10 per cent. on some lines compared with some of the earlier types. He agreed that wood poles made a cheap job for certain lines, and with regard to glass insulators, said the Board were using them in considerable quantities. As to the condition of galvanised steel towers after 15 years, well over 50 per cent. after the war had reasonably good galvanising left. In the case of about another 15 per cent. in industrial areas, the galvanising was not good at the moment and, generally speaking, the life under those conditions was about 10 years, although in very bad areas it was less. He promised to look into the point with regard to bad workmanship, and agreed that the design mentioned for copper lines seemed to have possibilities, although there was the necessity for increasing tower heights which was not welcomed by those responsible for flying. He could not agree that the regulations for foundations should be eased, because if a tower failed from this cause it could not be repaired in a day or two.

Correspondence

The Editor welcomes the free expression in these columns of genuine opinions on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.

Surplus Electrical Equipment

[To the Editor]

Sir,—I am desired by my committee to draw your attention to the following matter:—

Last week a statement was published in a leading trade journal* that ". . . . A proposal to appoint a panel comprising representatives of the manufacturers, merchants, wholesalers and electrical contractors has not proved generally acceptable to all the parties concerned and so the matter still hangs fire."

In the association's bulletin dated October 26, (a copy of which was despatched to you and the journal concerned on October 30), was quoted almost verbatim the decision of the Government Department concerned to set up an Advisory Panel and detailing the constitution of the Panel, its functions, etc.

This decision, although somewhat tardy was received most cordially by this association, as the bulletin indicates and this view was communicated to the Ministry of Supply together with the names of the four representatives nominated by A.E.M.T.

My committee ask me to state that upon making inquiries in responsible quarters they have been unable to obtain corroboration of the statement that the setting up of the Advisory Panel has not proved generally acceptable.

Yours faithfully,

J. T. Morgan.
Secretary
Association of Electrical Machinery Traders.

[* Not The Electrician—Ed.]

Oxford Street Lighting.—Despite appeals to increase the intensity of street lighting on the main roads throughout the city, a resolution to instal 150 W lamps has been rejected by Oxford Council by 32 votes to 22.

Industrial Information

The Metrovick Girl.—Appearing in the dullest period of the year, the Metrovick and Cosmos Lamp Calendar Girl, always radiant and colourful, imparts a warm glow to the chilly atmosphere. This year she represents a typically English golden blonde with blue-grey eyes, not provocatively glamourous, but in a somewhat unsophisticated, pensive mood that has a charm of its own. She is attired for a theatre or dance and her face reflects the rosy glow of firelight. Next year's calendar is preceded by the remaining portion of this year.

Metrovick calendar

B.E.A.M.A. Contract Price Adjustment Formulæ.—For purposes of calculating variations in (a) "Rates of pay," the rate of pay for adult male labour at November 10 shall be deemed to be 95s.; (b) "Costs of Material," the index figure for intermediate products last published by the Board of Trade on November 10 is 181.8 and is the figure for the month of October, 1945.

Electric Service in Temporary Houses.—Under this title the British Electrical Development Association has published an illustrated booklet describing the electrical installation of the temporary house and how the occupier can make the best use of the electrical equipment provided. There is also a chapter on the care of appliances, with information on what a unit of electricity will do.

Functional Requirements of Buildings.—The Codes of Practice Committee has issued for comment the draft Chapter VII Services (CP(B)502), of the Code of Functional Requirements of Buildings. The document is in nine parts, containing recommendations for water supply, cooking installations, refrigeration, laundering, telecommunications, sanitation and drainage, sewage disposal and refuse storage and disposal.

Cables in Quarries and Metalliferous Mines.—The Minister of Fuel and Power has amended the Quarries General Regulations (Electricity), 1938, and Metalliferous Mines General Regulations, 1938, extending until July 1, 1947, the period of grace for electric cables and apparatus in use on July 1, 1938, which complied with the statutory requirements previously in force, but did not comply with the new regulations brought into force on that date. Accordingly such cables and apparatus, provided they are still in good condition, may legally be used until 1947, before they need to be replaced to comply with the current regulations.

A.E.I. News.—In this month's issue special reference is made to the part played by the companies in the A.E.I. group in the development of the atomic bomb.

Oil Engines for India.—Agreements have been reached between British Oil Engines (Export) Ltd., of London, and Parry and Co., Ltd., of India, whereby the latter company become the managing agents throughout that country for a range of British oil engines of international repute in sizes up to 1 500 H.P. Their territory covers the whole of India; their head office is in Madras, and they have branches and sub-offices in Bombay Calcutta, Lahore and throughout Southern India. Many useful engine sizes are available for immediate delivery, but, to meet the urgent and increasing demand, the arrangement has been extended to cover the manufacture in India by Kirloskar Brothers, of Bombay, of a number of the types and sizes, which include Petter, Mirrlees, McLaren, Coventry Cub and Fielding units.

Employment Policy.—In a circular letter to company electricity undertakers the Electricity Commissioners ask for details of programmes of capital expenditure in the year 1946, and in each of the years 1947 and 1948 to provide information required by the Government for the economic survey in connection with the White Paper on Employment Policy. These details are to be entered on two forms—one for 1946, and the other for 1947-48. Arrangements have been made by the Ministry of Health to collect the requisite particulars in respect of all the activities (including electricity supply) of local authorities and joint boards in England and Wales, and similar arrangements are being made by the Scottish Home Department. The return is to be based on the current levels of costs and prices. In order to provide information as early as possible of the rate of capital expenditure in 1946, the Commissioners ask that the form for that year alone should be filled in and returned not later than February 1 next, without waiting for the completion of the form relating to the two subsequent years. The latter should be returned as soon as it is ready, and not later than August 1, 1946. Information is also desired in respect of expenditure on the repair and upkeep of capital works.

In Parliament

THE following are replies to recent questions in the House of Commons :—

Plastics (Prices).—Replying to Flying Officer Lever, Sir S. Cripps said that Polystyrene was not at present being made in this country. Perspex Diacone cellulose acetate and Beetle plastics were sold in a variety of forms.

Kent Electricity Supplies.—Mr. Sidney Marshall asked the Minister of Fuel and Power if he was aware that the Kent Electric Power Co., Ltd., before agreeing to bring a supply to the owner of Basing Farm, Cowden, Kent, who is an attested milk producer, required a payment of £500 towards the cost and a guaranteed revenue of £150 per annum for five years; and, as such terms were unlikely to encourage farmers to bring their farms up to date or to encourage milk production, would he take steps to see that such demands were considerably modified or waived. In reply, Mr. Shinwell said he understood that some revision of these terms might be possible if another farm on the road of the proposed mains was prepared to take a supply of electricity. The matter was not one in which, under his present powers, he was able to intervene.

British Industry (Scientific Research).—In a written reply to Col. Ropner, who asked the Lord President of the Council whether he had yet arrived at any estimate of the number of persons with scientific and technological qualifications who would be required in connection with the research and development of British industry and for other purposes during the next ten years, whether he was satisfied with the present output of such qualified persons from the universities, and whether he would take steps at an early stage to arrange to ensure that science students have their call up to the Forces deferred until they have taken their degrees: Mr. Greenwood said our resources of qualified scientists and engineers were being reviewed in the light of the prospective demand. As regards the latter part of the question, the possibility of continuing the war-time deferment of science students from call up would be borne in mind in formulating our long-term man-power policy.

Electrical Components (Raw Materials).—Mr. Norman Smith asked the Minister of Supply and of Aircraft Production whether he was aware that Wireohms, Ltd., had been compelled, through lack of raw materials and partly processed materials, to refuse, during the past three months, export orders to a value of not less than £125 000 annually, and when the raw materials in question would be available. In a written reply, Mr. Leonard stated that the firm in question was manufacturing electrical components and parts of domestic heaters and appliances for which there was at present a very great demand both in this country and abroad. The present abnormal demand had created a shortage in the materials used. Every effort was being made to secure the best distribution of available supplies.

Electricity Supplies.—Replying to Mr. Cook, Mr. Shinwell stated that it was estimated that the peak load on the national grid system during the coming winter would be between 8 500 000 and 9 000 000 kW, according to weather conditions. The available output capacity of the generating plant was not likely to exceed 8 600 000 kW. In Scotland, it would be between 775 000 and 825 000 kW according to weather conditions. The available output capacity of the generating plant was not likely to exceed 790 000 kW. It should be observed, however, that the national grid system was operated as one unit over the whole country and it was not always possible, therefore, to treat separately supplies in Scotland.

Nationalisation Plans.—In the course of his statement in the House of Commons recently, Mr. H. Morrison said the Government will introduce a Bill during the present Session to nationalise the coal-mining industry. At a later stage in the lifetime of Parliament the Government intend to introduce measures to bring under national ownership the electricity supply industry and the gas industry. This will implement the concerted plan for the co-ordination of the fuel and power industries which was foreshadowed in the King's Speech. During the interval which will necessarily elapse before these plans can be presented to Parliament and carried into effect, all necessary development in the industries concerned must proceed. The Government, therefore, propose to see that progressive undertakings will not be prejudiced if they continue to develop in the interim period; and the appropriate departments will enter into early consultations on the point with the industries concerned.

Purchase Tax.—Lieut.-Col. Birch said that the overriding question was that of increasing production, and, while the Government had many minor plans, they had no master plan that would touch the essentials. Sir H. Lucas-Tooth said the first announcement of the Budget was well received, but now the individual taxpayer had adjusted his eyes to the dazzle of the almost forgotten spectacle of taxation moving in a downward direction, a different note was beginning to creep into the applause.

Electricity Supply

Chester.—The Electricity Committee has decided to resume hire purchase sales of appliances.

Durham.—The C.C. is to improve the electrical installation at Medomsley Cottage Homes at £150.

Glasgow.—The Electricity Committee is to extend mains at a cost of £6 000 and provide branches, meters, etc., for changeover purposes at a cost of £5 000.

Ormskirk.—The Commissioners have informed the Ormskirk Electric Supply Co., Ltd., that the Ministry of Fuel and Power see no reason to intervene in the company's proposal to amend their electricity charges as from January 1 next. It is intended that in all tariffs where the unit rate is less than .5d., the minimum be .5d.

Milnrow (Rochdale).—The Electricity Committee has passed a resolution calling the attention of electrical contractors and residents to the fact that extensions or alterations of services must be reported to the Council in order that the latter may be assured that the work has been carried out in a satisfactory manner.

Durham.—The annual review of the assessment of the undertaking of the North-Eastern Electric Supply Co., Ltd., in the administrative county of Durham for the year ended March, 1944, shows an increase of £10 769 in rateable value.

Barrow-in-Furness.—Sanction for overhead lines to provide supply to Coniston, Torver, and Oxenpark, has been obtained by the Electricity Committee.

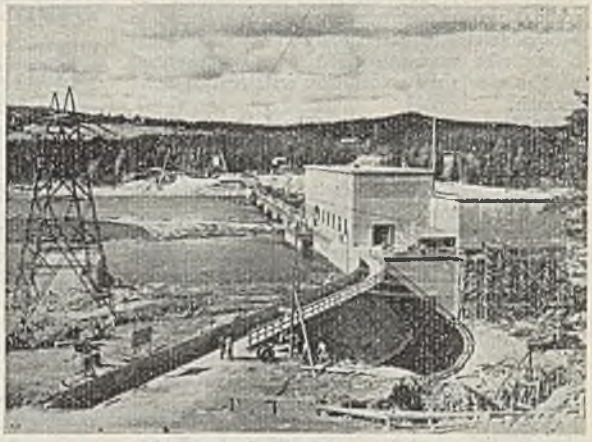
Northants.—The County Health Committee has had a report from Messrs. E. G. Phillips, Sons and Norfolk, consulting engineers, on the reorganisation of the engineering plant at Berrywood Hospital, the cost being estimated at £75 000.

Blackwall (London) Extensions.—The South Metropolitan Electric Light and Power Co., Ltd., proposes to reconstruct the Blackwall Point generating station, at an estimated cost of £3 279 210.

Burton-on-Trent.—The Electricity Committee is to provide supply to Barley Fields Farm, Anslow, at a cost of £150; to Morris Croft, Caldwell, at £190; to Grove Farm, Drakelow at £270; and improve supply to Blackenhall Farm, Barton, at £315.

Chesterfield.—At a meeting of the Electricity Committee, the Electrical Engineer reported that in view of the increase in the price of materials, and the fact that it was not possible to use switchgear from stock, the cost of the scheme for the supply to Cutthorpe would be £8 060 compared with the estimated £7 088 in June, 1944.

Northants.—The County Valuation Committee reports that in connection with the undertakings of the Northampton Electric Light and Power Co., Ltd., the Rushden and District Electricity Supply Co. and the Wellingborough Electric Supply Co., an increase in rateable value in the county from £68 823 to £79 850 has been agreed to.



A view of the new Gammelange power plant on the Indal River, in Northern Sweden. It has a capacity of 40 000 kW, and connects with the 175 000 kW Krangede power station. Together, the two plants supply about 12 per cent. of Sweden's total power requirements

Durham.—The R.C. has received a cable from the Ministry of Town and Country Planning expressing the view that the decision not to allow the erection of a power station at Kepier would not have an adverse effect on the North-East as far as employment was concerned. The R.C. has made another approach to the Ministry asking them to set out their reasons in detail for rejecting the Kepier plan.

Tynemouth.—The T. Council has been in touch with the North-Eastern Electric Supply Co., Ltd., regarding the Council's rights of purchase of the electricity undertaking in the New York area, belonging to the firm. The firm stated that it would maintain its opposition to the acquisition of parts of its undertaking, especially as

such a transfer would create a precedent in the undertaking. While the area involved at Tynemouth was small, considerable areas were affected by rights of purchase in other districts controlled by the firm. After giving the subject further consideration, the T.C. has applied for a further extension of the time allowed to exercise its purchase rights.

Fleetwood.—It was stated at a recent meeting of the T.C. that the electricity undertaking's reserves had saved consumers from any increase in charges. Mr. W. P. Lilwall, electrical engineer and manager, said the additional cost of coal meant a £27 000 extra charge a year on the undertaking over 1939. It was decided to make no recommendation for this to be passed on to users for the time being. It was agreed to be represented at the electrical exhibition in Preston next month.

Battersea (London).—The following consents by the Electricity Commissioners have been granted:—(a) establishment by the London Power Co., Ltd., and the Metropolitan Electric Supply Co., Ltd., of an underground main transmission line from Battersea generating station via Ravenscourt Gardens, Stamford Brook, Hammersmith, to North Hyde Road, Cranford, Middlesex; (b) establishment by the London Power Co., Ltd., of a 66 000 V main transmission line from Battersea generating station to Gipsy Corner, Acton.

Chesterfield.—The Electrical Engineer has reported that the probable expenditure during the next two years, largely due to the restrictions imposed during the war years, and to work in connection with housing schemes, would be £89 350. For the next five years the capital expenditure would be £250 000, which included the £89 350 for the two-year programme, but was exclusive of the estimated £332 481 in providing mains, services and sub-stations required to enable the Council to provide electricity in the areas of the Staveley U.D.C., and Chesterfield and Clown R.D.Cs.

Cardiff.—The Electricity Committee has adopted the following scheme for hire purchase for electric cookers:—To be limited to specified types and makes, no other apparatus to be included. Wiring at the standard rate to be added. The cash price to be paid over a period of seven years, 17½ per cent. to be added to cover interest charges. Free maintenance to be given throughout the seven years and at the end a scheme may be considered to give a further three years maintenance at a fixed charge in order to avoid the consumer having any heavy commitments for maintenance during the first ten years. If no wiring is installed at present, an installation to be included in the hire purchase agreement at the standard charge. In view of the limited number of cookers available, it is not suggested that any advertising or development programme shall be undertaken. Cookers should not be sold to persons already having adequate cooking facilities except in the cases of consumers at present hiring cookers wishing to return these, and hire purchase a new cooker. In order to meet the requirements of those consumers who are unable to pay cash for a cooker, some easy payment system is desirable. The present unstable position regarding deliveries and prices of cookers make a simple hire scheme unsound, and it is considered that the above scheme will meet the present conditions.

Rural Electrification

The Rural Electrification Advisory Committee recently set up by the E.D.A. consists of representatives of the Ministry of Agriculture and Fisheries, the Royal Agricultural Society of England, the National Farmers' Union, the Milk Marketing Board, the British Dairy Farmers' Association, the National Poultry Farmers' Union, the Institution of British Agricultural Engineers, the Electricity Commission, the Electrical Contractors Association, electric supply undertakings, and the E.D.A. Area Committee. At the first meeting of the Policy Sub-Committee, Mr. H. W. Grimmett, of the Electricity Commission, who is chairman of the committee and the sub-committee, pointed out that although development had been held up by the war, from 2 000 to 3 000 farms a year had been connected during the war years. The total of 290 000 farms in England and Wales included many agricultural buildings with no houses, but of that total 25 per cent. had been connected. Of the farms of more than 1 000 acres, 64 per cent. had been connected. It was agreed that supply undertakings should be encouraged to formulate schemes for supply to undeveloped rural areas. The sub-committee is to prepare information advising how the areas, where not fully electrified, should be zoned, giving the basis of probable revenue for different sizes and classes of farms and other consumers, and making suggestions for development. The Publicity Sub-Committee is to produce two publications—one showing how a community effort can assist in the extension of mains and the other dealing with all applications of electricity on farms and in cottages. The Technical Sub-Committee is to give advice on the installation, layout and utilisation of electricity on farms, by means of forms of illustrated talks and literature.

Contracts Open

WE give below the latest information regarding contracts for which tenders are invited. In the case of overseas contracts, particulars are to be had from the Department of Overseas Trade, Millbank, London, S.W.1 (corner Horseferry Road), unless otherwise stated.

Milngavie B.C.—Electrical work in connection with the erection of 26 permanent houses on the Balvie Road site. Applications to Mr. F. A. B. Preston, 6, Buchanan Street, Milngavie; deposit, £1 1s.

Bristol Mental Hospital, November 24.—Completion of the re-wiring of the existing electric lighting and power installations at the above hospital. Specification from Messrs. Hoare, Lee and Partners, 39, Broad Street, Bristol, 1; deposit, £10 10s.

North-West Midlands J.E.A., November 26.—Supply of outdoor type static transformers (No. A.278), electricity supply meters (No. A.279), spraying of cooling towers (No. A.281). Specifications from Mr. F. Favell, York Chambers, Kingsway, Stoke-on-Trent; deposit, £2.

Manchester City Council, November 26.—Supply, delivery and erection at Stuart Street generating station of six capstans and bollards (Spec. No. 840), and surge and make-up water cast-iron tanks, etc. (Spec. No. 841). Specifications from Mr. R. A. S. Thwaites, Electricity Department, Town Hall, Manchester; deposit, £1 1s.

Kettering Electricity Department, November 28.—Supply of e.h.t. and l.t., p.i. lead-covered armoured cables for the period of 15 months ending March 31, 1947. Specification from Mr. C. Burns, Rockingham Road, Kettering; deposit, £1 1s.

Skelton and Brotton U.D.C., November 30.—Supply and delivery of 3 three-phase static transformers, 50 cycles, with off-load tap-changing gear. Specification from the Electrical Engineer, 147/9, High Street, Skelton-in-Cleveland.

Bedwellty U.D.C., December 1.—(1) Supplying and laying approximately 1 000 yards of 3 in. cast-iron main; (2) supplying and erecting 11 000 V switchgear, underground cables, and overhead lines. Particulars from the Electrical Engineer, Electricity Showrooms, High Street, Blackwood.

Southend D.C., December 3.—Supply and delivery of l.t. cable for 12 months commencing January 1, 1946. Specifications from Mr. A. C. Johnson, Electricity Works, London Road, Southend-on-Sea.

North of Scotland Hydro-Electric Board (Distribution Scheme No. 1), December 10.—Supply, delivery and erection of h.t. and l.t. distribution lines. Specification from Mr. T. Lawrie, 16, Rothesay Terrace, Edinburgh, 3; deposit, £2 2s.

Sheffield Electricity Department, December 31.—Supply and delivery of two 600 kVA, 11/440 kV, 3-phase double wound self-cooled transformers. Specification from Mr. John R. Struthers, Commercial Street, Sheffield, 1; deposit, £2 2s.

Overseas

State Electricity Commission of Queensland, December 10.—Supply, delivery, erection, and setting to work of 7 500 kW and 750 kW steam turbo-alternators, accessories, and evaporating plant at Wide Bay Regional Electricity Board, Maryborough; Capricornia Regional Electricity Board, Rockhampton; and Townsville Regional Electricity Board. Tender forms from the Agent-General for Queensland, Queensland Government Offices, 409-410, Strand, London, W.C.2.

Eire Electricity Supply Board, January 28.—Supply, delivery and erection of the hydro-electric generating plant at Cathaleen's Fall and Cliff stations on the River Erne. Particulars from the Chief Design Engineer, Electricity Supply Board, 26, Lower Fitzwilliam Street, Dublin, C.18, deposit, £5 5s.

I.E.E. Radio Section

At a meeting of the I.E.E. Radio Section on Wednesday, a paper entitled "A Method of Increasing the Range of V.H.F. Communication Systems by Wattscarrier Amplitude Modulation," prepared by Mr. J. R. Brinkley, was delivered.

A summary of the paper is to the effect that the initial development of a method of extending the range or improving the coverage of v.h.f. communication systems of the type used for police services is described. The method is based on the simultaneous amplitude modulation of a number of carriers closely spaced in frequency. The frequency spacing between the carriers is so chosen that they lie within the bandwidth of the v.h.f. receiver, without producing audible interaction components of importance.

Two-carrier schemes employing separate transmitters at the same site have been found to give improved coverage, while two- and three-carrier schemes using separate sites have been found to give greatly increased range.

An unsuccessful attempt to achieve the same object with frequency-modulated (f.m.) transmitters using the same nominal carrier frequency is described. The difficulties of employing frequency modulation with common modulation are discussed.

Company News

MAX STONE.—Fst. and fin. div. 15% (10%).

J. STONE AND CO., LTD.— Intm. 10% (same).

BROADCAST RELAY SERVICE.—Intm. 3½% tax free (same).

STREAM-LINE FILTERS LTD.—Fin. 3%, mkg. 13% (10%).

JOHNSON AND PHILLIPS LTD.—Intm. div. 7½%, less tax (same).

J. H. FENNER AND CO. LTD.—Div. 6% (same) for yr. to June 30, 1945.

BRITISH ELECTRIC RESISTANCE CO., LTD. —Fst. and fin. div. 20%, less tax (same).

DELHI ELECTRIC SUPPLY AND TRACTION CO., LTD.—Intm. div. 4%, tax free (same).

COLOMBIA GAS AND ELECTRIC CORPORATION (U.S.).—Div. 10 c. per com. sh. mkg. 20% (same).

CHADBURNS (LIVERPOOL).—Net pft. to Mar. 31, £7 491 (£17 421). Div. 6% and bonus 4% (both same).

ELECTROLUX CORPN.—Net pft. qr. ended Sept. 30, $213 053 (after all charges and provsn. for estimated taxn.).

SYDNEY S. BIRD AND SONS.—Authorised cap. is to be raised from £50 000 to £65 000 by creatn. of 150 000 ord. shs. of 2s. each.

WALTER SPENCER AND CO., LTD.—Fin. div. 7½% (same), mkg. 12½% (same), less tax, for yr. ended Sept. 30. Net pft. £9 681 (£11 795).

AIRSCREW CO., LTD.—Fin. 15%, mkg. 25% for 1943-44 (same), also intm. 10% on acct. of 1944-45 (same). Pft. yr. to Mar. 31, 1944, £64 711, payable Dec. 31.

MCMICHAEL RADIO, LTD.—Div. 10%, less tax, on £143 788 8% cum. partg. prefd. ord. on acct. of arrears. Representg. 4% for six mos. to Dec. 31, 1942, and 6% in respect of nine mos. to Sept. 30, 1943.

R. AND W. HAWTHORN LESLIE AND CO., LTD.—Including invest. income, but after deprecn., taxn. and contins., pft. to June 30, £127 515 (£131 336). To dirs.' fees £967 (£850), fin. ord. div. 7% and bonus 5% (both same), mkg. 15% (same), gen. res. receives £50 000 (same), fwd., £51 980 (£56 043).

AERIALITE LTD.—Tradg. pft. for yr. to June 2, £22 283 plus £1 000 from res. for deferred repairs; deduct dirs.' fees £100, loss on sale of invest. £5, fire salvage exes. £556, exes. on new cap. £250, res. for E.P.T. to June 2, 1945, £8 000, deprecn. £2 337, leavg. £12 035. To prov. for inc.-tax £5 224. Fin. div. 12½% on ord. mkg. 22½% (same), fwd. £8 066.

CINEMA-TELEVISION LTD.—Trdg. pft. to Apr. 30 £113 678 (£95 908). Deduct inc. tax and N.D.C. £61 071 (£50 871), deprecn. £1 793 (£1 696), dirs.' fees £250 (£236) deb. int. £151 (£825), war damage prems. £41 (£103), net pft. £50 372 (£42 177) plus £33 809 (nil) brot. in, mkg. avail. £84 181 (£42 177), to deb. redemptn. res. nil (£8 368), fwd. £84 181.

KAYSER ELLISON AND CO., LTD.—Pft. to June 30, after taxn. and crediting this time E.P.T. recoverable, £20 997 (£44 888), plus £12 855 (£12 842) brot. in, pref. div. absorbs £3 000 net (same), intm. ord. div. 5% £6 250 (same), fin. ord. div. 7½% (12½), mkg. 12½% (17½), deprecn. res. nil (£15 000), staff benev. fund nil (£5 000), fwd. £15 227.

BURCO LTD.—Tradg. pft. to Sept. 30, £47 255 (£17 838), plus int. £512 (£834) and E.P.T. recoverable nil (£21 321), mkg. £47 767 (£39 993). Deduct dirs.' fees £350 (£300), deprecn. £3 147 (£3 597), taxn. £22 301 (£19 618), leavg. net pft. £21 969 (£16 478). To div. equalisatn. res. nil (£8 000), gen. res. £11 500 (nil), div. 20% (15), fwd. £20 998 (£21 029).

AERONAUTICAL AND GENERAL INSTRUMENTS, LTD.—Trdg., etc., pft. to Mar. 31, £68 752 (£67 582). To dirs.' fees £1 312 (£1 305) deprecn. £3 750 (same). E.P.T. £34 000 (£33 000), lvg. £29 690 (£29 527). To inc.-tax £14 500 (£14 000), gen. res. £3 750 (same), intm. div. 6½% £4 875 (same), fin. 8½% (7½), mkg. 15% (14) £6 375 (£5 625), fwd. £6 583 (£6 393).

PATERSON ENGINEERING CO., LTD.— Tradg. pft. to Apr. 30, £28 148 (£28 715), divs. from subsids. £14 667 (£14 667), divs. on gen. invts., etc., £939 (£942); mkg. total pft. £43 755 (£44 314). To staff bonus and insur. £4 200 (same), dirs.' fees £1 000 (same), taxn. £29 500 (£29 000), lvg. net pft. £9 055. Net pref. div. £2 063 (same), div. 10% (same) on ord. and bonus 2½% (same) £6 505 (£10 114), net (same), fwd. £47 649 (£47 161).

FREDERICK BRABY AND CO., LTD.—Tradg. pft. to Sept. 30, £188 244 (£295 737), plus divs. and int. £6 293 (£6 708). To taxn. £105 000 (£210 000), deprecn. £27 579 (£30 523), deb. and deposit int. £6 166 (£6 131), dirs.' fees £2 100 (same), leavg. net pft. £53 692 (£53 691). Pref. div. absorbs £13 610, additional div. on employees' stk. £1 440 (same), fin. ord. div. 1s. 6d. per £1 unit (same), mkg. 10% (same), to suspense res. acct. £25 000 (£20 000), fwd. £65 167 (£66 700).

JOHN RIGBY AND SONS, LTD.—Tradg. pft. to Aug. 31, £1 878 (£19 541), plus invest. income £1 278 (£3 886), transf. fees £5 (£12), pft. on sale of investmt. £146 (nil), E.P.T. repayable nil (£27 726), res. for wire levy not required nil (£1 247), mkg. £22 432 (£52 413). Deduct dirs.' fees £700 (same), deprecn. £10 313 (£9 419), inc.-tax and N.D.C. £11 419

(£25 800), leaving loss £19 124 (pft. £16 494), reducing cred. blce. brot. in after transf. of £10 000 from res. from £21 513 to £2 390, no div. (10%).

FALK STADELMANN AND CO., LTD.—Tradg. pft. to Mar. 31 £121 044 (£112 957), plus trans. fees £19 (£23). Written off goodwill and trade marks £2 945 (nil), to staff pensions £7 315 (£6 957), N.D.C. res. £4 000 (£4 250), tax £22 468 (£24 824); net pft. £84 334 (£76 949). Brot. in £50 593, plus £1 852 (£578) pft. on sale of securities. To pref. div. £31 500 (same); intm. ord. div. 10% (7½%), which dirs. recommend as fin. div. for yr., £50 750 (£43 312), staff pension and benev. fund nil (£5 000); fwd. £47 530.

WM. NEILL AND SON (ST. HELENS).—Tradg. pft. for yr. to Mar. 31, £62 991 (£70 896). Add int. on tax res. certs. nil (£400), deprecn. provided on plant sold now written back £1 682 (£855), W.D.C. refunded nil £1 855), repaymt. of contributns. to trade export fund £9 870 (nil), mkg. £74 543 (£74 006). Deduct deprecn. £3 339 (£4 036), loss on sale of plant, etc., £4 004 (£158), dirs.' fees £1 600 (same), cap. issue exes. nil (£1 486). W.D.C. £113 (£225), leavg. £66 487 (£67 501). To taxn. £47 000 (£52 000), defd. repairs £13 000 (£7 000). Fin. div. £6 250 (£8 333), carry-fwd. £8 589 (£8 352).

CRABTREE ELECTRICAL INDUSTRIES, LTD.—Div. received from J. A. Crabtree and Co. for yr. to Oct. 31, 1945, £65 000 (same). Add interest allowed by bankers and inc.-tax recovered £1 308 (£1 150), mkg. £66 308 (£66 150). Deduct administratn. exes. £921 (£800), dirs.' fees £1 700 (£1 550), leavg. net £63 687 (£63 800). Pref. div. for yr. £8 750 (same), fin. div. on ord. 5%, plus cash bonus 7½%, mkg. 17½% (same), fwd. £24 920 (£22 483). Tradg. pft. of operatg. co. for yr. to July 31, 1945, £224 105 (£244 292). After deductg. taxatn. £142 351 (£162 451), etc., net pft. £77 982 (£72 439). To deferred repairs £13 000 (nil), res. nil (£10 000), div. £65 000 (same), fwd. £76 856 (£76 875).

Company Meetings

WM. NEILL AND SON (ST. HELENS), LTD.—In the course of his address at the annual meeting, held at St. Helens Junction (Lancs.), on November 20, Mr. E. Riddel, the chairman, said that during the war period alone, the company's potential productive capacity had been improved by additions to plant, buildings, tools, &c., to the extent of some £45 255, and capital structure had been correspondingly kept intact by bringing in new capital funds of £45 000. During the same period some £26 250 had been set aside for depreciation, £20 000 had been added to the general reserve out of revenue, and a further £20 000, also out of revenue had been provided for deferred repairs, a total of £66 250. In addition to all this there now stood to their credit by way of post-war E.P.T. refund a sum of about £21 000 after allowing for income-tax.

PATERSON ENGINEERING CO., LTD.—The annual meeting was held in London on November 15. Sir William Paterson, the chairman, presided. In the statement circulated with the report and accounts, the chairman said the latter were of special interest, as showing the company's financial position one week before the end of hostilities in Europe. The stock and work in progress at £325 355, profit £38 554 and taxation provision £29 500 were almost identical with last year's figures. Payments received on uncompleted contracts £212 524, compared with £153 334, reducing creditors from £149 027 to £95 984 and giving a bank balance of £12 101 as compared with last year's small overdraft. These figures indicated that the company entered the post-war period on a sound financial basis. While it might be considered a little venturesome to speak of future prospects in these times, they had good grounds for confidence, as valuable home and export orders had been secured which more than compensated for cancellation of certain uncompleted balances of war-time contracts, and maintained their work in progress at a highly satisfactory figure. The subsidiary companies who had also been fully occupied during the war, were in a sound financial position.

Metal Prices

		Monday, Price.	Nov. 19. Inc.	Dec.
Copper—				
Best Selected (nom.)	per ton	£60 10 0	—	—
Electro Wirebars ...	„	£62 0 0	—	—
H.C. Wires, basis ...	per lb.	9 7/16d.	—	—
Sheet	„	11 1/16d.	—	—
Phosphor Bronze—				
Wire(Telephone)basis	„	1s. 0 7/16d.		—
Brass (60/40)—				
Rod, basis	„	—	—	—
Sheet „	„	—	—	—
Wire „	„	11d.	—	—
Iron and Steel—				
Pig Iron (E. Coast Hematite No. 1)...	per ton	£7 13 6	—	—
Galvanised Steel Wire (Cable Armouring) basis 0.104 in. ...	„	£30 0 0	—	—
Mild Steel Tape (Cable Armouring) basis 0.04 in. ...	„	£20 0 0	—	—
Galvanised Steel Wire No. 8 S.W.G. ...	„	£26 0 0	—	—
Lead Pig—				
English	„	£31 10 0	—	—
Foreign or Colonial	„	£30 0 0	—	—
Tin—				
Ingot (minimum of 99.9% purity) ...	„	£303 10 0	—	—
Wire, basis... ...	per lb.	3s. 10d.	—	—
Aluminium Ingots ...	per ton	£85 0 0	—	—
Spelter...	„	£31 5 0	—	—
Mercury (spot) Warehouse	per bott.	£31 5 0	—	—

Prices of galvanised steel wire and steel tape supplied by the O.M.A. Other metal prices by B.I. Callender's Cables Ltd.

Commercial Information

County Court Judgments

NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*

HILLIER, Maurice (trading as Moreburn's Radio), 486, Kingsland Rd., E.8, wireless dealer. £13 2s. 6d. Sept. 11.

HILLIER, Maurice, 486, Kingsland Rd., E.8, Wireless dealer. £10 19s. 6d. Sept. 11.

HILLIER, Maurice, 486, Kingsland Rd., E.8, wireless dealer. £14 4s. Sept. 13.

JONES, Ivor R., 97, Park Av., Saltney, Flint., electrician. £32 8s. 3d. Sept. 13.

RODGERS, Sydney, 125, Bolsover St., Sheffield, electrician, £11 4s. 4d. Aug. 27.

Satisfactions

JOHN LYSAGHT LTD., Newport, Mon., galvanised sheet mfrs.—Sat'n. Oct. 20, of deb. stock reg. Aug. 24, 1929, to the extent of £24 870.

NORTH-EASTERN ELECTRIC SUPPLY CO. LTD., Newcastle-on-Tyne.—Sat'n. Oct. 20, of deb. stk. reg. Aug. 13, 1935, to the extent of £29 723.

NORTH METROPOLITAN POWER STATION CO. LTD., London, N.—Sat'n. Oct. 17, of second deb. stock reg. Aug. 21, 1936.

Partnership Dissolved

Partnership between Herbert Heywood and James Austers Waters, carrying on business as electrical contractors and suppliers of electrical goods at 173, King Street, Oldham under the style of Universal Electric Co., was dissolved on August 21, 1945, by mutual consent.

Notice of Dividend

PINNEY, Gerald C., 128, Kendal Way, Cambridge, and MILLER, Arthur E., 4, Granby Street, Littleport, Cambridge, trading together as "Granby Service Co.," at 4, Granby Street, Littleport, wireless and electrical dealers. Supplemental dividend 3s. $4\frac{3}{16}$d. per £, payable Nov. 26, 1945, Official Receiver's Offices, 41, Sidney Street, Cambridge.

Coming Events

Saturday, November 24.

I.E.E., N.W. STUDENTS' SECTION.—College of Technology, Sackville Street, Manchester. Dance. *6.45 to 10.30 p.m.*

Monday, November 26.

I.E.E.—London, W.C.2. Informal meeting. Discussion, "Standardisation of Ripple Control," T. R. Rayner. *5.30 p.m.*—S. MID. CENTRE.—Grand Hotel, Birmingham. Kelvin Lecture, "Scientific Principles of Radiolocation," Sir E. Appleton. *6 p.m.*

Tuesday, November 27.

I.E.E., RADIO SECTION.—London, W.C.2. Discussion, "Film Forming Materials used in Insulation," C. R. Pye. *5.30 p.m.*——N.E. CENTRE.—Newcastle-on-Tyne. "Excess-Current Protection by H.R.C. Fuses on Medium-Voltage Circuits," R. T. Lythall, and "Excess-Current Protection by Over-Current Relays on Medium Voltage Circuits," A. G. Shreeve and P. J. Shipton. *6.15 p.m.*——E. MID. SUB-CENTRE.—Loughborough College. "Engineering Standardisation," J. H. R. Nixon. *6.30 p.m.*——N.W. CENTRE.—Manchester. "Practical Aspects of Telephone Interference Arising from Power Systems," P. B. Frost and E. F. H. Gould. *6 p.m.*——SCOTTISH CENTRE.—Glasgow. "The Place of Radiant Dielectric and Eddy Current Heating in the Process Heating Field," L. J. C. Connell, O. W. Humphreys and J. L. Rycroft. *6.15 p.m.*

ROYAL INSTITUTION.—21, Albemarle Street, London, W.1. Lecture II (Course of two lectures on "Recent Research Work in the Davy Faraday Laboratory"), "Divergent Beam X-ray Crystallography," Mrs. K. Lonsdale. *5.15 p.m.*

Wednesday, November 28.

I.E.E., RUGBY SUB-CENTRE.—Corporation Electricity Showrooms. "Recent Progress in the Design of the High-Voltage Overhead Lines of the British Grid System," W. J. Nicholls. *7 p.m.*——SCOTTISH CENTRE.—Caledonian Hotel, Aberdeen. "The Place of Radiant Dielectric and Eddy Current Heating in the Process Heating Field," L. J. C. Connell, O. W. Humphreys, and J. L. Rycroft. *7.45 p.m.*

BRITISH INSTITUTION OF RADIO ENGINEERS.—Manchester. Discussion, "Post-War European Broadcasting." *6.15 p.m.*

Thursday, November 29.

A.M.E. AND M.E., S. WALES BRANCH.—Crumlin. Visit of H.M. Chief Electrical Inspector of Mines," G. M. Harvey.

ASSOCIATION FOR SCIENTIFIC PHOTOGRAPHY.—Westminster, S.W.1. "Some Notes on Illumination Photomicrography," A. G. Sabin. *6.30 p.m.*

I.E.E., DEVON AND CORNWALL SUB-CENTRE.—Globe Hotel, Newton Abbot. "The Operation, Maintenance and Testing of Overhead Lines and Associated Outdoor Equipment on A.C. Systems," R. C. Hatton and J. McCombe. *3 p.m.*

Friday, November 30.

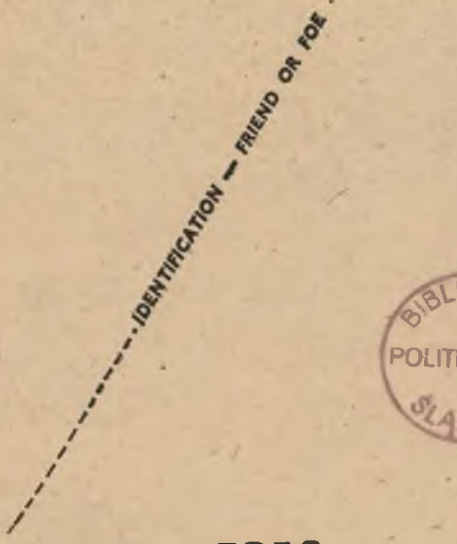
I.E.E., S. MID. STUDENTS' SECTION.—Loughborough. "Air Blast Circuit Breakers," J. Humphries.

N.E. COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS.—Newcastle-on-Tyne. "Electronics: Their Scope in Heavy Engineering," W. G. Thompson. *6 p.m.*

Saturday, December 1.

I.E.E., N. MID. STUDENTS' SECTION.—Bradford. "Voltage Stabilisers; their Principle and Design," G. N. Patchett. *2.30 p.m.*

JUNIOR INSTITUTION OF ENGINEERS, N.W. SECTION.—Manchester. "The Application of Electric Motors and Control Gear," H. P. Pentelow. *2.30 p.m.*



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